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Table of Contents

Medical Color Image Enhancement using Wavelet Transform and Contrast Stretching Technique……..…..…..1
Roopali D Pai, Prof. Srinivas Halvi, Prof. Basavaraj Hiremath……..…..…..1

WIRELESS TECHNOLOGY IN NETWORKS ……..…..…..8
Surabhi Surendra Tambe……..…..…..8

Uptake of Second Dose of Measles-Containing Vaccine among Children in Kakamega County, Kenya ……...…..…..11
F. M. Makokha, P. M. Wanjala, J. Githuku, and H. L. Kutima……...…..11

A Study on Clinical Profile of New Onset Focal Seizures in a Tertiary Care Centre ……..…..…..15
Dr. K. S. Amaravathi, Dr. R. Nagamani, Dr. P. Sakuntala, Dr. M.N.Shyamsunder, Dr.P.V. Rajasekhar, Dr. V. Gopalakrishna……..…..…..15

BEHAVIOR OF BLENDED SELF-COMPACTING CONCRETE USING INDUSTRIAL BYPRODUCT ……..……..…..19
Monika Y.E, Naveen Kumar S.M, Dr. M Rame Gowda, Sanjith J, Ranjith A……....19

Insider Data Theft Prevention System ……..…..24
Mr. Kunal Madhukar Shirkande, Prof. Prajakta A. Satarkar……..…..…..24

A Study on Clinical Profile of Acute Kidney Injury ……..…..28
Dr. R. Nagamani, Dr. K. Sudarsi, Dr. K. S. Amaravati, Dr. Musa Khan, Dr. P. Sakuntala and Dr. Deepthi……..…..…..28

White Tea (Camellia sinensis) Extract Role as AntiProliferative of Colon Cancer Cell Line, Caco-2 ……...33
Entissar S. Al-Suhaibani……...…..33

ROI in Training: How do HR Executives make investment decisions? ……...…..39
Cláudia Teixeira and Leandro Pereira……..…..…..39

Comparative effects of pioglitazone, α-lipoic acid, taurine and chromium picolinate and their combinations on hyperglycemic, lipid profile and oxidative stress parameters in fructose-induced insulin..…..45
Mohammed H. Moawad, Hala F. Zaki, Ezz-El-Din S. El-Denshary……..…..45

Study of Random Urinary Calcium – Creatinine Ratio in Prediction of Pre-Eclampsia ……...…..56
Dr. Gaurang K, Dr. Basavraj Savdi, Dr.Rudrappa G., Dr.Sabithabai T……...…..56

An Experimental Study on Compressive Strength and Splitting Tensile Strength of Concrete with Partial Replacement of Cement with Stone Quarry Dust ……..……...…..59
Dr. Naeem Ijaz, Muhammad Abdullah Alvi, Muhammad Umer Farooq, Masood UR Rehman, Usmaz Afzal, Qammar Abbas, Muhammad Farhan Arshad, Shahbaz Talib, Zeeshan Khaliq……..…..59

Important factors of BPR for ICT in Education Institutes at Delhi (India) ……...…..65
Saranjit Kaur, Kawaljeet Singh……..…..65

Ectrodactyly, Ectodermal Dysplasia with Cleft Palate: A Case Report ……..69
S.Subash, M.Sathyamoorthy, P.Karthikeyan, P.Paramanantham, P.Manoj Kumar Reddy……..69

Interleukin 6 as a Biomarker of Ischemic Heart Disease ……..71
Martin Joseph Sto. Tomas, Patricia Megan Baluyot, Ana Loraine Delos Santos, Jenelle Faustino, Eunice Licudine, Ella Marie Mendoza, Steven Truelen, Ma. Jennifer Tiburcio…..…..71

Structural Design Criteria & Design Loads on Delhi Metro Rail and Checking of Safety of Radial Joints in Tunnel Lining Segments ……..75
Vijay Bhushan Gupta, Dr. M.P.Jakhanwal……..75

Peace and Security: Necessities for Sustaining National Transformation in Nigeria ……..80
Madu, Catherine Omeriyang(Ph.D), Ewelum, Johnson Nnadi (Ph.D) & Chieke, Joseph Chukwuto……..80

Internals of Hadoop Application Framework and Distributed File System ……..84
Saminath.V, Sangeetha.M.S……..84

Medical Data Mining: Health Care Knowledge Discovery Framework Based On Clinical Big Data Analysis ……..91
Dalia AbdulHadi AbdulAmeer……..91

The Legacy of Kuriakose Elias Chavara as a Social Reformer ……..97
Manjula Scaria, Binoy Joseph……..97

Effect of Short Duration High Intensity and Long Duration Low Intensity Progressive Aerobic Exercise on Selected Health Related Fitness Components and Hematological Parameters on Male Students of Hara ……..102
Dereje Wakene, Negussie Bussa, Shemelis Mekonnen……..102

Effect of Physical Activities in Lowering Blood Pressure in Hypertensive Patients: The Case of Haramaya University Main Campus Employee, Ethiopia ……..108
Sheleme Gofe, Negussie Bussa and Molla Deyou……..108

Skewness Corrected Control Charts for Random Queue Length ……..113
Manik Khaparde, Nanda Rajput……..113

"A Comparative Evaluation of Palatal Adaptation in Denture Bases Processed With Compression Molding and Injection Molding In Two Different Palatal Configuration"-An In Vitro Study ……..123
Dr Vigneswaran Sekar MDS, Dr Sendhilnathan D MDS, Dr Lakshmi S, MDS, Dr Abby Abraham MDS, Dr Annapoorni. H MDS……..123

A study on relationship between intelligence and motor fitness between school level cricketers and footballers ……..131
Dalia Begum……..131

Adiponectin as a Biomarker of Type 2 Diabetes Mellitus ……..135
Christine Faith V. Tan, Maria Korina A. Dakis, Chiara L. Delos Reyes, Dong Yeob Ki, Shannen Jaye O. Langcamon, Denise T. Magdamit, Ma. Jennifer R. Tiburcio, Maria Ruth B. Pineda-Cortel……..135

Analyzing the Response of an RLC Circuit ……..139
Sonam Parihar……..139

In quest of understanding more about rural poverty and an adaptable rural growth among rural poor households in rwanda: new realities, new choices for tomorrow; ……...141
By Peter Mbabazi……..141

Vertical Integration: A Teaching Tool of Anaemia in Pregnancy ……218
A. Parimala, Nidhi Sharma, K. Jayashree, P. Sasireka……218

A Comparative Study on Medical Image Denoising in Hybrid domain ……221
Vishnu M., Arun P. S.……221

Analysis of Image Retrieval Using Linear Transformation Techniques ……226
Vidya Rajbansi……226

Sound levels assessment in an ecotourism destination: A case study on Binsar Wildlife Sanctuary of Indian Himalayan Region ……231
Priya Bhalla, Prodyut Bhattacharya, N. C. Gupta……231

Radiotherapy Induced Xerostomia in Head and Neck Cancer Patients ……238
Kailash Mittal, Abhishek Bahadur Singh, Nishu Bala……238

A preliminary study on perception of Cervical cancer ……242
Dr. Diptendu Chatterjee, Prof. Arup Ratan Bandyopadhyay……242

Online Medical History Repository System and Medical Insurance Cover ……246
Vipin Suthar, Sunny Nahar……246

Comparison of the accuracy and dimensional stability of interocclusal recording materials - An in- vitro study. ……248
Sandeep Vivek Gurav, Tulika S. Khanna, Nandeeshwar DB……248

Role & Purpose of Privileges in Global Platform ……257
Mohd Hamid……257

Empirical Study on Corporate Social Responsibility in United Arab Emirates. ……262
Isam Syed Arshad , Talha Muhammad , Ahmad Yahia Mustafa Al Astal……262

From Likes to Loyalty: The Power of Social Media ……267
Uttera Chaudhary, Ankita Asthana, Dr Puja Singhal……267

Efficient Driver Fatigue Detection and Alerting System ……271
Miss. Kanchan Manohar Sontakke……271

Speed Control of BLDC Motor Using DSPIC30F4011 Processor ……275
Yogini B. Hirave,Prof. R.T. Patil ,Mr Ketan Bagade……275

Characterization and Solubility Studies of Mefloquinehydrochloride Inclusion Complexes with α -Cyclodextrin/ Hydroxypropyl α -Cyclodextrin ……..…….……..…...…..282
M.Shirly Treasa, Dr.J.Prema Kumari…….…….……..…..……...282

Productivity Improvement through Single Minute Exchange of Die (SMED) Technique ……..…..287
Mohammed Viqar Nadaf Pinjar, Dr. Shivakumar S, Dr. G V Patil…….…..…..287

Challenges Involved in Developing Intelligent Automatic Command and Control Systems ……..…..295
**Ms Vandana M(SRS),Mr Sunil Sharma M(RS),Mr Prasoon Kumar M(RS),
Mr Gaurav Tripathi M(RS),Ms Asha Meena M(RS),Ms Sonali Rajvanshi M(RS)……..…..295**

Perovskite Solar Cell - A Source of Renewable Green Power ……..…….…..…..298
Prof. (Dr.) R. S. Rohella, Prof. (Dr.), S. K. Panda and Prof. Parthasarthi Das……..…..…..298

Understanding of Internet of Things (IoT) and Experimental Approach using WICED Sense in Android Platform ……..……..……..…..303
Saminath.V, Jung Su…….…….……..…..…..303

Analysis of kidney stones by PXRD and evaluation of the antiurolithic potential of Coix lacryma jobi. ….....309
Ksh.Sangeeta Devi,N.Rajen Singh,M. Damayanti, D.Velmurugan…….…….…..…..309

Preparation and Characterization of Sprayed Mo-doped ZnO Films ……..……..…..314
T. Sreenivasulu Reddy, M. Vasudeva Reddy, K.T. Ramakrishna Reddy……..…..…..314

An Exploration of Splits in African Independent Churches in Zimbabwe (2012-2014) ……...…….…..318
Dr Takesure Beta…….…….……..…..318

Interfacing Parallel Port Using Turbo C Programming ……..…..323
Kansham Modar Maring, Kansham Angphun Maring……...…….……..…..323

Study of Serum HDL Levels in Severe Sepsis Patients in Medical Intensive Care Unit ……...…..…..328
Dr. Naresh Monigari, Dr. Sudha Vidyasagar, Dr. jyosthna Elagandula.……...…….…..…..328

Seepage Rate through Concrete Rectangular Canal Sections with Different Levels of Partial Substitution of Rice Hull for Sand ……..……..341
Simmon M. Tan Jr., RPAE…….…….……..…..341

Laparoscopic ventral hernia repair –Early Experience in 25 patients ……..…..…..347
**Dr.Anshuman Pandey, Dr.Shakeel Masood, Dr.Ashok Kumar Singh, Dr.Rajul Abhishek,
Dr.Yukteshwar Mishra, Dr.Gaurav Bhardwaj…….…….……..…..347**

Accelerometer Based Trajectory Motion Recognition for an Intelligent Environment ……..…..354
Rinku Raichel Thankachan, Joseph John…….…….……..…..354

A study of performance appraisal system in unscheduled cooperative Banks in Noida region and its effect on employee's and organisation's growth and performance ……..……..357
Divya Srivastav, Dr Jaya Yadav…….…….……..…..357

Study the Response of Drought Stress Inducing by Mannitol in Germination to Seedling Stage of Mung Bean (Vigna Radiata L.) Variety MI5 and Variety Harsha ……..363
Dahanayake Nilanthi, Perera P.C.D. and PGTM Gunarathna……..363

Incidence and Trend of Antibiotic Resistance among Streptococcus pneumoniae Isolated from Pediatrics in Ekiti and Ondo States of Southwestern Nigeria ……..367
Ajibade V. A, Julius, O. O., and Ajayi, F. A……..367

Cloud Computing Adoption in Nigeria: Challenges and Benefits ……374
Kuliya Muhammed, Isma'il Zaharaddeen, Kabir Rumana, Abdulkadir M. Turaki……..374

An Analytical Study of Heavy Metal Concentration in Soil of an Industrial Region of Chhattisgarh, central India ……381
Manoj Kumar Tiwari, Dr. Samir Bajpai, Dr. U. K. Dewangan……..381

Effect of Fertilizer Rates on Soil Chemical Properties and Yield of Maize-Soybean Intercrop in Makurdi-Southern Guinea Savanna Zone of Nigeria ……389
A. Ali, N.B. Ibrahim And M. Usman……..389

Condition Monitoring Of Cooling Tower Fan Gearboxes by Wear Debris and Vibration Analysis – A Case Study ……397
D.Sivakumar, Dr. S.Adinarayana, Praveen kalla……..397

Study on the Quality of Honey Collected from Three Floral Sources of Bangladesh ……404
Mohammed Sakhawat Hossain, Md. Ruhul Kabir, Wim Reybroeck, Md. Zinnatul Alam……404

Effect of Different Chemicals on Drone Fertility of Honeybee (Apis mellifera L.) ……413
Mohammed Sakhawat Hossain, Boris Baer, Barbara Baer-Imhoof, Md. Zinnatul Alam……413

Geophysical and Geotechnical Investigations of a proposed Site for Afijio Local Government Stadium Ilora, Southwestern Nigeria ……419
Aladejana J. A., Talabi, A. O., Oke, S. A., Oyelami A. C…… ……419

Malaria and Pre-Eclampsia among Pregnant Women Attending Ante-Natal Clinic in Okigwe Local Government Area. ……426
Onuigbo C. Martin, Elendu C. Onwuchekwa, Ekeleme Uzochukwu G……426

Precautions in Planning and Construction for Trouble Free Maintenance ……436
Vijay Bhushan Gupta……436

Examination of Lactic Acid Bacteria's Ability from Fish Intestinal Tract in Deconjugation Bile Salt ……441
Astuti, Zaenal Bachruddin, Supadmo, Eni Harmayani……441

Utility of irreducible group representations in differential equations ……448
Ismail Mustafa Mohammed & Mohammed Ali Bashir……448

Cytogenetic Analysis of Red Rust Flour Beetle Tribolium castaneum, Herbst (Coleoptera: Tenebrionidae) ……453
Dr. Shweta Singh and Prof. Sant Prakash……453

Effect of Temperature and Humidity on the Culture of Tribolium castaneum, Herbst (Coleoptera: Tenebrionidae) in the laboratory ……..…..…..466
Dr. Shweta Singh and Prof. Sant Prakash…….…….……..…..466

Partial Replacement of Sand by Quarry Dust in Concrete ……...…..…..472
Sumit L. Chauhan, Raju A.Bondre…….…….…….……..472

Comparison of sonosalphingography and laparoscopy in evaluation of tubal patency in infertility patients ……..…..…..476
Dr Kavita Sambharam, Dr Supriya Rode, Dr Anand Bhalerao…….……..…..476

Secure Element : An evolution to existing secure technology …….…….……..…..481
Sonal Rohilla…….……..…..481

The Unreliable Narration and the suppression of Emotions in Kazuo Ishiguro's the Remains of the Day ……..…..486
N.Rema…….…….……..…..486

Multi Imsi – Subscription Based Mobile Service …….…….……..…..489
Deepak Kumar…….…….……...…..489

The Cortisol Awakening Response for Using Fuzzy Time Series and Genetic Algorithms ……...…..491
P. Senthil Kumar, B. Mohamed Harif, A. Nithya…….…….……..…..491

IAFP: Integration of Apriori and FP-Growth Techniques to Personalize Data in Web Mining …….…..499
Manasa G, Mrs. Kulkarni Varsha…….…….……..…..499

Structural Model Design of Xanthone Compounds as Antimalarial Activity ……...…..…..503
Dr.Amanatie, Prof. Dr.Jumina, Prof. Dr Mustofa, M.Kes, Prof. Dr M.Hanafi, Dr. Ria Armunanto…….…….……...…..503

Objectivity and Ethics in Empirical Research …….…….……..…..509
Dr. Kasphia Nahrin…….…….……..…..509

The Effect of Parental Mediation and Television Co-Viewing on Adolescents Sexual Initiation in Kenya ……..……....513
Sammy Yaah Baya, Dr. Hellen K. Mberia and Dr. Julius Bosire……...…….…..513

Pathogenicity of Aeromonas hydrophila to blunt snout bream Megalobrama amblycephala …….…..519
Ngoc Tuan Tran, Ze-Xia Gao, James Milton, Li Lin, Yang Zhou, Wei-Min Wang…….…..519

Seismic Vibration Control of a MDOF Building Connected with Viscous and SAVFD Dampers ……...…..526
Mr. Muralidhara G B, Mr. Naranagowda, Mrs. Swathi Rani K S…….…….……..…..526

Conservation and Management of Bioresources of Chilika Lake, Odisha, India ……..…….…..534
N.Peetabas & R.P.Panda…….…….……..…..534

Immediate Implant Placement Following Extraction in Maxillary Anterior Region – A Case Report ……..…..538
**Dr. Monika Sharma, Dr. Abby Abraham, Dr. Vigneshwaran .S , Dr. Lakshmi .S , Dr. H. Annapoorni……..……..……..

Implementation of Routing Protocol for Network and Data Security using Onion Routing with Salt Method ……..……..……...…..…..619
Sweta Tiwari, Deepak Arora, Vineet Singh…….……...…….…..…..619

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Medical Color Image Enhancement using Wavelet Transform and Contrast Stretching Technique

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Abstract- Low contrast and poor quality images are the main problems in the medical field. Wavelet transform based techniques are of greater interest because of their performance over Fourier and other spatial domain techniques. By using the wavelet transforms using Haar wavelet followed by the Laplacian operator to obtain the sharpened image gives a novel method for medical image enhancement. First, a medical image is decomposed with wavelet transform. Secondly, all high-frequency sub-images were decomposed with Haar transform. The contrast of the image is adjusted by linear contrast enhancement approaches. Filters are applied to identify the edges. Finally, the enhanced image was obtained by subtracting resulting image from the original image. Experiments showed that this method can not only enhance an image's details but can also preserve its edge features effectively.

Index Terms- Image Enhancement, Discrete Wavelet Transform, Color Conversion, Lifting DWT, Linear Contrast Stretching, Image Sharpening, RMSE, PSNR.

I. INTRODUCTION

A visual image is rich in information and many real world images are acquired with low contrast and poor quality, sometimes unsuitable for human eyes to read such medical and X-ray images. Image enhancement is a classical problem in image processing and computer vision. The image enhancement is widely used for image processing and as a preprocessing step in speech recognition, texture synthesis and many other applications. The main purpose of image enhancement is to bring out details that are hidden in an image or to increase contrast in a low contrast image[13]. Image enhancement is basically improving the interpretability or perception of information in images for human viewers and providing better input for other automated image processing techniques[16].

Medical image enhancement technologies have attracted much attention since advanced medical equipment's were put into use in the medical field. Enhanced medical images are desired by surgeons to assist diagnosis and interpretation because medical image qualities are often deteriorated by noise and other data acquisition devices, illumination conditions, etc. Also targets of medical image enhancement are mainly to solve problems of low contrast medical image. Image enhancement is the improvement of digital image quality without knowledge about the source of degradation[1]. Principle objective of Image enhancement is to process an image so that result is more suitable than original image for specific application[16].

The enhancement methods can broadly be divided into the following two categories[8][18]

- Spatial Domain Methods
- Frequency Domain Methods

In spatial domain techniques , we directly deal with the image pixels[16][8]. In this method pixel values are manipulated to get desired enhancement results. The value of pixel at coordinates (x,y) on enhanced image 'F' is the result of operations performed on the neighborhood of (x,y) on the input image 'f'. In frequency domain methods, the image is first converted into the frequency domain. In this process, the Fourier Transform of the image is computed first. All of the required enhancement operations are performed on the Fourier transform of the image. All required enhancement operations are performed so that modification is done in the contrast of an image, in brightness of an image etc. As a consequence the pixel value (intensities) of the output image will be modified according to the transformation function applied to the input values. Image enhancement simply means, transforming an image f in to an image g using T. (Where T is the transformation. The pixel values in images f and g are denoted by r and s, respectively [5]. The pixel values r and s are related by the expression,

$$s = T(r) \qquad \ldots\ldots (1)$$

Where T is a transformation which maps a pixel value r into a pixel value s. The results of above transformation are mapped into the grey scale range as we are dealing here only with grey scale digital images. Therefore, the results must be mapped back into the range [0,L-1], where L=2k, k being the number of bits in

the image being considered. Therefore, for an 8-bit image the range of pixel values will be[0, 255].

In conventional Fourier transform, we use sinusoids for basis functions. It can only provide the frequency information. Temporal information is lost in this transformation process. In some applications, we need to know the frequency and temporal information at the same time. Unlike Fourier transform, Wavelet transform shows localization in both time and frequency and hence it has proved itself to be an efficient tool for a number of image processing applications [4]. Fourier transform based methods are less useful because, they cannot work on non-stationary signals but wavelets can do. Hence wavelet based noise removal has attracted much attention of the researchers for several years. Unlike conventional Fourier transform, wavelet transforms are based on small waves, called wavelets. It can be shown that we can both have frequency and temporal information by this kind of transform using wavelets. Wavelet analysis is similar to Fourier analysis in the sense that it breaks a signal down into its constituent parts for analysis. Whereas the Fourier transform breaks the signal into a series of sine waves of different frequencies, the wavelet transform breaks the signal into its "wavelets", scaled and shifted versions of the "mother wavelet"[6].

$$\psi_{a,b}(t) = \frac{1}{\sqrt{|a|}}\psi\left(\frac{t-b}{a}\right) \quad \ldots\ldots (2)$$

Where a,b∈R , $a \neq 0$

The parameter a is the scaling parameter or scale, and it measures the degree of compression. The parameter b is the translation parameter which determines the time location of the wavelet. If $|a| < 1$, then the wavelet in (2) is the compressed version (smaller support in time- domain) of the mother wavelet and corresponds mainly to higher frequencies. On the other hand, when $|a| > 1$, then $\psi_{a,b}(t)$has a larger time-width than $\psi(t)$ and corresponds to lower frequencies. Thus, wavelets have time-widths adapted to their frequencies. This is the main reason for the success wavelets in signal processing and time-frequency signal analysis.

Wavelet is irregular in shape and compactly supported. It is because of these properties of being irregular in shape and compactly supported that make wavelets an ideal tool for analyzing signals of a non-stationary nature [7].

There are many types of Wavelets like Haar Wavelet, Shannon Wavelet, Meyer wavelet, Daubechies Wavelet etc. for the analysis. Daubechies wavelets are very famous but haar wavelet are the simplest among wavelet families and suited well for binary images.

Wavelet Transform can be classified into continuous and discrete. Discrete Wavelet Transform (DWT) based image coding has better performance than traditional DCT based image coding, The DCT is similar to the discrete Fourier transform: it transforms a signal or image from the spatial domain to the frequency domain . DCT is real-valued and provides a better approximation of a signal with few coefficients. This approach reduces the size of the normal equations by discarding higher frequency DCT coefficients[17]. The enhanced image is reconstructed by using inverse DCT and it will be sharper with good contrast. The discrete wavelet transform (DWT) provides sufficient information both for analysis and synthesis of the original signal, with a significant reduction in the computation time[8].

DWT transforms, a discrete time signal to discrete wavelet representation[15]. By applying the 1-D discrete wavelet transform (DWT) along the rows of the image first, and then along the columns to produce 2D decomposition of image. DWT produce four sub bands low-low(LL), low-high(LH), high-low(HL) and high-high(HH).By using these four sub bands we can regenerate original image[10]. Theoretically, a filter bank shown in Fig. 1 should work on the image in order to generate different sub band frequency images. LL band contains more information whereas the remaining sub-bands constitutes the information of edges[3].

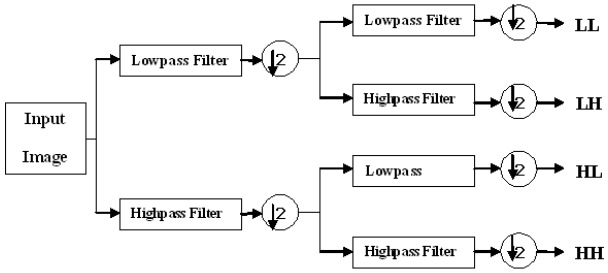

Figure 1: Discrete wavelet transform

Motivation:

Medical images are a special kind of images and are very important for diagnosis and correct interpretation. But images can be blur or may be of low contrast and poor quality. In such cases it will be difficult for surgeons to take the decisions. The principal objective of image enhancement is to modify attributes of an image to make it more suitable for a given task and a specific observer. Enhanced medical images are desired by surgeons to assist in diagnosis and interpretation. The result is more suitable than the original image for certain specific applications.

Contribution:

The Lifting DWT is used for image decomposition. We also used Linear Contrast Stretching to increase the brightness followed by Laplacian filter for the edge detection. Finally enhanced image is obtained by subtractions the sharpened image from original image. So we get the enhanced image which is visually appealing and with high PSNR value and low RMSE.

II . LITERATURE SURVEY

Dr. Muna F. Al-Samaraie et. all [1] have proposed 'Medical Colored Image Enhancemet using Wavelet Transform Followed by Image Sharpening' where a novel method for enhancing and sharpening medical color digital images is given. Low contrast and poor quality are main problems in the production of medical images. By using the wavelet transforms with Haar transform followed by using the Laplacian operator to obtain the sharpened image. First, a medical image was decomposed with wavelet transform. Secondly, all high-frequency sub-images were decomposed with Haar transform. Thirdly, noise in the frequency field was reduced by the soft-threshold method. Fourthly, high-frequency coefficients were enhanced by different weight values in different sub-images. Then, the enhanced image was obtained through the inverse wavelet transform and inverse Haar transform. Lastly, the filters are applied to sharpen the image; the resulting image is then subtracted from the original image. Experiments showed that this method can not only enhance an image's details but can also preserve its edge features effectively. The parameters measured is PSNR which is satisfactory.

Yashu Rajput et. all [2] proposed 'Advanced Image Enhancement Based on Wavelet & Histogram Equalization for Medical Images' where Image enhancement is used to produce high quality pictures like Medical images. As the quality of the image is very much depends on environmental effects like light, weather or equipment that we used to capture the picture, images may loose important information which is required to enhance the quality of an image. So we have many techniques to recover the lost data to improve the quality of the picture .Non linear enhancement technique is used to increase the contrast level of an image like wavelet transform and Histogram Equalization. In this experiment it is found that this method enhance the contrast level of an image.

Ganesh naga sai Prasad et. all[3] proposed 'Image enhancement using Wavelet transforms and SVD' where Resolution and contrast are the two important attributes of an image. In this paper developed a method to enhance the quality of the given image. The enhancement is done both with respect to resolution and contrast. The proposed technique uses DWT and SVD. To increase the resolution, the proposed method uses DWT and SWT. These transforms decompose the given image into four sub-bands, out of which one is of low frequency and the rest are of high frequency. The HF components are interpolated using conventional interpolation techniques. Then we use IDWT to combine the interpolated high frequency and low frequency components. To increase the contrast, we use SVD and DWT. The experimental results show that proposed technique gives good results over conventional methods.

Anamika Bhardwaj et. all [4] proposed 'A Novel approach of medical image enhancement based on Wavelet transform' where, by using the wavelet transform and Haar transform, a novel image enhancement approach is proposed. First, a medical image was decomposed with Haar transform. Then again high frequency subimages were decomposed secondly noise in the frequency field was reduced by the soft threshold method. Then high frequency coefficients are enhanced by different weight values in different sub images. Then the enhanced image was obtained through the inverse Haar transform. Lastly, the image's contrast is adjust by nonlinear contrast enhancement approaches. Experiments showed that this method can not only enhance an image's details but can also preserve its edge to increase human visibility.

III. PROPOSED MODEL

Input images are medical images. We have used both grayscale and color medical images. Our method works well for non medical images as well.

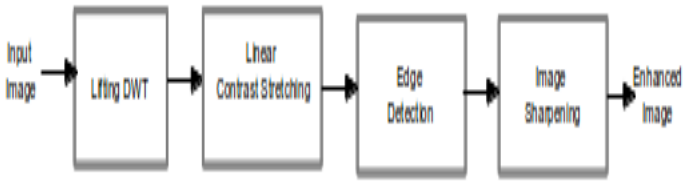

Figure 2 : The Image Enhancement Block for grayscale images

Figure 3 :The Image Enhancement Block for color images

Lifting DWT :

In Lifting Scheme, the signal is divided into odd and even signals. Later, a sequence of convolution and accumulation techniques is applied[12].

Steps involved in Lifting Scheme are[11]:
1. SPLIT
2. PREDICT
3. UPDATE

[1] SPLIT:
This step is performed in order to split the data into two smaller subsets i.e. even and odd

[2] PREDICT:
Here, we make use of the even samples that are multiplied by the prediction operator to predict the odd samples. Then the detail

coefficient is obtained by taking the difference between the odd sample and the prediction value.

[3] UPDATE:

In this phase, the even samples are updated with detail to get smooth coefficient

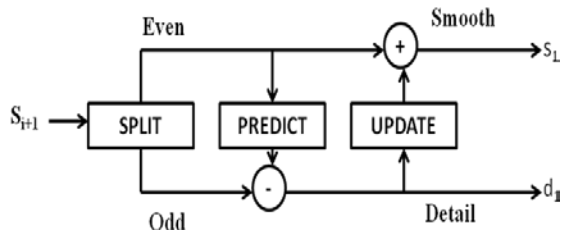

Figure 4: Wavelet Transform: Lifting- based implementation

RGB to HSV Conversion :

Color vision can be processed using RGB color space or HSV color space. RGB color space describes colors in terms of the amount of red, green, and blue present. HSV color space describes colors in terms of the Hue, Saturation, and Value. In situations where color description plays an integral role, the HSV color model is often preferred over the RGB model. RGB defines color in terms of a combination of primary colors R,G and B but the HSV model describes colors similarly to how the human eye tends to perceive color[1].

Equations used for color conversion is as follows :

$$H = \cos^{-1}\left\{ \frac{\frac{1}{2}[(R-g)+(R-b)]}{\sqrt{(R-g)2+(R-b)(G-b)}} \right\} \text{....(3)}$$

$$S = 1 - \frac{3}{R+G+B}[min(R,G,B)] \quad \text{.... (4)}$$

$$V = \frac{1}{3}(r+g+b) \text{.... (5)}$$

Linear Contrast Stretching :

The stretch used to rescale image data into brightness values can make a drastic difference in the way that the image appears. You can adjust the parameters of the stretch in order to maximize the information content of the display for the features in which you are most interested. This process is referred to as contrast stretching because it changes contrast in the image[1]. Contrast refers to the relative differences in the brightness of the data values. This technique modifies the linear contrast stretch that was related to the value transformation of the brightness part of the image. It can be measured by the lowest value of the brightness contrast (grey level = 0) to the highest value of the brightness contrast (grey level = 255) to full the grey scale level. A brightness value of between 0-255 would be spread out and could be calculated with the equation below :

g(x,y)= T[f(x,y)] .... (6)

where,

g(x,y) = A brightness value of the area in the image at the exit

f(x,y) = The brightness value of the area at the entrance

T = The function for the linear transformation

Edge Detection :

Edges are significant local changes of intensity in an image. Edges typically occur on the boundary between two different regions in an image. Important features can be extracted from the edges of an image (e.g., corners, lines, curves). This method clearly defines the edges of the image. An edge point is a point at the location of a local intensity change. An edge detector is an algorithm that computes the edges in an image. Laplacian flter is used with eqn. [9]

$$\nabla^2 = \frac{4}{\alpha+1}\begin{bmatrix} \frac{\alpha}{4} & \frac{1-\alpha}{4} & \frac{\alpha}{4} \\ \frac{1-\alpha}{4} & -1 & \frac{1-\alpha}{4} \\ \frac{\alpha}{4} & \frac{1-\alpha}{4} & \frac{\alpha}{4} \end{bmatrix} \text{.... (7)}$$

We have used the value for α is 0.8

Image sharpening :

The new approach enhancement model in this research begins with brightness enhancement. The algorithm of this technique was processed according to the sharpening model, which on the first stage, the color information of the digital image are transformed into grayscale image. Then, linear contrast stretch approaches to enhance the brightness of the image. The image is then edge detected by finding the second derivative of the Laplacian operator. Finally, increase the sharpness of the image by subtracting the result with the original image.

This step subtracts the edge detection output from original image and hence gives the enhanced image

.

$$f_{enh}(x,y) = f(x,y) - \nabla^2 T[f(x,y)] \text{... (8)}$$

IV. ALGORITHM

Problem definition : Medical images are a special kind of images and are very important for diagnosis and correct interpretation. But images can be blur or may be of low contrast and poor quality or sometimes are distorted by noise during acquiring and transmissions. In such cases it will be difficult for surgeons to take the decisions. The principal objective of image enhancement is to modify attributes of an image to make it more suitable for a given task and a specific observer. Enhanced medical images are desired by surgeons to assist in diagnosis and interpretation. The result is more suitable than the original image for certain specific applications.

Objective:

- To increase PSNR
- To decrease MSE, RMSE

Input: Medical image

Output: Enhanced mage

Step 1: Read the input image

Step 2 : Check the dimensions if it is 2 then go to Step 5 else go to step 3

Step 3 : Apply RGB to HSV conversion

Step 4 : Retain H and extract S and V

Step 5 : Apply Lifting DWT. Get LL,LH,HL,HH band

Step 6: Extract only LL band and resize into original image size

Step 7 : Apply Linear Contrast Stretching using equation

Step 8: Perform Edge Detection using Laplacian filter

Step 9: Image sharpening by subtracting the output from step 8 from original image

Step 10 : Perform HSV to RGB conversion for color image

Step 11 : Enhanced image

Step 12 : Measure RMSE and PSNR

V. PERFORMANCE ANALYSIS & RESULT

For the set of input images performance of Lifting DWT with haar wavelet method followed by image sharpening is measured. Here for the purpose of performance measurement image with 256 x 256 resolution is used.

Subjective and objective evaluations are the types of evaluations which are helpful to examine the quality of the image. The image is observed by a human who has special knowledge of human visual system, in subjective evaluation. But this examining method of an image quality doesn't give efficient results because HVS, human vision system is complicated system.

So we choose subjective evaluation to measure the quality of an image. Various parameters are used to measure the image quality in objective evaluation of the image. Mean square error (MSE), Peak signal to noise ratio (PSNR), Root mean square error (RMSE) are the some of the metrics used here.

5.1. Performance parameters definition:

5.1.1 Mean square error (MSE)

Mean square error (MSE) is the quality measuring parameter which is used over a great extent, and is the simplest one among all other metrics. It is found by taking the average of the squared differences of the intensities of the original and estimated image [14][5].

For an image of size M x N the mean square error (MSE) is defined as :

$$MSE = \frac{1}{MN}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1}(f(x,y) - f_{enh}(x,y))^2$$

…. (9)

5.1.2 Root mean square error (RMSE)

Root mean square error (RMSE) is the other quality examining metric of the image. It is obtained by taking square root over mean square error (MSE).

$$RMSE = \sqrt{\frac{1}{MN}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1}(f(x,y) - f_{enh}(x,y))^2}$$

…. (10)

5.1.3 P*eak signal to noise ratio (PSNR)*

Peak signal to noise ratio (PSNR) is widely used quality metric. It is measured in logarithmic scale in decibels (dB). By calculating the ratio of maximum signal power to the maximum noise power we can find the PSNR value of the corresponding image. If PSNR value of the image increases, the quality of the image also increases gradually[15].

Here L reflects the the maximum possible pixel value of the image .If the K channel is encoded with a depth of 8-bit, then L= 2^8 - 1 = 255. PSNR is usually expressed in terms of the decibels scale .If a signal to noise ratio is high then the mean square error will be minimum[10].

Peak signal to noise ratio (PSNR) is defined as,

$$PSNR = 10\log_{10}(\frac{255^2}{MSE})$$

…. (11)

VI. RESULT

The below figures shows the results of the existing DWT method and proposed Lifting DWT method. Grayscale medical image IM0006 and color medical image IM_0016 are used, and the comparison of the original image, DWT image and proposed method image enhancement is displayed.

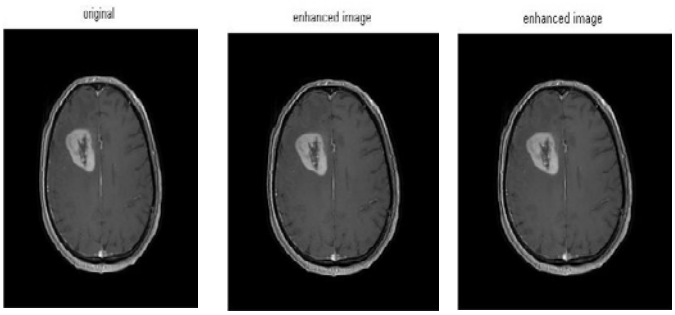

Figure 5 : Original grayscale Image, DWT Enhanced image ,Lifting DWT Enhanced Imag

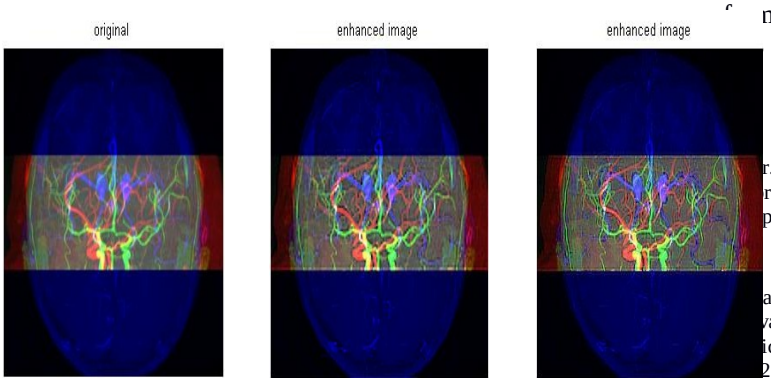

Figure 6 : Original Color Image, DWT Enhanced image ,Lifting DWT Enhanced Image.

From Table I, we observed that the PSNR value of the proposed Lifting DWT method is greater than the existing DWT method, and RMSE value is lesser than the existing method for different medical image input.

Table I: Comparison of RMSE and PSNR values for DWT method and proposed Lifting DWT method.

Image	Existing Method		Proposed Method	
	RMSE	PSNR(dB)	RMSE	PSNR(dB)
IM_0006	3.8321	36.4621	2.5385	40.0392
IM_0016	5.3203	33.6631	4.4323	35.2208
IM_0004(1)	5.2129	33.7893	3.3934	37.5181
IM_0001-005.dcm	6.0677	32.4703	3.5967	37.0128
r5b.jpg	7.0077	31.2202	5.7832	32.8943

VII. CONCLUSION

An important problem of medical image enhancement based on wavelet transform is how to extract high-frequency information. Haar transform is used to decompose the high-frequency sub-images of wavelets in this algorithm. This helps us to extract high-frequency information effectively. Different enhancement weight coefficients in different sub-images and Edge sharpening are used in the process of medical image enhancement. They can also help us to enhance a medical image effectively. Results of experiments show that the algorithm not only can enhance an image's contrast, but also can preserve the original image's edge property effectively. We use one level CDF 5/3 lifting DWT to decompose an image. The sharpening method procedure was experimented with additional steps. We first transform the image from color image into grayscale, then begin edge detecting with Laplacian technique. The edge detected image is then subtracted f n the original image. The output image after enhancement of high quality.

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WIRELESS TECHNOLOGY IN NETWORKS

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Abstract- The following research paper presents an overview regarding the emerging technology of Wireless Brodband networks. It focuses on the history,tools,standards and implementation of Wi-Fi networks.However the main purpose of this research paper is to understand the various problems associated with the implementation of these WLANs and propose recommendation and measures to solve these problems and mitigate potential risk factors.

Index Terms- QoS, Security, WLANS, Wi-Fi

I. INTRODUCTION

Telecommunication has become an integral part of our daily lives and has been contributing widely to the advancement in various fields. One of the emerging mode is Wireless broadband technology which transmits multiplexed information on a wide band of frequencies. The deployment of Wireless broadband services is done by weighing the geographical population density against the bandwidth limitation. Wireless technologies are designed to reduce the time and different types of obstacles created by cables and more convenient than wired networking. In 1997,'Wireless fidelity-popularly known as Wi-Fi technology was developed by IEEE 802.11 standards which provided users the liberty to connect to the internet from any place.But this service was pretty expensive till 2002 ,however the new 802.11g standards in 2003 has lead to creation of Wifi enabled devices to the masses as a result today a Wi-Fi router has become a household commodity in most modern homes in India.

Since its inception, the Wi-Fi technology has a come a long way in providing quicker wireless access to Internet applications an data across a radio network thereby making the access process faster than conventional modem. Radio bands such as 2.4GHz and 5GHz depend on wireless hardware such as Ethernet protocol and CSMA for the Wi-Fi Technology to work .Like every communication network, this method also involves transmitter(Wireless Router/Hotspot) and receiver which can be any Wifi enabled device like laptop,mobile,tablet etc.

Many organizations and users have found that wireless communications and devices are convenient, flexible, and easy to use. Users of wireless local area network (WLAN) devices have flexibility to move their laptop computers from one place to another within their offices while maintaining connectivity with the network. Wireless personal networks allow users to share data and applications with network systems and other users with compatible devices, without being tied to printer cables and other peripheral device connections. Users of handheld devices such as personal digital assistants (PDAs) and cell phones can synchronize data between PDAs and personal computers and can use network services such as wireless email, web browsing, and Internet access. Further, wireless communications can help organizations cut their wiring costs.

A. WIFI – SOFTWARE TOOLS

Windowusers:KNSGEM2,NetStumbler,OmniPeek,Stumbverter, WiFi Hopper,APTools.

Unix users:Aircrack,Aircrack-ptw,AirSnort,CoWPatty,Karma

Mac users:Macstumble,KisMac,Kismet.

(Users may select a Wi-Fi software tool that is compatible with their computer or else it should be builtin)

B.FOR CONNECTING TO A WI-FI

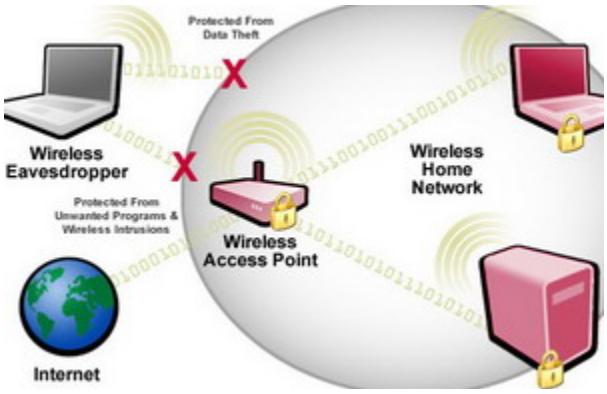
A wireless adapter card is essential .

The SSID infrastructure, and data encryption are also required.

The Wi-Fi security methods include-MAC ID filtering,Static IP addressing and WEP encryption.

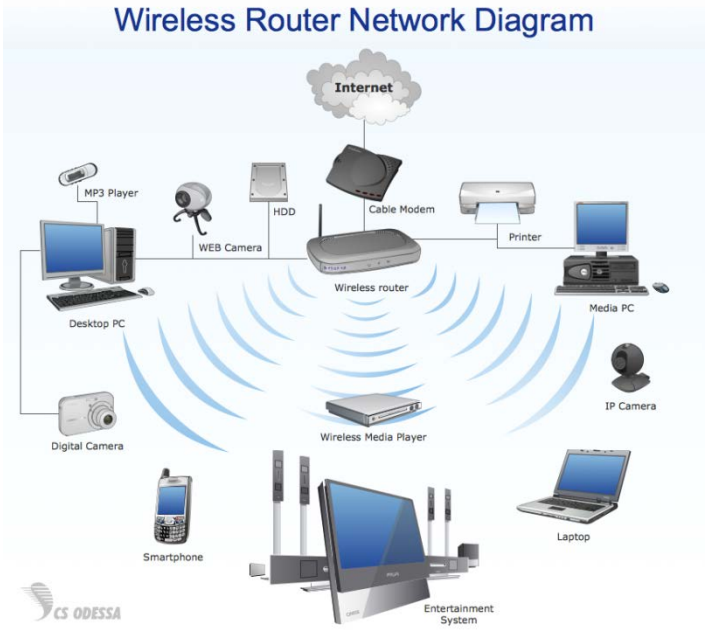
C.The Wi-Fi network technology is based on IEEE 802.11 protocol.Following are the various Wi-Fi Standards:

1)802.11a technology has a range of 5.725 GHz to 5.850GHz with a data rate of 54Mbps.
2)802.11b with a data rate of 11Mbps at 2.4GHz
3)802.11e addresses Qos issues and is excellent for streaming quality of video,audio and voice channels.
4)802.11f addresses multivendor interoperability
5)802.11g deals with higher data rate extension to 54Mbps in the 2.4GHz.
6)802.11h deals with dynamic frequency selection and transmit power control for operation of 5GHz products.
7)802.11i addresses enhanced security issues.
8)802.11j addresses channelization in Japan's 4.9GHz band.
9)802.11k enables medium and network resources more efficiently.
10)802.11 deals with Wireless Network Management which is still in progress.



II. EXISTING TECHNOLOGIES AND PROBLEMS

The basic existing technology for implementation of Wireless networks(WLAN) in residential and enterprise setups can be understood simply from these explanatory diagrams.



However our major concern in this research paper is that there are several issues associated with the deployment and management of WLAN. These include scalability,provisioning,real-time and non-real time data flow,accessibility range,power management interference from other systems operating in the same spectrum such as Bluetooth. Major problems that we need to address are-

1.Security Management

2.QoS(Quality of Service) and centralized Management of WLANs.

The Risk Environment

While wireless networks are exposed to many of the same risks as wired networks, they are vulnerable to additional risks as well.

Wireless networks transmit data through radio frequencies, and are open to intruders unless protected. Intruders have exploited this openness to access systems, destroy or steal data, and launch attacks that tie up network bandwidth and deny service to authorized users. Another risk is the theft of the small and portable devices themselves.

Wireless networks and handheld devices are vulnerable to many of the same threats as conventional wired networks. Intruders who gain access to information systems via wireless communications can bypass firewall protection. Once they have accessed systems, intruders can launch denial of service attacks, steal identities, violate the privacy of legitimate users, insert viruses or malicious code, and disable operations. Sensitive information that is transmitted between two wireless devices can be intercepted and disclosed if not protected by strong encryption. Handheld devices, which are easily stolen, can reveal sensitive information

III. SOLUTIONS BASED ON RESEARCH

Recommendations for Secure Wireless Networks

- Maintain a full understanding of the topology of the wireless network.
- Label and keep inventories of the fielded wireless and handheld devices.
- Create backups of data frequently.
- Perform periodic security testing,audits and assessment of the wireless network.
- Perform a risk assessment, develop a security policy, and determine security requirements before purchasing wireless technologies.
- Apply security management practices and controls to maintain and operate secure wireless networks after careful installation

- The information system security policy should directly address the use of 802.11, Bluetooth, and other wireless technologies.

- Configuration/change control and management practices should ensure that all equipment has the latest software release, including security feature enhancements and patches for discovered vulnerabilities.
- Standardized configurations should be employed to reflect the security policy, and to ensure change of default values and consistency of operations.
- Security training is essential to raise awareness about the threats and vulnerabilities inherent in the use of wireless technologies.
- Robust cryptography is essential to protect data transmitted over the radio channel, and theft of equipment is a major concern

- Enable, use, and routinely test the inherent security features, such as authentication and encryption methods that are available in wireless technologies.
- Firewalls and other appropriate protection mechanisms should also be employed

IV. RESULTS

THE RESEARCH FINDINGS SUGGEST THE RESULT THAT A SECURE ENVIRONMENT CAN BE CREATED FOR WIRELESS NETWORKS BY UNDERTAKING CERTAIN MEASURES WHICH WOULD ENABLE US TO GAIN ACCESS TO THESE WLANS BY MITIGATING POTENTIAL RISKS.

V. CONCLUSION

Organizations and individuals benefit when wireless networks and devices are protected. After assessing the risks associated with wireless technologies, organizations can reduce the risks by applying countermeasures to address specific threats and vulnerabilities. These countermeasures include management, operational, and technical controls which will not prevent all penetrations and adverse events, they can be effective in reducing many of the common risks associated with wireless technology.

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Uptake of Second Dose of Measles-Containing Vaccine among Children in Kakamega County, Kenya

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Abstract- Measles is a major cause of death and complications among young children worldwide despite the availability of a safe and effective vaccine. Per annum over 158,000 cases of measles mortality are reported globally, especially in Africa and Asia. In Kenya, 59 per a million measles incidence were reported in 2011. Approximately 80.1 % of the children aged less than 5 years receive a first dose of measles-containing vaccine in Kakamega County. In 2013 a second dose of measles-containing vaccine was introduced in the routine immunization system. A cross-sectional survey was conducted to determine the coverage of second dose of measles-containing vaccine among children in Kakamega County. Thirty clusters were selected using probability proportional to size with replacement, 19 households were surveyed per cluster and data of the youngest child aged between 24-35 months collected. Among the 571 children surveyed; the coverage of second dose of measles-containing vaccine was 102 (17.9%) (95%CI = 14.9% to 21.3%).The caretaker's awareness of the second dose of measles-containing vaccine, time taken to the nearest health facility, uptake of Pentavalent 3 and uptake of at least two doses of Vitamin A was significantly associated with the uptake of the second dose of measles-containing vaccine, p-value of 0.0000, 0.0010, 0.0281 and 0.0000respectively. The second dose of measles-containing vaccine coverage in Kakamega is very low, strategies focusing on demand creation, conducting outreach services in hard-to-reach areas and ensuring that there are no missed opportunities should be put in place to increase utilization of the second dose of measles-containing vaccine across the County.

Index Terms- Children in Kakamega County, Kenya, Measles-containing vaccine, uptake

I. Introduction

Measles is a highly contagious, acute viral illness that can lead to complications such as pneumonia, encephalitis, and death (1;2). Almost all non-immune children contract measles if exposed to infection. Measles kills more children than any other vaccine-preventable disease. Measles is a worldwide major cause of death and complications among young children despite the availability of a safe and effective vaccine. Per annum over 158,000 measles mortalities are reported globally, especially in Africa and Asia (2).

An effective measles vaccine has been available since the 1960s, and all countries offer measles-containing vaccine (MCV) in tandem with immunization program (3). Since 2000, deaths due to measles have decreased by 78 percent globally. However measles outbreaks are still common in many developing countries, particularly in parts of Africa and Asia as a result of sub-optimal implementation of immunization strategies (3). Measles remains a public health concern in Kenya. It contributes significantly to the burden of disease among children aged less than 5 years (4).

According to Kenya Demographic Health Survey (KDHS) (7, 14), 85.0% in 2009 and 87.9% in 2014 of Kenyan children aged 12–23 months had received first dose of measles-containing vaccine (MCV1). Similarly administrative coverage of MCV1 was 86% in 2010 and 87% in 2011 in Kenya (5). This was a steady increment as compared to 2003 when the coverage of MCV1 in Kenya was 46.4% (6). The MCV1 coverage in the former Western province, where Kakamega County is located was estimated at 77.7% in 2009 (7) and 80.1% in 2014 (14).

In 2009, the World Health Organization (WHO) recommended that all children under 5 years of age in countries where MCV1 coverage was more than 80% for three consecutive years should receive a second dose of measles-containing vaccine (MCV2) in their routine immunization (RI) schedule (8). The rationale for providing a second opportunity for measles vaccination is two-fold: First to immunize the primary vaccine failures among children who did not respond to MCV1 and second is to vaccinate those children who were missed out by routine services (9). In line with the WHO recommendation Kenya introduced MCV2 in RI in 2013 (4). Apart from administrative coverage that is reported routinely by all the immunization points in the county, little was known on the population coverage. Therefore, this study set out to determine the uptake and factors associated with its uptake of MCV2 in Kakamega County, Kenya.

II. Materials and Methods

Study site

Kakamega County is the second most highly populous county among the 47 counties in Kenya, with projected 2015 population was 1,929,401 of which about 4 % being children aged 24-35 months old. It is located in Western Kenya about 30km north of the Equator, at Latitude and Longitude of 0'275" N, 34'757"E respectively. The County boarders Vihiga County to the South, Busia and Siaya Counties to the West, Bungoma and Trans Nzoia Counties to the North, Uasin Gishu to the North East and Nandi County to the East. The county covers an area of approximately 3050.3 km^2. Administratively the County consists of sixty wards and twelve sub- Counties (10).

Sample and Sampling Technique

A sample of 571 children was surveyed as per the WHO guidelines of conducting immunization coverage survey. Multi-stage cluster sampling technique was used by selecting 30 clusters (Villages) and then 19 children aged 24-35 selected from each village (11).

Data Processing and Analysis

Data was entered and cleaned using MS Excel 2007 (Microsoft, Seattle, WA, USA) and analysed using EPI Info 7 (CDC, Atlanta, GA, USA) computer software. Univariate and bivariate analysis were calculated. Prevalence Odds Ratios at 95% confidence interval (CI) were used to assess measure of association between variables. P-value of ≤ 0.05 was considered significant. Factors with a p-value ≤ 0.10 were subjected to multiple logistic regression model using backward elimination, dropping the least significant independent variable until all the remaining predictor variables were significant (p-value ≤ 0.05). All biologically plausible two-way interactions between variables remaining in the model were tested and retained if significant.

III. Results

Coverage of MCV2 among Children

Of the 571 children surveyed, 293(51.3%) were female and 293(51.3%) were aged less than 30 months with median age of 29.0 months with inter-quartile range of 26.5 to 33.0 months, 533(93.3%) of the mothers were aged less than 40 years with median age of 27.0 years with inter-quartile range of 24.5 to 32.5 years, 157(27.4%) of the mother had at least secondary education. The corresponding vaccination coverage was 102 (17.9%) (95%CI = 14.9% to 21.3%), 480(84.1%) (95%CI = 80.7% to 86.9%), 510(89.3%) (95%CI = 86.4% to 91.7 %), 489(85.6%) (95%CI = 82.4 % to 88.4%), 438(76.7%) (95%CI = 73.0% to 80.1%), and 164(28.7%) (95%CI = 25.1-% to 32.7%) for MCV2, MCV1, OPV3, Pentavalent3, Pneumococcal3 and at least two doses of Vitamin A respectively (Table 1). 16(2.8%) (95%CI= 1.7 % to 4.6%) had not been vaccinated against any antigen.

Table 1: Coverage for MCV2 among children aged 24-35 months by risk factors

Variable	Categories	N= 571 n (%)	95% CI
Child sex	Male	278(48.7)	44.5-52.9
Child Age	< 30 months	293(51.3)	47.1-55.5
Number of Deliveries	> 1	473 (82.8)	79.3-85.8
Birth Order	≥1	430(75.3)	71.5-78.8
Age of mother	< 40	533(93.3)	90.9-95.2
Level of education of the mother	Secondary and above	157 (27.4)	23.8-31.3
Occupation of the mother	Business/ Farmers/Casual	533(93.3)	90.9-94.2
Marital status of the mother	Married	476(83.4)	80.0-86.3
Caretaker's awareness on MCV2	Yes	279(48.9)	44.7-53.0
Time taken to nearest health facility	< 30 minutes	99(17.3)	14.4-20.8
Received OPV 3	Yes	510(89.3)	86.4-91.7
Received Pentavalent 3	Yes	489(85.6)	82.4-88.4
Received Pneumococcal vaccine 3	Yes	438(76.7)	73.0-80.1
Received MCV1	Yes	480(84.1)	80.7-86.9
Fully immunized at 1 year	Yes	370(64.8)	60.7-68.7
Received MCV2	Yes	102(17.9)	14.9-21.3
Received ≥ 2 doses of Vitamin A	Yes	164(28.7)	25.1-32.7

Factors Associated With Uptake of MCV2

Multivariate analysis showed that only caretaker's awareness of MCV2, time taken to the nearest health facility, uptake of Pentavalent3 and two or more doses of Vitamin

A were significantly associated with uptake of MCV2 (Table 2). However factors such as uptake of MCV1, and oral polio vaccine 3 were also significant in bivariate analysis.

Table 2: Multivariate Analysis for most significant risk factors MCV2 uptake among children aged 24-35 months

Term	Odds Ratio	95% C.I.	P-Value
Caretaker aware of MCV2	14.5	6.9 -30.2	0.0000
Received Pentavalent 3	3.5	1.1-10.4	0.0281
Time taken to nearest health facility < 30min	2.7	1.5-5.0	0.0010
Received ≥ 2 doses of Vitamin A	4.5	2.7-7.6	0.0000

IV. Discussion

Global coverage estimates for the MCV2 were reported for the first time in 2013.The global coverage was 35% by the end of the second year of life and 53% when including older age groups, and in Africa it was estimated at 7% (12, 13). Therefore the MCV2 coverage of 17.9% in Kakamega County is comparable to coverage in developing world given that the MCV2 was only introduced into RI in Kenya in 2013 (4). For instance both Sudan in 2012 and Eastern Mediterranean region in 2013 had coverage of 24% (13). However in 2013, MCV2 coverage was 81% in European and 92% in Western regions. This could be partly explained by the fact that only 23% of the countries in the African region had included MCV2 in their RI system by 2013 as compared to 71% and 48% in European and Western regions respectively (13).

The low uptake of MCV2 in Kakamega County could also be attributed to poor immunization trends witnessed across the Country. According to the KDHS (7), 77% of Kenyan children aged 12–23 months had received all recommended vaccines. However, KDHS(14) shows that only 68% and 62.2% of children age 12-23 months were fully vaccinated nationally and in Kakamega County respectively (14). However, MCV1 coverage in the country remained at a high of 87% in 2014(14). This was similar with estimates of 86% in 2010 and 87% in 2011 (5, 15). This stagnation could be attributed to devolution of health services in 2013, where some health indicators declined. This low uptake of MCV2 coupled with unchanged coverage of MCV1 creates a pool of children without immunity against measles infection. This is a precondition for major measles outbreaks in the region. This also dims the prospect of eliminating measles in the region by 2020.

From bivariate analysis sex and age of the child and marital status of the mother did not influence the uptake of MCV2 in Kakamega County. This is similar to a study conducted in Brazil that showed that there was no difference in coverage by sex and age of the child (16). Children of the caretakers who were aware of MCV2 had 15 times more chances of receiving MCV2 than those whose caretakers had no knowledge of MCV2; this is collaborated with Ibnouf, Borne *et al.* (17) and KNBS (7) that showed that knowledge on the importance of vaccination played a role in the uptake MCV.

Time taken to the nearest immunization post was associated with the uptake of MCV2. For instance children stay within 30 minutes walk to the immunization centre had 3.3 better chances of receiving MCV2 than those who walk for longer. Previous immunization history also contributed a lot in the uptake of MCV2. From multivariate analysis only four factors were significant in determining the uptake of MCV2 namely; caretaker's awareness of MCV2, time taken to the nearest health facility, uptake of Pentavalent 3 and uptake of at least two doses of Vitamin. This agrees with many studies that have shown that time or distance taken to vaccination facility and the mother's awareness of the purpose of vaccination play a big role in the utilization of immunization services (17, 19).

V. Conclusion

The MCV2 coverage in Kakamega is very low and given that the majority of those who missed MCV1 also missed MCV2 there is likelihood of recurrent measles outbreaks in the County. Which means the vision of measles elimination by 2020 will remain a mirage. The distance from immunizing facilities, caretakers awareness, uptake of at least two doses of vitamin A and pentavalent 3 were the main determinants of receiving MCV2.

VI. Recommendations

Kakamega County needs to put in place strategies that focus on demand creation for MCV2, outreach services in hard-to-reach areas and utilizing the missed opportunities in order to maximize uptake of MCV2 in the County.

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A Study on Clinical Profile of New Onset Focal Seizures in a Tertiary Care Centre

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***Abstract*- Background:** Epilepsy can be associated with profound physical, social and psychological consequences. Seizures beginning in adult life are likely due to an identifiable cause as compared to those beginning in childhood which are more likely to be idiopathic.

Objectives: To study the clinical profile of new onset focal seizures

Materials and methods: This is a prospective study of 50 cases of new onset focal seizures attending Osmania general hospital medical outpatient department and admitted in medical wards between January 2013 to June 2014. Thorough clinical examination to detect any abnormality in the central nervous system and also to screen the systemic diseases with special attention to tuberculosis and neurocysticercosis was done. Diagnosis was verified by investigations like CT Scan, MRI, EEG and CSF analysis.

Results: Majority of the patients belonged to the age group of 28-37 years. Male to female ratio was 1.5:1. Etiological factors in the decreasing order of frequency are as follows: Post stroke epilepsy (38%), Calcified granuloma (14%), Neurocysticercosis (14%), Tuberculoma (10%), Idiopathic (10%), Brain tumor (6%), Brain abscess (4%) and Meningitis(4%).

Conclusion: Cerebrovascular disease was the most common etiology after 50 years of age whereas calcified granuloma, neurocysticercosis, tuberculoma and epilepsy were common in younger individuals.

Index Terms- New onset focal seizures, Cerebrovascular disease, Calcified granuloma, Neurocysticercosis

I. Introduction

Epilepsy describes a condition in which a person has recurrent seizures due to chronic underlying process that affects people of all ages. Epilepsy refers to a clinical phenomenon rather than a single disease entity, since there are many forms and causes of epilepsy.[1,2]

Epilepsy is a major public health concern in terms of the burden of the disease, nature of illness and its impact on individuals and families. It has been estimated that, globally, at any time there are at least 50 million people with epilepsy and 85% of them are in developing countries.[3,4] However, in developing countries, given the high incidence of epilepsy, the prevalence is relatively low, which may be due to the poor prognosis and high mortality for people with epilepsy[5]. This poor prognosis is mainly because of a large treatment gap along with poor health seeking behaviour of people[5]. In a meta-analysis of previously published and unpublished community-based studies, the overall prevalence of epilepsy in India was found to be 5.3%; slightly higher in the rural areas with a prevalence of 5.5%[6]. The incidence of epilepsy in India is estimated to be 49.3 per 100 000, leading to about half a million new cases every year[7].

Focal seizures arise from a neuronal network either discretely localized within one cerebral hemisphere or more broadly distributed but still within the hemisphere . With the new classification system, the subcategories of “simple focal seizures’’ and “complex focal seizures’’ have been eliminated. Instead, depending on the presence of cognitive impairment, they can be described as focal seizures with or without dyscognitive features. Focal seizures can also evolve into generalized seizures.[8]

With the history and clinical examination, if proper analysis of etiology is made with available investigations, the epilepsy can be treated accordingly thus reducing the morbidity and mortality associated with it.

Hence, this study is aimed at evaluating the clinical profile and etiological analysis of new onset focal seizures in adults of more than 18 years of age.

II. Objectives

To study the clinical profile of new onset focal seizures and to analyze the etiological agents of new onset focal seizures.

III. Methodology

Patients with age at onset of seizures >18 years and epilepsy diagnosed according to ILAE, attending Osmania General Hospital between January 2013 to June 2014 were included in the study. Patients with age at onset of seizures<18 years, patient who is known case of seizure disorder and seizures due to metabolic causes and Pseudo Seizures were excluded from the study. All patients selected were subjected to detailed history, clinical examination and investigations (Complete Blood Picture, Random Blood Sugar, Blood urea, Serum creatinine, Serum electrolytes, HIV1&2, VDRL, CT Brain, CSF analysis, MRI

Brain, EEG and other relevant investigations). The patients were classified according to the ILAE classification.

International League against Epilepsy (ILAE) Commission on Classification and Terminology, 2005 -2009 has provided an updated approach to classification of seizures

1. FOCAL SEIZURES a. Focal seizures without dyscognitive features (with motor, sensory, autonomic or psychic symptoms), b. Focal seizures with dyscognitive features , c. Evolution of focal seizures to generalized seizures .
2. GENERALIZED SEIZURES a. Typical absence seizures , b. Atypical absence seizures , c. Generalized, tonic-clonic seizures, d. Atonic seizures, e. Myoclonic seizures
3. UNCLASSIFIABLE SEIZURES Epileptic spasms

All patients were started on appropriate antiepileptic drugs and other medications depending on the etiological factors.

IV. RESULTS

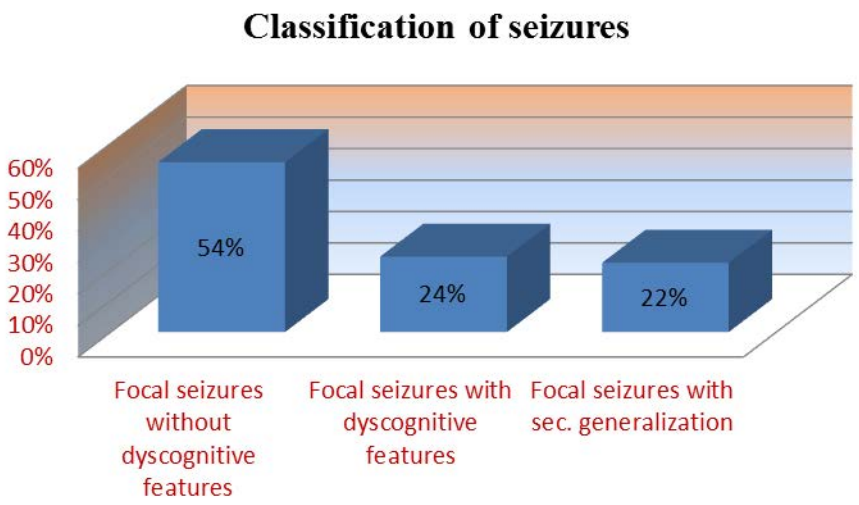
From January 2013 to June 2014 a total of 50 patients with new onset focal seizures attended medical OPD and admitted to medical wards. There were 30 males and 20 females with a male to female ratio of 1.5: 1. The maximum number of patients were in the age group of 28 - 37 years of age.

Table: Age distribution

Age group in years	**18-27**	28-37	38-47	48-57	58-67	>67	Total
Number, %	9(18%)	13(26%)	3(6%)	10(20%)	9(18%)	6(12%)	50(100%)

Out of 50 cases 27(54%) patients presented with focal seizures without dyscognitive features, 12(24 %) patients had focal seizures with dyscognitive features and 11(22%) patients presented with focal seizures evolving in to secondary generalization.

Fig: Classification of seizures



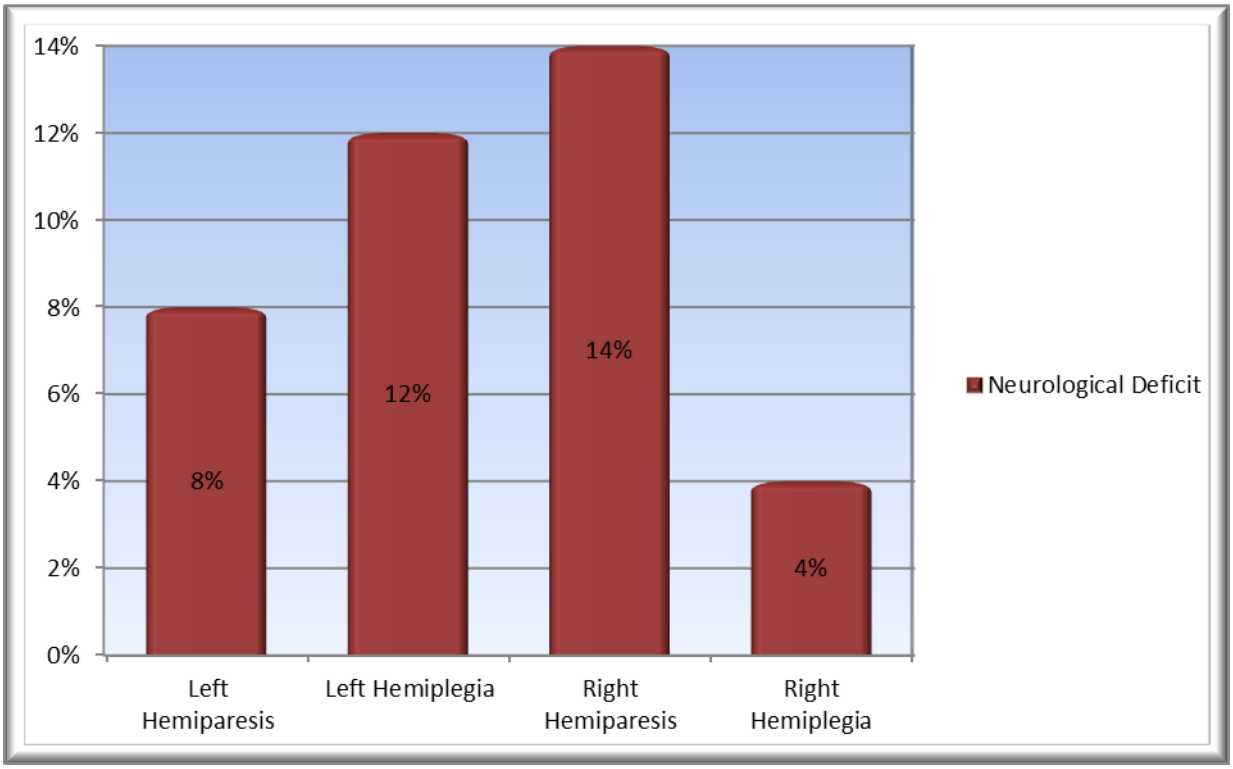
6 (12%) patients presented with epilepsia partialis continua.

24(48%) patients presented with prodromal symptoms and aura preceding seizures which were more significant in patients with dyscognitive features and secondary generalization. 15(30%) patients in our study had post-ictal phenomenon in the form of confusion, disorientation, loss of consciousness, drowsiness, headache, generalized body aches, Todd's paralysis, aphasia, amnesia and mood changes.

No significant family history was noted among patients in the study.

Neurological deficit was present in 19(38%) patients. 7(14%) patients had right hemiparesis, 2(4%) patients had right hemiplegia, 4(8%) patients had left hemiparesis and 6(12%) patients had left hemiplegia.

Figure: Neurological deficits

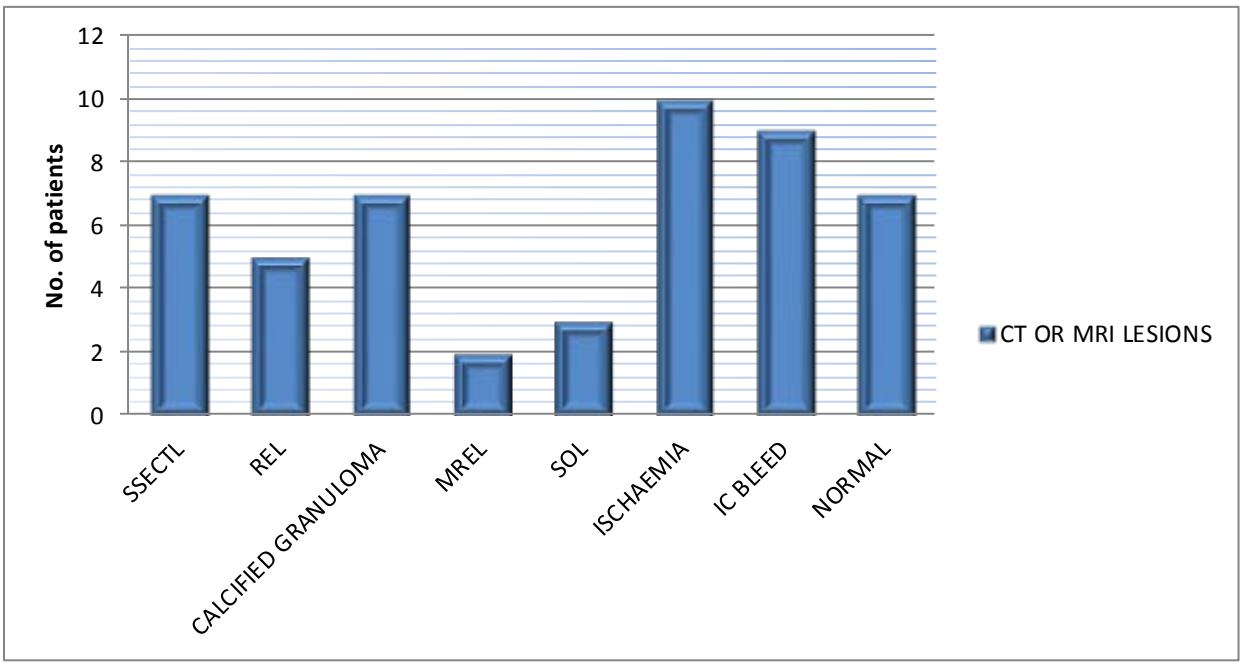


Among the etiological factors post stroke epilepsy (n=17, 38%) was the commonest cause followed by calcified granuloma (n=7, 14%), neurocysticercosis (n=7, 14%), tuberculoma (n=5, 10%), idiopathic (n=5, 10%), brain tumors (n=3, 6%), brain abscess (n=2, 4%) and Meningitis (n=2,4%).

In our study all patients underwent CT Brain (plain or Contrast) or MRI Brain depending upon the requirement for diagnosis**.**

Of these 43(86%) patients showed abnormal imaging findings. 19(38%) patients had CVA(Infarction in 10 and hemorrhage in 9 patients), 7(14%) patients had single small enhancing CT lesions, 5(10%) patients had ring enhancing lesions, 7(14%) patients had calcified granuloma, 3(6%) patients had space occupying lesions and 2(4%) patients had multiple ring enhancing lesions. 7(14%) patients did not have any radiological abnormalities.

Figure: Imaging abnormalities



V. Discussion

We had 50 cases of new onset focal seizures. The maximum number of patients were in the age group of 28-37years. The age was lower in other studies (mean age of 14.8 years and 25 years in studies by Thomas S V et al[9]., and Dilli Ram Kaffle[10]) as we had excluded patients <18 years of age and those with previous history of seizures. There was a slight male (M:F=1.5:1) preponderance similar to that of a study by Dilli Ram Kaffle[10](M:F=1.3:1).

None of our patients had family history of epilepsy contrary to the studies by Dilli Ram kaffle[10](10%) and a study conducted in Sudan(20%).

The common causes of partial seizures in our study group in the decreasing order of frequency are post stroke epilepsy (n=17, 38%), calcified granuloma (n=7, 14%), neuro cysticercosis (n=7, 14%), tuberculoma (n=5, 10%), idiopathic(n=5, 10%), brain tumors (n=3, 6%), brain abscess (n=2, 4%) and Meningitis(n=2, 4%).

The etiological factors and imaging findings were similar to the the studies by Dilli Ram Kaffle[10], Trentin et al[12] , Ravindra Kumar Garg et al[12]., and Pradeep et al[13].

EEG was abnormal in 25(50%) patients which was comparable to the studies by Dilli R Kaffle[10](48.6%) and Joseph et all.,(47.1%)[14].

Patients with Neurocysticercosis responded well to a combination of albendazole, steroids and anti epileptic drugs. Patients with Tuberculoma responded well to anti Tubercular therapy along with anti epileptics.

VI. Conclusion

This study highlights the current scenario of the pattern of new onset focal seizures in a tertiary care centre. The fact that seizures commonly affect the productive age group and mostly due to secondary causes are issues for concern. In the face of recent advances in neurophysiological investigations, an accuracy in identifying etiopathogenesis of underlying cause of seizures, the future prospective management of seizures appears bright and convincing.

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BEHAVIOR OF BLENDED SELF-COMPACTING CONCRETE USING INDUSTRIAL BYPRODUCT

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Abstract- Advancement in technology demand certain properties of the concrete related to strength and durability to be improved to some extent possible. In this regard, self-compacting concrete was emerged to overcome certain fresh properties also.. The SCC was first developed in 1988 to achieve workable and durable concrete structure. In the present article summarizes the improvement in certain fresh properties even with mechanical properties was found to be improved with metakaolin and silica fume as admixtures at different ages of concrete curing.

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Index Terms- SCC- self compacting concrete, MK- Metakaolin and SF- Silicafume

I. INTRODUCTION

The development of self-compacting concrete (SCC) has been one of the most important development in the building industry. The purpose of this concrete concept is to decrease the risk due to human factor. Also with an addition of admixtures, great improvement in the pore structures, also compact ability was found to be affected by the characteristics of the materials and the mix proportions hence, it is necessary to arrive the proper mix design procedure. The use of SCC is spreading worldwide because of its very attractive properties.SCC was first developed in the late 1980's by Japan researchers. Research & development work into SCC in Europe began in 1990's. In Europe it was probably first used in civil work for transportation networks in mid 1990's.The EC funded a multi-national industry lead project "SCC" 1997-2000 & since then SCC has increasing in all European countries. In 2002 EFANARC published their "specification guidelines for SCC Okamura & Ozawa have proposed the mix proportion system for SCC.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

CHANDRAKANT U.et.al (2014) studied was made an attempt to understand the effect of mineral admixtures on fresh and hardened properties of SCC. In this study, metakaolin and cement kiln dust were considered as mineral admixtures. The addition of 10 % Kiln Dust in SCC mixes found to increase the self compact ability characteristic like filling ability, passing ability, flowing ability and segregation resistance. The compressive strength, flexural strength and split tensile strength of SCC increased for 7 days to 28 days of replacement levels of 10%, 20%, 30 % of cement by Metakaolin & CKD.

B.H.V. PAI et.al (2014) studied on Self Compacting Concrete mixes Ash and Rice Husk Ash. The research project was aimed at producing and comparing SCCs incorporating Fly ash (FA) and Rice husk ash (RHA) as supplementary cementing materials in terms of their strength parameters. SCC containing FA has better performance in regard of strength parameter than SCC containing RHA. It was also observed from the experimental results that the calculated cement content (200kg/m3) as per the Nan Su et al. method was not adequate to give the required strength to the mix.

J.M.SRISHAILA et.al (2014) studied on Combined Effect of Ground Granulated Blast Furnace Slag and Metakaolin on Mechanical Properties of Self Compacting Concrete, investigated the combined effect of Ground Granulated Blast Furnace Slag (GGBS) and Metakaolin on the properties of self compacting concrete. The workability test of self compacting concrete was carried out on fresh concrete. The compressive, split tensile, and flexural strength test of concrete with replaced GGBS plus Metakaolin at 5%,15%and

25% and 3%,6% and 9% were examined after curing period of 28 and 56 days. Fresh property results show that as the percentage of Metakaolin increases the filling and flowing ability of the concrete decreases. The compressive, split tensile, flexural strength was maximum for the mix proportion Metakaolin 6% and GGBS 15% and is higher by 44% with respect to first mix.

J.M.SRISHAILA et.al (2014) investigated on mechanical properties of self compacting concrete incorporating combined effect of GGBFS at 5%, 15% & 25% and metakaolin at 3%, 6% & 9%. Fresh properties like filling and flowing ability were found to be decreased with the percentage increase in metakaolin. The hardened properties showed maximum strength at 6% of metakaolin replacement and 15% of replacement of GGBFS.

B.H.VENKATARAM et.al (2014) studied on self compacting concrete by incorporating the effect of admixtures. Author aimed at producing SCC mixes of M25 grade by considering the effect of five mineral admixtures namely, fly ash, GGBFS, silica fume, rice husk ash and shell lime powder. Also hardened properties of these SCC mixes were compared in terms of strength.

DEEPA BALAKRISHNAN S.et.al (2013) studied on fresh properties and strength parameters of SCC incorporating fly ash and dolomite powder. High volume fly ash self compacting concrete was developed with 18.75%, 25% & 31.5% by percentage mass replacement of fly ash and 6.25%, 12.5% of replacement with dolomite powder. From the experimental results, it was found that, inclusion of fly ash in SCC mixes tend to reduce the bleeding and segregation and passing and filling ability of concrete was found to be increased. Dolomite powder found to improve the segregation resistance of the concrete mix.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

The Present investigation methodology adopted has been divided into two phase. The 1st phase's covers the development of SCC mixes using industrial by product such as SF and MK and also study the fresh properties of developed blended SCC mixes in the laboratory. The 2nd phase covers the study of hardened properties of developed SCC mixes in the laboratory according to Indian scenario.

Cement: In this experimental study, ordinary Portland cement 43 grade conforming to IS: 8112-1989.
Fine aggregate: Locally available river sand nearby area was used as a fine aggregate.
Coarse aggregate: All types of aggregates are suitable. The normal adopted size is ranged 10-12mm.

Table 1 Physical Properties of Coarse and Fine Aggregates

Property	Fine aggregate	Coarse aggregate
Specific gravity	2.66	2.67
Finess modulus	2.32	7.69
Bulk density	1297	1327
Particle shape	Rounded	Angular

Fresh properties

Filling Ability: The ability of concrete to fill up the formwork to be placed.

Passing Ability: The ability to pass through congested reinforcement without separation of the constituents or blocking.

Resistance to segregation: The ability to retain the coarse components of the mix in suspension in order to maintain a homogeneous material.

Table 2 Fresh properties of Self Compacting Concrete.

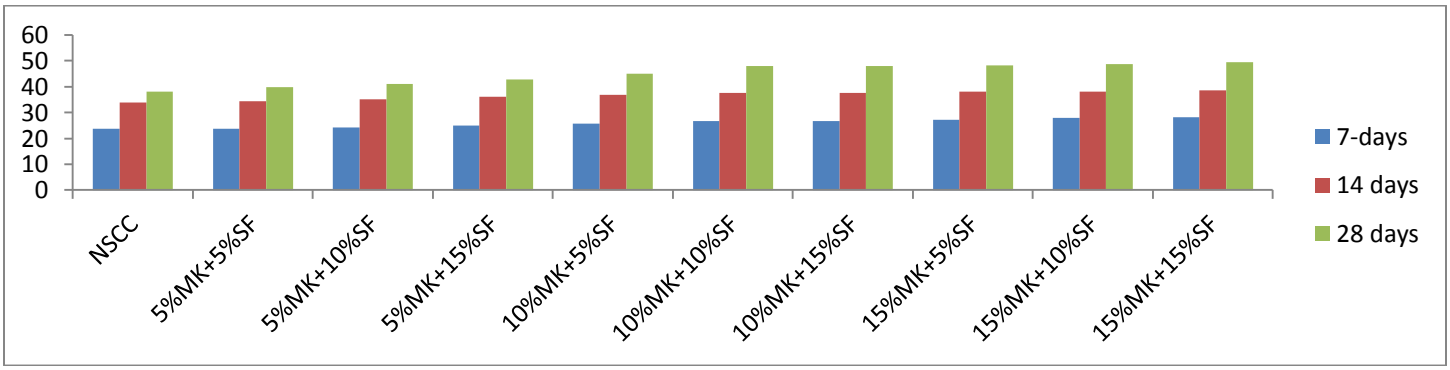
MIXES	Slump flow (650-800mm)	T_{50cm} Slump flow (2-5sec)	V-funnel (6-12sec)	J-ring (0-10sec)
NSCC	710	3.46	8	4
5%MK+5%SF	706	3.34	9	7
5%MK+10%SF	702	3.12	9	5
5%MK+15%SF	700	3.04	10	6
10%MK+5%SF	696	2.97	10	7
10%MK+10%SF	689	2.90	11	8
10%MK+15%SF	682	2.82	12	9
15%MK+5%SF	670	3.46	8	7
15%MK+10%SF	687	3.34	10	4
15%MK+15%SF	690	3.12	9	5

Hardened properties of SCC

The following are the tables give the test results of Self compacting concrete, when cement is partially replaced by Silica fume and metakaolin, for Compressive and Split tensile strength.

Table 3 Compressive Strength test results

Specification	7-days compressive strength(Mpa)	14-days compressive strength(Mpa)	28- days compressive strength (Mpa)
NSCC	23.63	33.82	**38.06**
5%MK+5%SF	23.77	34.24	39.76
5%MK+10%SF	24.18	35.08	41.09
5%MK+15%SF	24.92	36.10	42.72
10%MK+5%SF	25.6	36.90	44.89
10%MK+10%SF	26.6	37.58	47.92
10%MK+15%SF	26.7	37.65	47.94
15%MK+5%SF	27.2	37.98	48.23
15%MK+10%SF	27.89	38.05	48.74
15%MK+15%SF	28.24	38.50	49.35

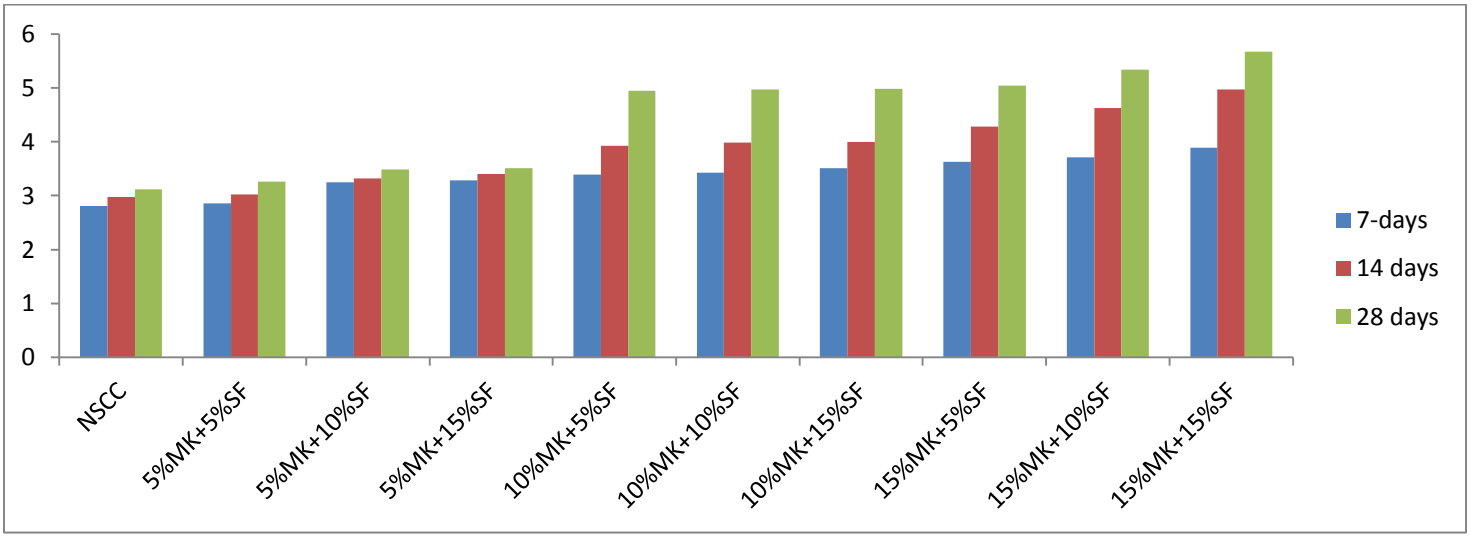


Graph 1 Compressive strength results

The above graphical representation indicates the compressive strength for 7, 14 and 28 days with various replacements of MK & SF with cement. It has been noted that increase in the percentages and blending of both the mineral admixtures gives the incremental strength.

Table no 4: Split tensile strength test results

Specification	7-days Split tensile strength(Mpa)	14-days Split tensile strength(Mpa)	28- days Split tensile strength (Mpa)
NSCC	**2.81**	**2.98**	**3.12**
5%MK+5%SF	2.85	3.02	3.26
5%MK+10%SF	3.25	3.32	3.48
5%MK+15%SF	3.28	3.40	3.51
10%MK+5%SF	3.39	3.92	4.94
10%MK+10%SF	3.42	3.98	4.97
10%MK+15%SF	3.51	4.00	4.98
15%MK+5%SF	3.63	4.28	5.04
15%MK+10%SF	3.71	4.62	5.34
15%MK+15%SF	3.89	4.97	5.67



Graph 2 Split tensile strength

The above graphical representation indicates the splitting tensile strength for 7, 14 and 28 days with various replacements of MK & SF with cement. It has been noted that increase in the percentages and blending of both the mineral admixtures gives the incremental strength.

CONCLUSION

Trial and error procedure have to be adopted for maintaining flow ability, self compatibility and obstruction clearance as per Nan Su method till to arrive consistent SCC mix.

There was an increase in the strength of SCC when the cement is replaced by MK & SF up to 15%. This also reduces the cement content by increasing the MK &SF thus reducing the further cost of SCC mixes developed.

Using the combined mixing of SF & MK as a cement replacement level between 5-15%, SCC mixes can be achieved with good flow characteristics and better compressive strength. However the results obtained proves that percentage addition of SF& MK is allowed up to 15% without sacrificing the compressive strength in all the cases.

MK & SF can be very good replacement for cement with respect to economy, strength and the considerations of availability of resources.

The MK & SF in place of cement shall be very economical and can also help in the utility of Industrial wastes and in maintaining the ecological balance, thus reducing the consumption of cement.

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Insider Data Theft Prevention System

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Abstract- Insider data theft attacks are characterized by an adversary stealing a legitimate user's credentials and using them to impersonate the authenticate user and to perform malicious activities. Prior works also combines a user behavior profiling technique with a baiting technique, but profiling user behavior using single modeling technique suffers from a considerable number of false positives. Also decoy documents are placed at conspicuous locations rather than using automatically generated decoys which may not give significant accuracy to the detection system. Proposed system will extend prior work and presents an integrated detection approach where behavior profiling will be done by combining more than one classifier, each uses different modeling algorithm to reduce false positive rate. Along with this proposed system will include a baiting approach based on automated generation of demand decoy documents on the user's file system and user authentication by challenge questions, to provide more accuracy. Proposed system could provide a strong defense mechanism against malicious insider data theft attacks.

Index Terms- Behavior profiling technique, Anomaly detection, Decoy documents, User authentication by challenge questions

I. INTRODUCTION

In many business organizations, the most destructive form of attacks against a computer network is not from the outside hacker, but from trusted entities that belong to the internal organization. Data theft attacks are augmented if the attacker is a malicious insider. This is considered as one of the top threats to cloud computing by the Cloud Security Alliance.Insiders may get the credentials of authorized user by sniffing password for accessing system illegitimately. The insider can be considered extremely dangerous, due to an in-depth knowledge of the target and trusted access to sensitive information on the system.

The Twitter incident is one of the popular examples of an insider data theft attack from the Cloud. Several Twitter corporate and personal documents were illegitimately copied to technological website TechCrunch. Customer's accounts, including the account of U.S. President Barack Obama, were illegitimately accessed. The attacker used a Twitter administrator's password to get access over Twitter's corporate documents, hosted on Google's infrastructure as Google Docs.

Much research in security has paying attention on ways of preventing insider data theft by developing sophisticated access control and encryption mechanisms. However these mechanisms have failed to prevent data damage caused by insider data theft.
A possible solution proposed here is, an integrated approach for masquerade attack detection which uses behavior profiling (using ensemble of classifiers with different modeling algorithm) with generating on demand decoy documents to bait attackers along with user authentication by challenge questions. The approach could improve detection accuracy over prior techniques and will be less vulnerable to impersonation attacks.

II. MOTIVATION

Existing algorithms used for modeling user behavior uses statistical features, such as the sequence of user commands or co-occurrence of multiple events combined through logical operators. The anomaly detectors built using these algorithms are used then to determine deviations from normal user behavior. Anomaly detectors suffer from low accuracy and particularly from high false positive rates. One way to overcome this shortcoming is by combining several base classifiers to create one ensemble of classifiers. Each classifier uses a different modeling algorithm to profile user behavior.

If the different classifiers have highly overlapping anomaly spaces, then when evading detection by one classifier by impersonating real user behavior, an attacker is likely to get away from detection of the other classifiers. Combining different classifiers in this case does not comprise a good defense mechanism against mimicry attacks. To overcome the limitations of model diversity, proposed system will merge the two different detection techniques .The first is a modeling technique based on profiling behavior profiling. The second is a baiting technique where decoy technology is used.

In prior work, Decoys files are strategically placed at conspicuous locations by the legitimate user in their own file system, but there is no guarantee that fake user will surely touch these files. So to overcome this limitation proposed system will generate on demand decoy documents, if user is suspected as masquerader by behavior profiling. Any access to these decoy documents is then considered as indicative of malicious insider activity.

III. LITERATURE REVIEW

Stolfo et al proposed a combined approach for detecting masquerade attacks [1]. The authors focused on modeling user search behavior with a baiting technique to reveal an attacker's malicious intent. They hypothesized and showed that a masquerader would engage in search activities different from those of the legitimate user in terms of their volume and frequency.

Maloof et al applied a user behavior profiling technique to detect malicious insider activities which violated `Need-to-Know' policy [2]. In order to identify bad insider behavior, they defined the malicious user scenarios and had to combine results different sensors through a Bayesian net. Although the few attack

scenarios tested were detected, there was no real evaluation of the false positive rate associated with the overall classifier.

Hershkop et al surveyed that most of the prior user behavior profiling work focused on auditing and modeling sequences of user commands including work on enriching command sequences with information about command arguments. A thorough review of these machine learning techniques can be found in this survey [3]. The detection rates of these anomaly detection techniques ranged between 75.8% and 26.8%, with false positive rates ranging between 1% and 7%. These results are obviously far from satisfactory.

Chawla et al presented a novel approach to distributed learning using fuzzy clustering [4]. This intelligent method of partitioning a dataset is compared to simpler, random methods of partitioning. The results presented in this paper suggest that for very large datasets, the creation of ensembles of classifiers can perform reasonably well.

Dzeroski et al empirically evaluated several state-of-the art methods for constructing ensembles of heterogeneous classifiers with stacking and shown that they perform comparably to selecting the best classifier from the ensemble by cross validation [5]. They had proposed a new method for stacking which uses multi-response model trees at the meta-level.

Bowen et al concluded as masquerade attacks pose a grave security problem and detecting masqueraders is very hard [6]. In this paper, the author has investigated the use of such trap-based mechanisms for the detection of masquerade attacks. They evaluated the desirable properties of decoys deployed within a user's file space for detection.

IV. PROBLEM STATEMENT

Proposed system presents an integrated detection approach where profiling user search behavior will be created by combining more than one classifier to reduce false positive rate. Along with this proposed system will use a baiting approach based on the crafting on demand decoy documents on the user's file system and user authentication by challenge questions. The proposed system will be designed to prevent unauthorized and illegitimate access to the system and to provide security to the user's data by combining behavior profiling and decoy documents.

V. PROPOSED WORK

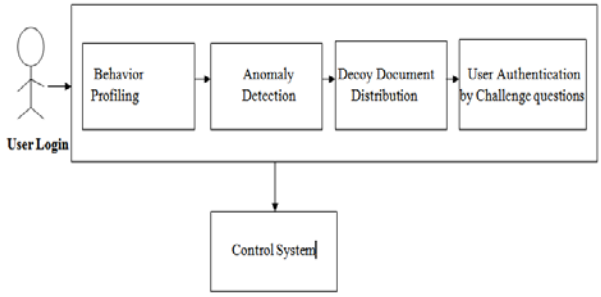
A. SCOPE

Profiling user behavior is an anomaly detection technique. Anomaly detection has the potential to identify new and unknown attacks. While profiling user behavior, any abnormal behavior is indicative of masquerade activities. However, it may produce high false positive rates, particularly if the user model does not simplify well because of lack of model training data. An anomaly detector suffers from low accuracy, and mainly from high false positive rates. One way to overcome this shortcoming is by combining several base classifiers into ensemble classifier. Each classifier will use a different modeling algorithm to profile user behavior.

The ensemble methods output collectively one classification label which reacts the meta-learning from these models or the consensus amongst them. The objective of using such ensemble methods is to improve robustness and classification accuracy over single-model methods.An adversary may know how a user behaves and execute a `mimicry attack'. However, they are improbable to know what the sufferer knows. If the sufferer baits the system with automatically generated decoy documents may trap the adversary later. Even a sophisticated adversary who mimics the sufferer or target user may still get trapped, as they do not know that the decoys are being accessed.

If the anomaly detector is subject to insider attack, then the decoy file monitoring is likely to catch the masquerade activity. If decoy documents are wrongly accessed by user then user authentication by challenge questions is likely to catch masquerade activity. Hence dependency and interlinking between above techniques could increase the overall efficiency of proposed system by reducing false positive rates.

Following Figure 1 shows the Architecture of the insider data theft detection system:



Profiling search behavior detects anomalous user search behavior forming a baseline of standard search behavior. Then it monitors for abnormal search behaviors that reveal large deviations from the baseline. The system builds a normal user model C that models the user's search behavior by extracting features. System measures the deviation between actual user behavior and the historical user behavior as defined by the normal user model C. The distance D is compared in order to determine whether there is enough proof for masquerade activity.

If there is difference between current behavior and standard behavior, that user will be flooded by automatically generated decoy documents. The true user has an idea about decoy files. That why true user will not supposed to access to these files. On the other hand fake user does not know that files are fake files. So he will access that files.

The insider data theft detection system generates alert when decoy documents are being accessed, copied or read. As soon as the decoy document is loaded into memory by any application, system verifies whether that file is an original file or a fake decoy file by computing a Hypertext Message Authentication Code (HMAC) which is embedded in that file and comparing it with previously embedded document. If the two HMACs match, the document seems to be a decoy otherwise, the document seems to be normal. If the decoy documents are not being accessed then user activity is not malicious enough.

Following figure describes the flowchart of overall decision process related to masquerade alert generation.

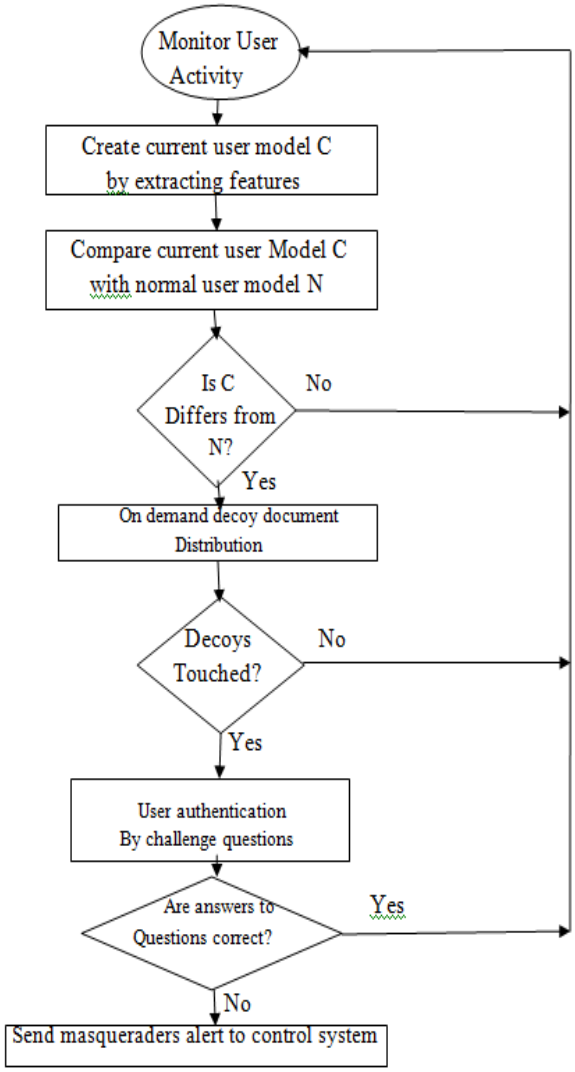


Fig.2. Alert Generation Process

B .METHODOLOGY

Insider data theft attack detection system will be developed using following modules:

Module 1: Validating user logins

The application will be deployed on a system. The Application will be used to validate the insider data theft attack detection system. User logins are the basic inputs for detection system. Application will include the following options:

1. It will store user name, password, confirm password, contact number and at least ten secrete questions at the time of account creation.

2. It will allow strict entry time checking by querying the user with randomly selected secret questions on each login.

Choice of selecting questions will be done by user at the time of account creation.

Module 2: User access behavior profiling

Anomalous user behavior can vary from normal user behavior baseline. Regular user has an idea about the file structure and contents of the system. So his search for files is limited and specific. According to this assumption standard user model will be prepared by extracting features such as search pattern, number of touches to file, keystrokes, mouse movements etc. My contribution to existing work will be to reduce feature set by selecting minimum distinguishing features among them.

Also I wish to contribute by creating ensemble of classifier for reducing low accuracy of anomaly detection. Some of the following classifiers from following will be combined in my work.

1. One class support vector machines: They are Linear classifiers used for classification and regression. It maps input data into a high-dimensional feature space using a kernel function.

2. Naïve bayes classifier: It uses only data from a single user when training a classifier to profile a distinct user. It calculates the likelihood that a command block belongs to masquerader or not.

3. Multivariate bernoulli event model: A vector of binary attributes is used to represent a document indicating whether the command occurs or doesn't occur in the document.

4. Multinomial model: It uses the number of command occurrences to represent a document, which is called "bag-of-words", capturing the word frequency information in documents.

Module 3: Anomaly detection

The system will be developed where current user behavior will be modeled. It will be compared with the standard behavior model of that user. If the difference is exceeding the limit, then that user is suspected to be masquerader. It will be the first suspecting alert of my detection system. User will be exposed to next module only if this alert is generated. If the current user behavior is same as the past behavior, there is no need to traverse the next modules and the user is allowed to continue his work on original data.

Module 4: Decoy document distribution

Whenever alert by anomaly detection is generated, decoy information such as tax returns, bank receipts, policy documents etc may be supplied immediately on demand. My contribution to existing work will be to supply decoy documents automatically on generation of first alert rather than keeping decoy traps. The system will maintain same directory and file structure for the decoy file system and the original file system rather than providing irrelevant bogus data in the decoy files for confusing the attacker. The information contained in the decoy file is delivered in such a way as to appear completely normal to the attacker and he will not get any doubt of fake or worthless data is being served to him.

Module 5: User authentication by challenge questions

If a decoy document is loaded into memory then current user's behavior seems abnormal. If decoy documents will be accessed by authenticate user by mistake, even authenticate user also will be treated as masquerader by detection system. Hence it will increase false positive rate. To overcome this limitation, a set of challenge questions will be asked to the user whose

answers are only known to the real user. This will improve accuracy of overall detection system.

The answers to these questions will be given by the administrator of the system during the installation of the application. Choice of these questions will not be done by the user; administrator will choose the questions and will provide answers which are totally confidential between the user and him. Questions can be like, what is the secret password key of the company members? This module can be shifted upwards (before the decoy document distribution) on the basis of experimental results.

Module 6: Control system

The control system will represent an interface to view the malicious insider accesses. It will allow the administrators to enforce give/reject policies for the remote users. Administrator can block the masquerader by denying access to the systems data. When attacker will be caught then administrator will notify true user to set his credentials again. It will maintain logs of anomaly detection system.

VI. FACILITIES AVAILABLE AND REQUIREMENTS

Hardware required	Few systems with interconnected network Intel® Pentium IV & above, Min 512MB RAM.
software required	jdk 1.7 .

Proposed system will require any heterogeneous network and will work on any platform.

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A Study on Clinical Profile of Acute Kidney Injury

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Abstract- Acute renal failure is a common clinical condition encountered in most of the hospitals.

This study is an attempt to evaluate the clinical profile of acute renal failure in 50 patients admitted in Osmania general hospital.

Method- This is a prospective study done in Osmania general hospital over a period of two years. It included 50 cases with clinical and laboratory evidence of acute renal failure.

Results- Out of 50 patients 32 were male and 18 female. Average age was 40.2 years. Oliguria and vomiting were common presenting features. Other common symptoms were fever, malaise, jaundice and diarrhoea. 42 cases had oliguric renal failure and 8 cases were non oliguric.

The aetiological factors are acute gastroenteritis, septicemia,malaria, leptospirosis, snake bite, toxic dye ingestion and congestive cardiac failure. Two patients had obstructive uropathy.In our study, 80% of the patients survived. 72% of patients were treated conservatively and 28% underwent dialysis.

Index Terms- Acute Kidney Injury; Pre Renal; Renal;Post Renal;Malaria; Septiceamia.

I. INTRODUCTION

Acute renal failure (ARF) is a protean syndrome of varied severity. It is characterized by a rapid (hours to weeks) decline in the glomerular filtration rate (GFR) and retention of nitrogenous waste products such as blood urea nitrogen (BUN) and creatinine.[1,2]ARF is not a single disease but, rather, a designation for a heterogeneous group of conditions that share common diagnostic features: specifically, an increase in the blood urea nitrogen (BUN) concentration and/or an increase in the plasma or serum creatinine (SCr) concentration, often associated with a reduction in urine volume. The alternative proposed term Acute kidney Injury (AKI) better captures the diverse nature of this syndrome.[3,4,5,6,7] In keeping with the spectrum of changes seen in AKI, a diagnostic classification scheme was developed. This scheme is referred to by the acronym RIFLE, and includes three levels of renal dysfunction of increasing severity, namely, Risk of renal dysfunction , Injury to the kidney and Failure of kidney function, and two outcome categories: Loss of function, and End stage kidney disease.

AKI complicates 5-7% of acute care hospital admissions and up to 30% of admissions to the intensive care unit. AKI is also a major medical complication, particularly in the setting of diarrheal illnesses, infectious diseases like malaria and leptospirosis, and natural disasters such as earthquakes.[8]

II. AETIOLOGY OF ACUTE KIDNEY INJURY[9]

- causes of ARF are generally divided into three major categories:
- Diseases that cause renal hypoperfusion, resulting in decreased function without frank parenchymal damage -**prerenal AKI**
- Diseases that directly involve the renal parenchyma – **intrinsic AKI**
- Diseases associated with urinary tract obstruction – **postrenal AKI.**

III. PRERENAL ACUTE KIDNEY INJURY

Renal blood flow and glomerular filtration rate (GFR) are relatively constant over a wide range of renal perfusion pressures, a phenomenon termed autoregulation. This autoregulatory response normally renders an individual relatively resistant to prerenal forms of ARF; however, a marked decrease in renal perfusion pressure below the autoregulatory range can lead to an abrupt decrease in GFR and lead to AKI

IV. POSTRENAL ACUTE KIDNEY INJURY

Obstruction of urine flow is generally considered a less common cause of ARF. In several series, obstructive uropathy is encountered in 2% to 10% of all cases in ARF.[76,77]The cause of obstruction of urine flow can be classified as intrarenal or extrarenal.

Analysis of urine and blood biochemistry is useful for differentiating between the major categories of oliguric AKI, namely prerenal AKI and intrinsic AKI caused by ischemia or nephrotoxins.

The fractional excretion of Na+ (FENa) is the most sensitive index for this purpose. The FENa relates Na+ clearance to creatinine clearance. The renal failure index provides comparable information, because clinical variations in serum Na+ concentration are relatively small.[10,11]

Diagnostic Index	Prerenal Azotemia	Ischemic Intrinsic Azotemia
Fractional excretion of Na+ (%)	< 1	> 1
Urinary Na+ concentration (mEq/L)	< 10	> 20
Urinary creatinine/plasma creatinine ratio	> 40	< 20
Urinary urea nitrogen/plasma urea nitrogen Ratio	> 8	< 3
Urine specific gravity	> 1.018	< 1.012
Urine osmolality (mOsm/kg H20)	> 500	< 250
Plasma BUN/creatinine ratio	> 20	< 10-15
Renal failure index,[*] UNa/Ucr/Pcr	< 1	>1
Urine sediment	Hyaline Casts	Muddy brown granular casts

V. DIALYSIS[9,15]

In patients with acute renal failure, dialysis is used as an extension of the supportive measures. There is no evidence that dialysis shortens the course in acute renal failure. Dialysis may be hazardous because of the episode of hypotension and arrhythmias.

Dialysis is indicated if medical measures fail to prevent the following: ® Pulmonary oedema,Hyperkalemia,Metabolic Acidosis,Signs and Symptoms of uraemia,Pericarditis

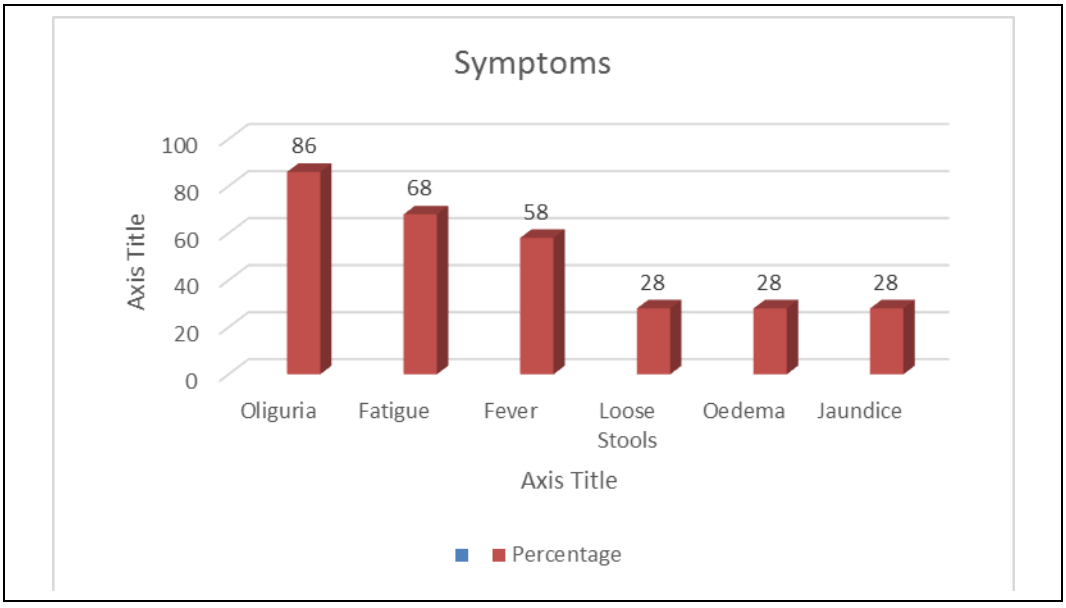
VI. MATERIALS AND METHODS

This a prospective study of 50 patients of acute renal failure admitted to Osmania General Hospital from October 2009 to October 2011. All patients with clinical and biochemical evidence of acute renal failure according to RIFLE criteria were included in the study. Patients with chronic renal disease and aged below 12 years were excluded. Detailed history was recorded, general physical examination, systemic examination was done and necessary investigations were done. All the patients were followed up till time of discharge.

VII. RESULTS AND ANALYSIS

Out of 50 cases studied, 32(64%) patient were male and 18(36%) were female.Their age ranged from 16-80 years with mean age of 40.72 years. The ratio of Male: Female was 1.8:1. The maximum incidence was seen in the age group between 21 to 30 years.

Out of 50 cases, 43(86%) patients had oliguria, 40(80%) had vomiting, 34(68%) patients had history of fatigue. Fever was seen in 29(58%) cases and 14(28%) patient had loose stools.



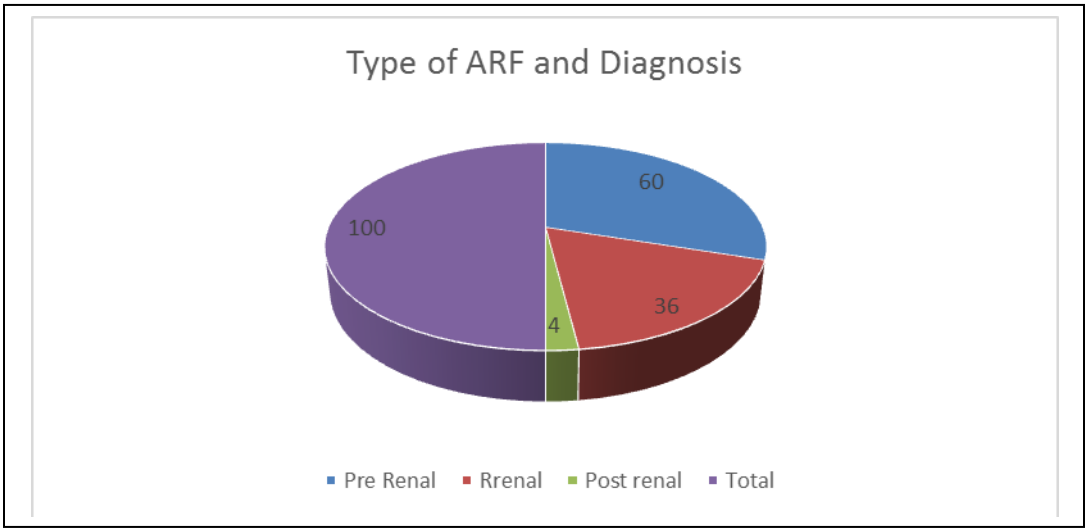
Out of total number of patients studied 15(30%) patients had hypotension, 14(28%) patients had oedema, 14(28%) had icterus.

84% had oliguria and 16% were non-oliguric on general physical examination. Out of 50 patients, 6(12%) patients had history of diabetes mellitus and 8(16%) patients had hypertension.

VIII. Type of Acute Kidney Injury

Out of 50 cases. Prerenal ARF was seen in 30(60%) patients, 18(36%) patients had renai ARF and 2(4%) had post renal ARF.

Type of ARF	Number	Percentage
Pre Renal	30	60
Renal	18	36
Post renal	2	4
Total	50	100



Out of 50 patients studied, 30 had pre renal AKI, of which 14(28%) patients had acute Gastro enteritis, 5(10%) had Malaria and 3(6%) had AKI following septicaemia. One patient had congestive heart failure and one had acute pancreatitis.

Out of 50 cases, 38 cases had renal cause of which, Malaria was seen in 3(6%), 2(4%) had nephrotoxic AKI (herbal medicine induced), 3(6%) had septicemia, 1(2%) had acute glomerulonephritis, 2(4%) had snakebite and 1(2%) had RPGN and 3(6%) patients had toxic hair dye (super vasmol) ingestion. Out of 50 cases 2(4%) patients had AKI following bladder outlet obstruction.

Out of 50 cases, 36(72%) patients were managed conservatively and 14(28%) patients underwent haemodialysis

Out of 50 cases studied, 40(80%) patients survived. Mortality was seen in 10(20%) patients. Among the patients managed conservatively 3 patient died and of those who underwent haemodialysis,seven patients died. The major risk factors affecting prognosis of the patients were presence of multi organ failure, high baseline serum creatinine level, and complications developed during the course of illness.

IX. DISCUSSION

In the present study, age of the patients ranged from 16 to 80 years with mean age of 40.72 years. There were 32(64%) were males and 18(36%) were females. Bernich B et al., in their study of pattern of acute renal failure, found that 58% were males and 36% were females. Mean age of these patients was 56.2 years.[12] Ravindra L Mehta et al., in their study had 41% females and 59% males. Mean age of these patients was 59.5 years.[16]

We noted that, vomiting and oliguria were most common symptoms comprising 86% and 80% respectively. This finding is comparable with other studies done by Singhal AS et al[22], which showed that oliguira was seen in 85.2% patients and 80% had vomiting. In the present study, hypotension was seen in 30% of patients. This was comparable with other studies done by Liano F et al.[23], where hypotension was seen in 32.8% of patients

In the present study, 30(60%) had AKI due to pre renal cause. Majority of patients had gastroenteritis 14(28%). Other common presentation were malaria 7(14%), sepsis 9(18%), snakebite 3(6%), obstetric causes 4(8%), toxic hair dye ingestion 3(6%) and congestive cardiac failure 1(2%).

In the present study, acute gastroenteritis is the dominant cause of AKI. Most of these patients had severe dehydration. Hypotension was seen in some of the patients. Most of these patients were treated conservatively and resumed normal function. One patient required haemodialysis.

This is comparable to a study done by Ghayas khan et al, where acute gastroenteritis was found to be the commonest cause of AKI accounting for 58.97% of cases in their study.[24]

Malaria is an important cause of ARF in the present study ,of 50 cases 7(14%) patients had Malaria. Among this, falciparum malaria was seen in 5(71%) of patients and vivax malaria was seen in 2(29%) of patients. In the study of ARF by Prakash J et al., 15% patients had Malaria. Falciparum malaria and vivax malaria were responsible for ARF in 76(80.9%) and 11(11.7%) of the patients.

In the present study, about 2(4%) patients had obstructive uropathy. This was comparable to a study done by Singhal AS et al., in which 5% of patients had obstructive uropathy.[22]

Among 36 patients who were managed conservatively 3 died. In the present study, good results were obtained with conservative management. This was comparable to a study done by Hakim AL et al., in which 74% of patients were managed conservatively and 26% of patients underwent dialysis.

X. CONCLUSIONS

It was observed that clinical features were almost in accordance with studies conducted earlier.

Oliguria and vomiting were found to be the predominant symptoms in acute renalfailure.

Acute gastroenteritis was the predominant cause of acute renalfailure and these patients were recovered with conservative management.

Other causes of renal failure in our study were similar to other studies like malaria andsepticemia.

About 80% patients were survived. 20% of patients were treated conservatively and 28% patients underwent haemodialysis. We observed that early diagnosis and early intervention were probably responsible for good survival rate

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White Tea (*Camellia sinensis*) Extract Role as AntiProliferative of Colon Cancer Cell Line, Caco-2

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***Abstract*- OBJECTIVES:** Tea (Camellia sinensis) is one of the most consumed beverages in the world. White tea is made from the buds and young leaves of the tea plant which are steamed and dried, whilst undergoing minimal oxidation.

METHODS: Caco-2, cells were incubated with white tea extract at concentrations, 300µM, 500µM, 700µM and 900µM for 72h at 37°C and 5% CO_2. MTT assay DNA fragmentation assay, cytological and immunocytochemical investigations were investigated.

RESULTS: MTT assay was used to test the extract on the effect of the proliferation of the colorectal cancer cell line, Caco-2. IC50 extract inhibited the proliferation of Caco-2 cells and induced Caco-2 cell death in a dose-dependent manner. Treated cells showed typical characteristics of apoptosis including inhibited the viability and proliferation of treated Caco-2 cells *in vitro* even by DNA fragmentation, cytological alterations and increased of P53 activity.

CONCLUSIONS: Results from this study show that white tea extract has antiproliferative effects against cancer cells. Regular intake of white tea can help to maintain good health and protect the body against disease. Future study will may deal with further investigations of white tea extract possible usages as a new alternative or complementary chemotherapeutic agent for human cancer types specially colon cancer type.

***Index Terms*-** white tea extract, Caco-2 Cells, p53, antiproliferative effects.

I. INTRODUCTION

Colorectal cancer is the third most common form of cancer and the second leading cause of cancer deaths in both men and women around the world. Alarmingly, increasing numbers of reported cases of colon cancer in recent years has made this form of cancer a major health concern[1]. The current treatment for colorectal cancer is generally surgical resection combined with chemotherapy by cytotoxic drugs and radiation. However, this therapy is just moderately successful especially for late stage cancers; therefore new approaches to the treatment of colorectal cancer are required. In recent years, interest has increased in using natural products for pharmacological purposes, as a form of complementary or replacement therapy. It is known that the risk of colorectal cancer increases with dietary habits like high animal fat intake[2]. Epidemiological and prospective studies have reported several beneficial effects of bioactive compounds on human health, particularly in protecting against chronic degenerative diseases, such as cardiovascular disease, diabetes mellitus and cancer. Phenolic compounds, present in fruits and vegetables, show antioxidant and antiproliferative properties. A number of studies have suggested that high consumption of fruit and vegetables decreases the risk of colon cancer[3].

Second only to water, tea is one of the most consumed beverages in the world. Most of the commercial varieties of teas come from the dried leaves of a shrub is *C. sinensis.* Based on processing and harvesting the leaves, tea types are black, green, oolong and white[4]. White tea is an unfermented tea made from young tea leaves or unopened buds covered with tiny, silvery hairs, and the leaves are harvested once a year in the early spring. The leaves are then steamed rapidly and dried, with a minimum amount of processing to prevent oxidation[5]. Green, oolong and black teas are processed to a greater extent compared to white tea, though green tea is also unfermented.

The mechanisms that have been suggested for the health benefits of tea include scavenging of reactive oxygen species (ROS), modification of signal transduction pathways, cell cycle checkpoints, and apoptosis, and the induction of various enzyme activities involved with drug metabolism and carcinogen activation/detoxification[6].

P53 has been shown to be involved in the induction of apoptosis, cell-cycle arrest and differentiation responses that prevent further proliferation of stressed or damaged cells and so protect from the outgrowth of cells harboring malignant alterations[7]. P53 role in the repair of DNA damage has also been described and the ability of p53 to induce reversible cell-cycle arrest may contribute to the ability of cells to repair and recover from damage before reentering a normal proliferative state[8]. The aim of this study was to evaluate the effect of white tea extract on the inhibition of proliferation of the colorectal cancer cell line, Caco-2.

II. MATERIALS AND METHODS

Chemical reagents: White tea extract, MTT salt or 3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyl tetrazolium bromide, dimethylsulfoxide (DMSO), commercial methanol, commercial ethanol, commercial acetone, Tris-HCl, edetic acid, Triton-X100, RNase A, proteinase K, NaCl, 2-propanol, phosphate-buffered saline (PBS), ethidium bromide, agarose gel, Peroxidase, trypsin, Hematoxylin and eosin (Hx & E) stain, primary monoclonal antibody against p53 and biotinylated immunoglobulin secondary antibody were purchased from Sigma-Aldrich, Egypt.

Cell line and cell culture: Caco-2 cell line, was obtained from American Type Culture Collection (ATCC, USA). They were sub-cultured as mono-layer according to the instructions provided by ATCC in Dulbecco modified Eagle medium (DMEM) supplemented with 10% heat inactivated (56°C,

30min) fetal bovine serum, 2mmol/L L-glutamine, 100U/mL Penicillin-Streptomycin and 100U/mL Amphotericin B at 37°C in a humidified atmosphere of 5% CO_2. Cells were used when monolayer reached 80% confluence in all experiments. Cell propagation media was purchased from Invitrogen (Carlsbad, CA).

Methods: 1.Cell Viability Assay: *In vitro* evaluation of antiproliferation effect: growth inhibition was evaluated by MTT assay. MTT salt or 3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyl tetrazolium bromide was reduced by mitochondrial dehydrogenases to water blue insoluble formazans[9]. Viable cell number/well is directly proportional to formazans production. 8.25×10^3 cells were seeded into each well of 96-well plate, incubated with culture medium overnight (12h), replaced with fresh medium containing white tea extract at concentrations: 300µM/L, 500µM/L, 700µM/L and 900µM/L for 72h at 37ºC in an incubator with 5% CO_2. After incubation, white tea extract modified medium was replaced by 100µL of MTT (0.5mg/mL) medium for incubation (3h at 37°C and 5% CO_2). MTT medium was then replaced with 100µL of DMSO and left for 10min on a platform shaker to solubilize converted formazan. The absorbance values were determined at 570nm test wavelength and 630nm reference wavelength (Spekol 1200 spectrophotometer). Untreated cells were as a positive control cells and all values were correlated with this set of data. The experiment was performed in triplicates. Inhibition Percentage=[1–(net Absorbance of treated well/net Absorbance of control well)]x100%, then was plotted against white tea extract concentrations.

2.Determination of DNA fragmentation by DNA laddering assay: cells were seeded in 60-mm petri dishes at density $4x10^5$ cells/plate (treated cells by IC_{50} concentration of white tea extract or positive control cells). Adherent and floating cells were collected by centrifugation at 1000×g/5min. Cell pellet was suspended in cell lysis buffer (Tris-HCl 10mmol/L pH7.4, edetic acid 10mmol/L pH8.0, Triton-X100 0.5%) and kept at 4ºC/10min then, lysate was centrifuged at 25.000×g/20min. Supernatant was incubated with RNase A 40µg/L/1h (37ºC), incubated with proteinase K 40µg/L/1h (37ºC), mixed with NaCl 0.5mol/L and 50% 2-propanol overnight (-20ºC), then centrifuged at 25.000×g/15min. After drying, DNA was dissolved in buffer (Tris-HCl 10mmol/L pH7.4, edetic acid 1mmol/L pH 8.0) and separated by 2%agarose gel electrophoresis at 100V for 50min. DNA was visualized under ultraviolet light after staining with ethidium bromide[10].

3.Cytological changes investigation: detached and trypsinized cells (IC_{50} concentration of white tea extract treated cells and positive control cells) were collected and centrifuged at 2000 rpm for 5min. Cell pellet was re-suspended with 100µL of PBS (pH7.3). 10µL of the suspension were smeared on a glass slide, allowed to air-dry, fixed with cool methanol for 5min before proceeding by Hx&E stain and examined under light microscope[11].

4.Immunocytochemical investigations: by detection of p53 by immunocytochemistry staining kit. The procedure was done according to the manufacturer's instructions, simplified as follows: 1-2 drops of Peroxidase was applied to cells (IC_{50} concentration of white tea extract treated cells and positive control cells) on the slide (10min), followed by blocking solution (10min). Cells were fixed in ethanol:acetone (9:1) for 30min at -20°C and then rinsed again with cold PBS at room temperature. Cells were incubated overnight with primary monoclonal antibody against against p53 at dilution of 1:75 at 4°C, then in Tris buffer and biotinylated immunoglobulin secondary antibody was used[12]. The slides were then mounted and examined under light microscope.

5.Statistical analysis: results were presented as mean±standard deviations (SD). Analysis of variance (ANOVA) for two variables (Two Way-ANOVA) was used together with student t-test. Significant analysis of variance results were subjected to post hoc. Statistical significance was set at $P<0.05$ and high significance was set at $P\leq 0.01$[13].

III. RESULTS

1.Cell viability assay: *In vitro* evaluation of antiproliferation effect.

Cytotoxic effect of different concentrations of white tea extract (300µM, 500µM, 700µM and 900µM) for 72h on Caco-2 cell line was determined by MTT assay (Figure 1). Cells number started to reduce immediately after treatment with white tea extract concentrations in a dose dependent manner. All concentrations were found to be high significantly different ($P\leq0.01$) in respect to their antiproliferative and apoptotic effects when compared with positive control cells. Cell inhibition percentage was gradually increased with white tea extract concentration increasing and 95% of cell inhibition was observed when cells were treated with 900µM/72h. Cell proliferation reduced about 25% and 30% when cells were treated with 300µM and 500µM for 72h, respectively. Cells proliferation decreased to 50% when treated with concentration of 700µM/72h.

2.Determination of DNA fragmentation by DNA laddering assay.

DNA degradation into multiple internucleosomal fragments is a distinct biochemical hallmark for apoptosis. Nuclear DNA isolated from Coca-2 cancer cells was separated by agarose gel electrophoresis and stained with ethidium bromide, and a typical ladder formation was observed upon 72h when treated with white tea extract concentration at 700µM whereas untreated cells did not show typical ladder (Figure 2). Results indicated that white tea extract induced DNA fragmentation which was caused by apoptosis.

3.Cytological changes investigation.

Positive control cells group had round nuclei, distinct small nucleoli and homogeneous chromatin with an accentuated nuclear membrane (Figure 3a). After Coca-2 cells treatment by white tea extract concentration at 700µM/72h, apoptotic cells were identified by a series morphological changes as an important experimental proof of underlying processes alterations appeared as: bleb plasma membrane, cellular shrinkage, chromatin condensation granules, vacuolated cytoplasm, degrading nucleus and apoptotic bodies formation were observed (Figure 3b, 3c and 3d).

4.Immunocytochemical investigation.

After Coca-2 cells treatment by white tea extract concentration at 700µM/72h, when applying p53 stain, p53 protein reaction in the positive control Coca-2 cells, was showed

negative reaction (no brown stain) (Figure 3f). After Coca-2 cells treatment by white tea extract concentration at 700µM/72h, those fields had necrotic or apoptotic nucleus for white tea extract effect showed p53 positive reaction (over expression of p53 protein) when over 55% of cells had nuclear brown staining, with slight intensity degrading in the same field (Figures 3e).

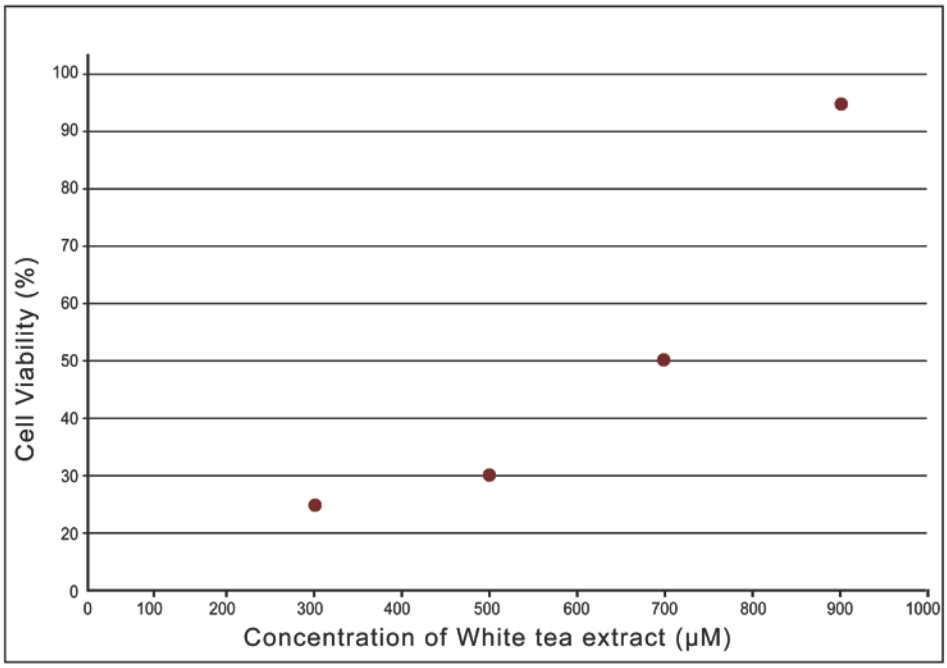

Figure 1: Effect of white tea extract with different concentrations on the cells viability of Caco-2 cells. The experiment was performed in triplicates and values means were calculated [mean±SD, n (for each concentration)=4].

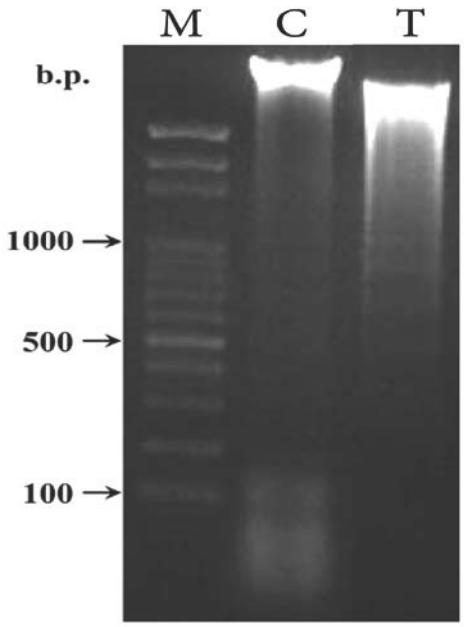

Figure 2: DNA fragmentation by DNA laddering assay of extracted DNA from white tea extract treated cells and positive control cells. DNA laddering, typical for apoptotic cells, which were visible in treated Coca-2 cells (T), and there was no any apoptotic features in the positive untreated cells (C) where M indicating to marker.

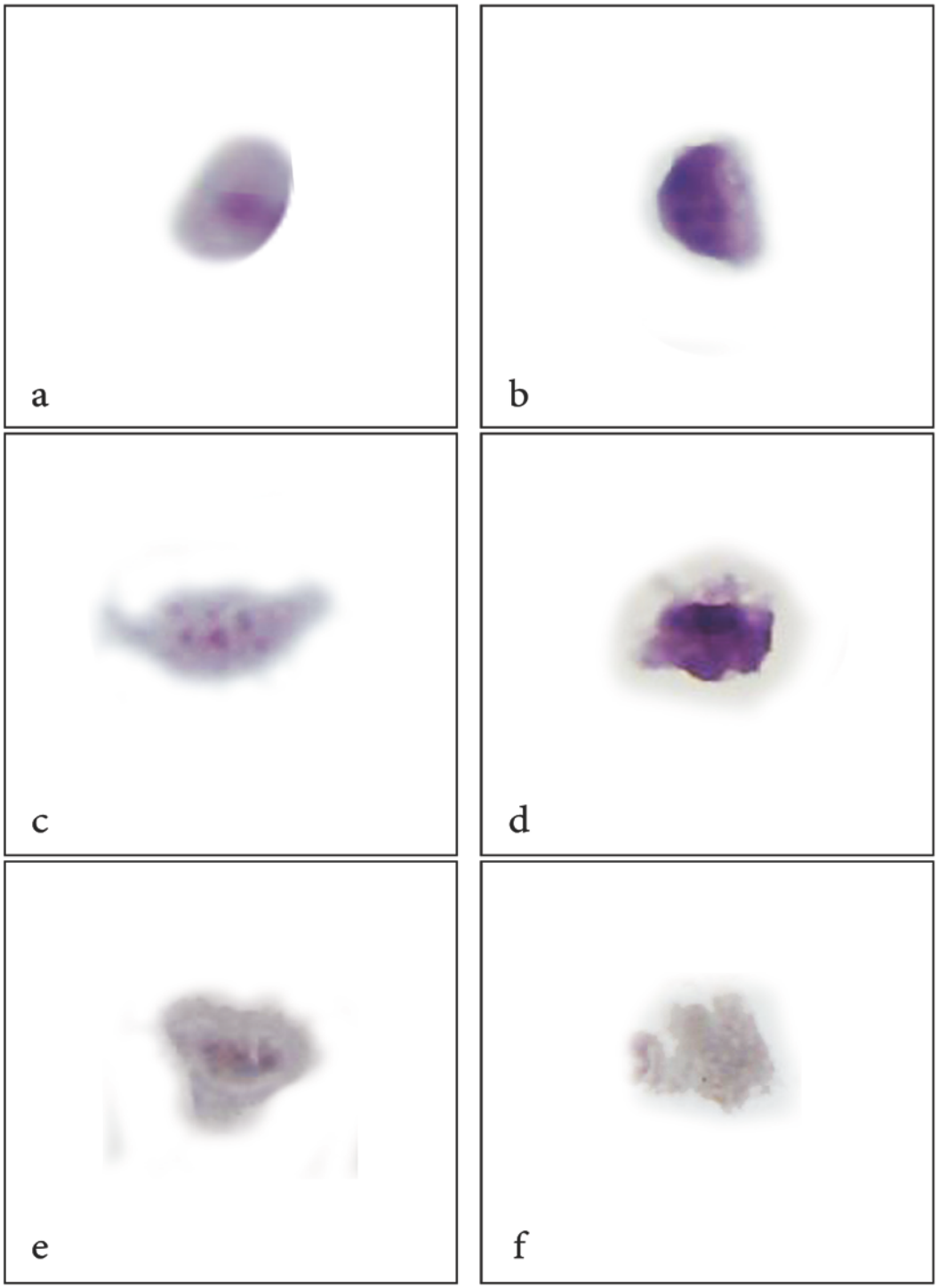

Figure 3: Cells in different stages of apoptosis in treated cells are easily distinguishable. Cell with normal morphology (a). Complete apoptotic cell (b). Degradation of nucleus, vacuolated cytoplasm with apoptotic bodies (c). Nuclear condensation is evident in cells (dark, condensed and irregular rounded nucleus), bleb membrane and cell shrinkage (d). Immunocytochemistry of treated cell showing p53 protein nuclear positive reaction indicating cell apoptosis incidence (e). Control positive cell showing nuclear negative reaction (f).

IV. DISSCUTION

Tea contains a number of polyphenolic compounds belonging to the flavan-3-ol (catechin) family, such as (−)-epigallocatechin, (−)-epicatechin, (−)-epigallocatechin-3-o-gallate, (−)-epicatechin-3-o-gallate, (+)-catechins and (+)-gallocatechin[14]. These compounds are known to have a wide spectrum of biological activities such as antioxidant, antiviral, anticancer, antibacterial, antifungal, antitoxoplasmal,

antitrypanosomal, anticoccidial, antinematodal and antihelminthic[15].

Apoptosis, as programmed cell death, is a highly organized cell death process characterized by an early obvious condensation of nuclear chromatin, loss of plasma membrane phospholipid asymmetry, activation of nucleases, enzymatic cleavage of DNA into oligonucleosomal fragments and segmentation of the cells into membrane-bound apoptotic bodies[16]. DNA fragmentation, a hallmark of apoptosis, is regulated by a specific nuclease called caspase-activated DNase and its inhibitor[17]. Apoptosis has specific signals instructing the cells with specific morphological change as plasma and nuclear membrane blebbings, chromatin condensation, proteases activation and DNA fragmentation that are considered as landmarks of the apoptotic process[18].

That was agreed with the results of recent study after treatment by white tea extract. White tea extract decreased the viable percentage of cell number (dose dependent effect) and induced apoptosis of Caco-2 cells. Therefore, we may presume that as primary mechanism involved in white tea extract growth-inhibitory effects as it considered main apoptotic signals.

P53 is a tumor suppressor gene product which is very important for cells in multicellar organisms to suppress cancer[19]. P53 has been described as 'The Guardian of the genome', referring to its role in conserving stability by preventing genome mutation[20]. Upon genotoxic and other stress, p53 protein levels increase. Activated p53 releases signal to cells to undergo growth arrest, cell differentiation or apoptosis[21]. Caco-2 cells which were treated with white tea extract exhibited increased levels of p53 expression at concentration of 700µM/72h, which suggested that p53 involved in white tea extract-induced Caco-2 cell death.

V. CONCLUSION

In this study, we have demonstrated that white tea extract inhibited proliferation and induced apoptosis in colon cancer (Caco-2) cells which depended on up-regulation of p53 protein. Future *in vitro* and *in vivo* study will may deal with further investigations of the possible usages of white tea extract as a new alternative chemotherapeutic agent but in limit doses for human colon cancer suggested treatment and other types of cancer.

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ROI in Training: How do HR Executives make investment decisions?

Cláudia Teixeira and Leandro Pereira

Abstract — This paper intends to provide a deeper understanding about the current ROI in Training practices applied in organizations.

Although the well advanced practices on how to estimate and measure business initiatives benefits, it is still an uncommon practice to apply this knowledge and methodologies on HR initiatives, in particular, training programs. The ability to keep a business sustainable in such a current globalized world, hugely comes from the human capital in organizations, or in other words, from the dynamic competences owned by the company teams. For this reason, the investment in professional training is increasing hence the need on assuring that the right training programs are implemented and contributing to the business goals.

Knowing how to measure the ROI in Training is becoming a critical skill for HR Executives as they need to justify whether that investment was effective, or in other words, whether there was any return generated with the training programs to their organization employees and ultimately to the business goals.

This paper presents the main results from a research about the current ROI in Training practices used by organizations, where it was possible to conclude that level 1 and 2 (reaction and learning evaluation) is frequently used, however the remaining levels (Impact, Application and ROI analysis) are often neglected.

Finally, the article also points out some recommendations and directions for future research on the topic.

Keywords – Benefits, Business Case, Business Impact, Human Resources, ROI, Strategy

I. INTRODUCTION

The crisis context together with the huge speed of technology advancements, the power of social networking and market globalization are triggering organizations to invest more resources on professional training. The new business challenges leveraged by the growing market competition are demanding the development of new technical and dynamic competencies across organizations, to get well prepared and skilled teams towards the business success. On the other hand, business managers, including HR Executives, are getting pressurized to optimize their resources and deliver successful results [1].

Having this said, the Human Resources department paradigm has changed. HR mission is no longer focused on payroll, firing procedures and holidays planning, but far beyond that. HR is playing a strategic role close to the Administration Board.

Nowadays executives are no longer satisfied with qualitative results, but instead, want to clearly know the actual economic return on investment, where every monetary unit spent should enhance the business bottom line [2]. In this context where competition is strong and resources are scarce, every project, program or initiative implemented must create value, or in other words, create more economic return: either by increasing business, reducing or avoiding costs and increasing efficiency [1].

So, knowing how to measure the ROI in Training is a growing skill required to HR Executives, which allow them to evaluate the estimated value for each training program towards the right decision-making. By knowing the estimated return and making the right training investments, HR will be able to justify the need on qualifying people, get the required budget approved and fulfil the end goal of responding to market competition and retaining talents.

Therefore, HR should be aware and knowledgeable about the following questions:

a) Is my organization aware about the return on investment of the training provided?

b) Are the training programms aligned with the strategic axes?

c) Does the training contribute positively to achieve the business goals?

d) Are the training performance reports duly documented and formalized?

Although the increasing investment on training human capital, most organizations fail to deliver the intended results [2] [5]. Some of the causes of this return failure is due to:

- Poor definition of the business goals and lack of training alignment to strategic axes
- Lack of up-front analysis (needs deep assessment)
- Poor definition of the impacts expected
- Inappropriate training program to the purpose
- Lack of Managers involvement
- Lack of training follow-up and application evaluation
- Poor quality of the training delivered
- No methodology defined

Very often, organizations tend to lack on making a deep analysis about the current challenges faced by their employees to better understand which tasks, knowledge or behaviour are required to be trained by each person. By preparing a prior diagnosis, the area Directors together with HR will be able to determine whether the problem identified is a training issue or if it should be addressed in another way. Often, training programs are provided with the *expectation* to mitigate certain

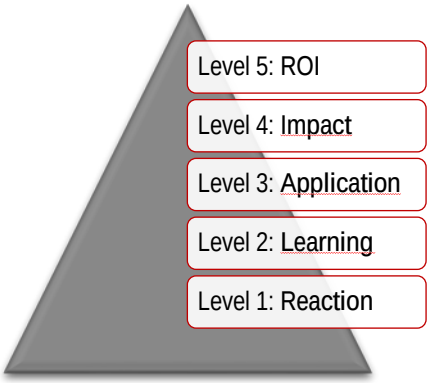
negative impacts when it ends to fail delivering those results as the best solution would be a non-training solution instead [such as compensation strategies, team buildings, managerial coaching, processes and workflow improvements, equipment repair or replacement, workload adjustment and others] [5].

Having this said, the need to invest resources in the right training programmes is a growing concern together with the need to avoid wasting financial capital in training sessions only due to a legal compliance.

According to Blaise Pascal: *"No one is that ignorant that does not have anything to teach. No one is that wise that hasn't got anything to learn"*.

II. WHAT IS THE ROI IN TRAINING?

Figure 1- ROI Framework



ROI INSTITUTE™

Source: Adapted from Philips, Jack. 2007

The ROI Methodology is used over 5,000 organizations and considered the most used and implemented evaluation system in the world [2]. The ROI Methodology not only provides the capability to evaluate program performance, but also improves the design of programs for optimal impact.

Below are presented the intended goals for each level of the framework and some techniques suggestions for collection (which must be appropriate to the purpose under analysis) [3] [4] [6]:

- **Level 1**: **Reaction**: Measure participant's reaction to the program. What did they like? What is their opinion [trainer, atmosphere, scheduling]? Did they found the training useful?
  - *Techniques*: Survey; Interviews
- **Level 2**: **Learning**: Measures skills, knowledge or attitude changes. [Change in attitude, skills, knowledge].
  - *Techniques*: Pre and Post-training assessments eg. Test performance, role play, pre-post test
- **Level 3**: **Application**: Measures changes in **behavior** on-the-job and specific application and implementation. [Doing things differently at work]
  - *Techniques*: Observation; Interview.
    Note: Allow time for change. This analysis should be done Pre and Post Training for comparison
- **Level 4: Impact**: Measures business impact (program benefits). Overall change to the business [i.e. decreased costs with a task; reduce nº accidents at work; increase sales; increase efficiency]
  - *Techniques*: Control Group; Trend Analysis

When defining the objectives for Level 3 and 4 it is aimed to clearly see how the training program's outcome will actually help the organization, which are typically required by sponsors of training and development (the key clients who pay for the program and support it), so they can connect training with business-unit measures. After the training session is conducted, these goals and related metrics must be collected to compare the training benefits estimation with the actual benefits realisation.

- **Level 5: Return on Investment**: compares the program monetary benefits with the program costs, presented in a percentage. Analyse how the bottom line changed and analyse whether the benefits are greater than the cost. To determine ROI, we need to collect data through assessment and evaluation on what knowledge and skills were gained and what behaviors have changed. If there is no change on employee's behavior, there is no impact hence no ROI [2]. In order to define the initiative's impact, *Pereira Diamond* suggests the benefits identification within four dimensions: business growth, costs reduction, efficiency increase or legal compliance [1].

III. ROI IN TRAINING BENEFITS

To better understand the ROI contribution to Management teams, below are presented the main **benefits** [2] [5]**:**

- **Measure Contribution –** By following an accurate and credible process it is possible to get the specific contribution from a number of programs, or in other words, the impact of learning in quantitative terms. A ROI study will determine if the program benefits outweighed the cost, which is a key information for HR better management;
- **Establish Priorities** – By calculating ROI In different areas allows to understand which programs contributes the most and assist on choosing the highest impact programs within the organization. The most inefficient programs may be redesigned or redeployed while the ineffective ones should be discontinued;
- **Focus on Results** – This methodology is a results-based process, so it focus on the program results and

requires stakeholders involved to focus on measurable objectives: what the program attempts to accomplish;

— **Earn respect of Senior Executives and Sponsor** – Senior executives seek to know the ROI of decisions, so they will appreciate the efforts to connect training to business impacts and show the benefits monetary value;

— **Alter Management Perceptions of Learning and Development** – allows top management understanding that learning is an investment and not an expense.

IV. Methodology

Considering the increasing the need on improving the training investment practices in organizations, this research aims to obtain a deeper understanding about the ROI in Learning practices applied by HR and identify the main gaps for improvement.

For this purpose, several HR members (Directors, Managers and Coordinators) from different sectors (Banking, Construction, Energy, Retail, Health, Insurance, Telco and others) were contacted and invited to participate in a survey.

The sampling method used was a convenience sample as the researchers invited participants who were aware about the importance of this subject.

The survey was composed by six multiple choice questions based on a Likert rating scale and one open question, designed based on the ROI Methodology best practices.

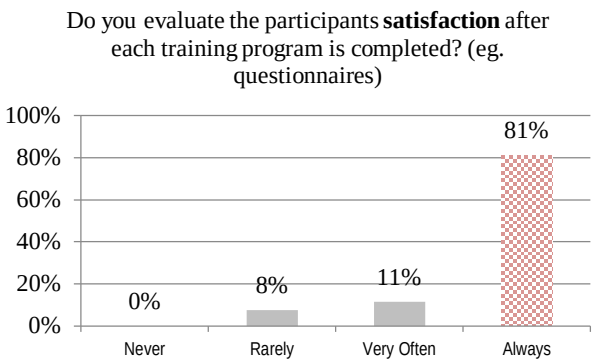
From 100 surveys sent during a one week period from 4 to 9 May 2015, 53 have accepted to participate which means a success rate of 53%.

V. Results

Regarding the sample profile 26% of the participants were HR Directors, 40% HR Managers and 33% HR coordinators.
Concerning the organization dimension in terms of the number of employees, 11% have <10 employees, 9% between [11-49] employees, 49% between [50-250] employees and 30% with > 250 employees.

Below are presented the survey questions and the related data analysis.

Figure 2

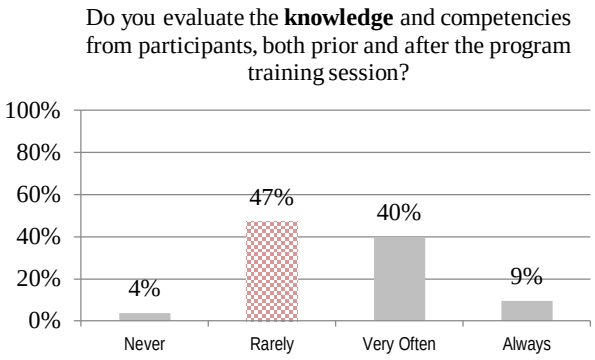


Source: Self-constructed

This question aims to analyze the first level of the ROI Pyramid.

Out of the 5 levels, the participant's reaction evaluation is the most frequent practice: 81% says that do it always, 11% very often and only 8% do it rarely.
These numbers are very positive as it shows that the reaction analysis is a common concern across the majority of organizations. However, do organizations consider the participants feedback to improve trainings quality and effectiveness? Whenever there is a negative classification to the training session, is it queried why? These are critical aspects to consider for a successful satisfaction evaluation.
However, even though the reaction towards the program may have been excellent, that will not necessarily guarantee a learning transfer (application on the job) and consequently no impact (no changes in outcomes) [4].

Figure 3



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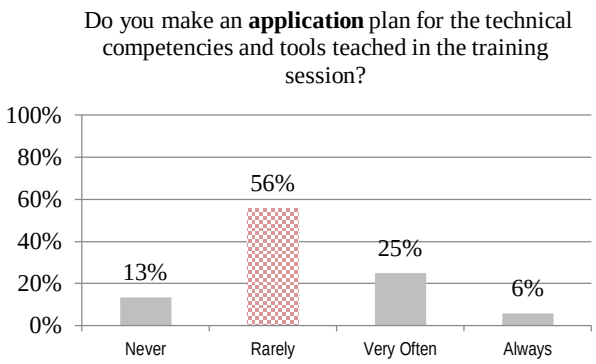
This question aims to analyse the second level of the ROI Pyramid: the learning progress obtained from training. At this level it is possible to observe a huge drop from the previous one. Only 9% says do it *always*, 40% *very often* and 47% *rarely*, while 4% has *never* completed this task. These numbers suggest that almost half of the organization miss the

learning evaluation process straight after the training program, which does not allow them to understand how much it contributed to the target audience (knowledge or skills improvement).

In order to evaluate the third level, participants were queried whether they prepare an application plan at the end of the program and if they prepare a systematized follow-up to validate it.

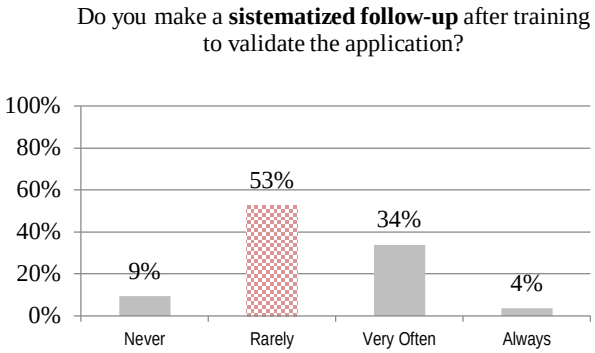
Figure 4



Source: Self-constructed

Regarding the preparation of an application plan, only 6% answered *Always*, 25% *very often*, against a huge proportion doing it *rarely* with 56%. 13% says they *never* do it. These numbers suggest that the majority of the companies do not make any plan at the end of the training program, specifying what, when and where will apply the new knowledge/skills acquired in their reality (daily tasks).

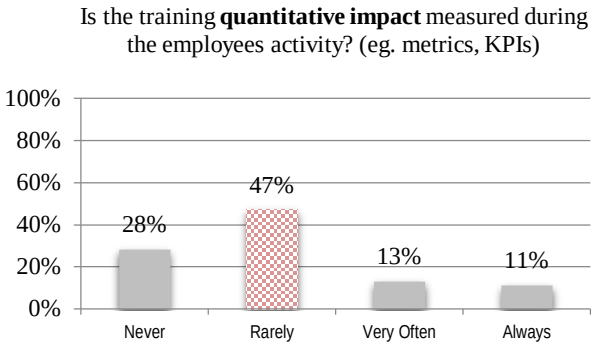
Figure 5



Source: Self-constructed

Similarly to the previous question, very similar results were verified: only 4% says it is always done a follow-up, 34% very *often*, 53% *rarely* and 9% *Never*. These results come as a consequence. If there is a lack of a prior application plan to what tasks/projects/processes the new techniques/skills/knowledge acquired will be applied, then validating that application in a systematized way will also be compromised. If there is no follow-up in employee's job reality, how can we measure if the training was successful? If there is no change in employee's behavior, then there is no impact, no benefits, hence no positive ROI. So it is crucial to be aware about this information, to improve management decisions. By missing this step, it will be impossible to prepare an impact analysis and measure the quantitative value of the benefits generated. In other words it will be impossible to conclude whether the investment in training brought value to the business.

Figure 6



Source: Self-constructed

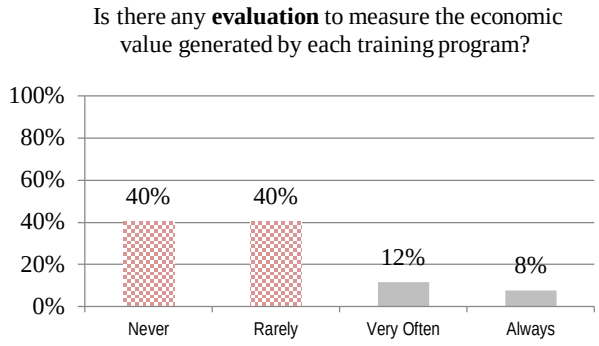
The numbers suggest that 4% always do an application analysis and 11% confirms a quantitative impact measurement. But is it possible to measure an impact without making a follow-up on the application? If there is no application there is no ROI, so are people consistently aware and knowledgeable about what ROI means?

Upon the decision-making process about considering making or not the training program, HR together with the Area Director, must have collected the current problem / difficulties faced by their employees (team) and the impacts on the employees daily basis. It is critical to identify what tasks or processes have to be improved and understand their linkage to the business results, before any decision about the training program solution. Having the current scenario (prior to the training) clearly identified (i.e described with metrics), then after the training program the same metrics should be verified and evaluate whether there was any improvement and how much.
In this step we should be able to answer the following questions:

- Was the training effective?
- Did it fit the previous "pains" identified?
- How much that benefits represents in monetary terms?

To assist on getting this information, the organization should create specific metrics and *kpis* which "pictures" the current scenario (prior the training) and assure its collection once again, after the training program.

Figure 7



Source: Self-constructed

Having the training benefits identified and quantified in monetary terms, the last step aims to conclude whether the investment added value, or in other words, if the benefits leveraged (positive business impacts) were higher than the investment.
Regarding the costs, these are typically composed by fixed and variable costs. The fixed costs are the ones which remain no matter how many participants will attend the training program [4].
On the other hand, variable costs are those that change according to the participants attending, such as: training manuals, meals/coffee breaks, travelling costs, training fees and many others.
In order to understand the proportion of value added, the return on investment (ROI) indicator is recommended, which should be at least a positive number (ROI > 0 %). The ROI formula is presented below:

$$\text{ROI (\%)} = \frac{\text{Net HR Program Benefits}}{\text{HR Program Costs}} \text{ x } 100$$

These query allows to conclude that 40% do the ROI Calculation rarely and another 40% never which are concerning numbers. If organizations miss on collecting the training impacts (benefits) they will not be able to calculate ROI.

It is important to note that some kind of trainings, such as behavior related (i.e leadership, teamwork, attitude and a happier work atmosphere), can only be measured over time [4]. Very often, people change their habits straight after the training but with time they tend getting back to the old habits, therefore these benefits assessments should be done after 2-3months of the training program and repeat it at after 6 months.
Frequently, change will occur right after training, but employees get back into old habits or get back to the methods they are familiar with or may even get pressured by peers or co-workers to avoid the change. For this reason, the benefits assessments should be done 2-3 months after the training program and repeated at 6 months out.

VI. Research Limitations

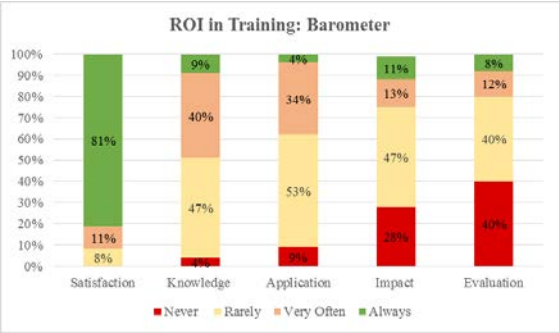
Regarding the research limitations, the sample analyzed is small and based on a convenience sampling, so for future research would be recommended to consider a larger sample as statistically, will provide more diversity and a more representative results of the population.

For a more detailed research, it would have been interesting to complete a factor analysis which could provide more insightful information (for instance, compare the results between the business sectors; business sizes; HR roles, and others).

VII. Conclusion

In terms of conclusion, although the well advanced practices on business cases and return on investment methodologies, HR departments still fail on completing the full process towards training programs. By making the wrong decisions, organizations not only waste resources (financial capital, time and human capital), but also compromise the achievement of business results while taking the risk on loosing key talented people.

Figure 8 – ROI in Training Barometer



Source: Self-constructed

Figure 8 illustrates a Barometer within the ROI Pyramid, where according to each process frequency usage we may identify the maturity level of the process in place.

In terms of conclusion, knowing how to estimate a training program benefits and make the right decisions is a demanding key skill to Human Resources Executives who are playing a strategic role together with the top management.

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Comparative effects of pioglitazone, α-lipoic acid, taurine and chromium picolinate and their combinations on hyperglycemic, lipid profile and oxidative stress parameters in fructose-induced insulin resistant rats

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Abstract- The potential of pioglitazone and certain micronutrients, namely, α-lipoic acid, taurine and chromium or their combinations to improve glycemic status and insulin resistance (IR), and their role in treating oxidative stress insults and dyslipidemia were studied.

Seven groups of rats (n=8) were fed on fructose enriched diet (FED) for 18 weeks. One group served as FED-control, groups were daily treated with pioglitazone (7mg/kg), α-lipoic acid (600 mg/kg), taurine (600mg/kg), chromium (500mg/kg), and combination of pioglitazone with each of such micronutrients during the last 6 weeks of treatment. Another group was fed on normal laboratory chew (normal control group). At the end of the experiment, blood samples were taken by retro-orbital technique for estimation of markers related to IR. Induction of IR was associated with increased body weight gain (23.5%) coupled with elevated fasting blood glucose (134%), glycated hemoglobin (64%), triglycerides (6%), total cholesterol (29%), low density lipoprotein (62%). The level of high density lipoprotein was reduced (26%). Fructose-induced IR was accompanied by reduction of superoxide dismutase (85%) and glutathione (74%), whereas malondialdehyde was elevated (145%). Body weight gain was enhanced after treatment with pioglitazone, taurine and their combinations. Fasting blood glucose was lowered after treatment with pioglitazone, α-lipoic acid or taurine. It was normalized after co-administration of pioglitazone and chromium. Glycated hemoglobin was reduced by pioglitazone, taurine or chromium alone or in combination. Lipid profile and oxidative stress parameters were improved after pioglitazone administration, alone or along with each of the tested micronutrients.

In conclusion, this study proves the benefits of co-administration of α-lipoic acid, taurine or chromium with pioglitazone in FED-induced IR models in rats.

Index Terms- FED-fed rats, insulin resistance, oxidative stress, pioglitazone.

I. Introduction

Metabolic syndrome (MS) is a constellation of risk factors for cardiovascular diseases and type II diabetes mellitus, characterized by obesity, dyslipidemia, IR and hyperglycemia **(Hall et al., 2006)**. Changes of dietary habits including increased intake of simple sugar , mainly fructose commonly used in food industry and as a sweetener of soft drinks **(Isomaa et al., 2001)**, contribute to the growing worldwide prevalence of MS.

Oxidative stress has been reported to play an important role in type II diabetes mellitus (**Siddiqui et al., 2005; Shukla et al., 2007**).

In animal models, excessive fructose intake is associated with IR, impaired glucose tolerance, hyperinsulinemia and hyperlipidemia (**Elliot et al., 2002).**

Enhancement of insulin action might be an effective approach in alleviating MS. Insulin sensitizers increase peripheral tissue sensitivity to insulin without stimulating its release (**Vekramadithyan et al., 2000)**. Thiazolidinediones, including pioglitazone are used for the treatment of IR and management of type II diabetes mellitus (**Bailey, 1999; Dey et al., 2002).** Pioglitazone is used for improvement of insulin sensitivity in muscles and adipose tissue (**Georios et al., 2013**).

Micronutrients are effective in treating IR syndrome complications. Alpha lipoic acid is reported to be a necessary co-factor in mitochondrial energy metabolism. It also possesses an antidiabetic action (**Liu et al., 2002; Suh et al., 2004).**

Taurine was reported to improve insulin sensitivity in fructose-fed rats (**Nandhini et al., 2005**), an action that was attributed to combating the destructive effects of free radicals on the pancreas.

Chromium picolinate is an essential trace nutrient which is used as a nutritional supplement **(Sawyer**, 1994) with a central role in glucose metabolism. Chromium improves glucose tolerance by decreasing hepatic extraction in pigs (**Guan et al., 2000**). Its deficiency may lead to diabetes mellitus (**Wada et al., 1983; Striffler et al., 1998)**. Chromium was reported to improve insulin sensitivity and modulate lipid metabolism in peripheral tissues **(Anderson, 2008).**

Therefore, there is a need to search for a better alternative therapy for IR syndrome that is more effective and less toxic. The present work was therefore, carried out to investigate the possible beneficial effects of α-lipoic acid, taurine or chromium in fructose-induced insulin resistant syndrome alone or in combination with pioglitazone.

II. Materials and Methods

Animals

Adult male albino rats weighing about 180 gm/each were purchased from National Research Centre, Cairo, Egypt and left

to accommodate in the animal house of Faculty of Pharmacy, Cairo University for one week before being subjected to experimental work. All animals were provided with diet and water ad libitum. The study was carried out according to the guide lines of Ethics commity of Faculty of Pharmacy, Cairo University.

Drugs and chemicals

Fructose was purchased from EL-Nasr Pharma, Egypt. Pioglitazone (Glaxo Smithkline, Beechow, Harlow, MK) was dissolved in normal saline and kept at 4^0C (7mg/kg/day; p.o; **Zinn et al.,2008**). Alpha lipoic acid (Thiotacid®, 600mg/kg/day; p.o; **Androne et al**., **2000**) was suspended in 1% tween 80. Taurine (Nutra Planet, Advanced Platinum series, GMP, 111 Bethea Rd, St 101, Fayettevielle, GA 30214, USA) was dissolved in normal saline solution just before use (600mg/kg/day; p.o; **Anitha Nandhini et al., 2002; Penget al., 2005**). Chromium picolinate (E Merk, Dramstadt, Germany) was suspended in 1% Tween 80 (500µg/kg/day; p.o; **Moony et al**., **1995**).

Induction of insulin-resistance syndrome

Insulin resistance was induced in rats by oral administration of 10% fructose in drinking water for 12 weeks(**Sanchez-Lozada et al., 2007**). To insure that metabolic syndrome was induced, fasting blood glucose level was determined at different time intervals.

Experimental design

Animals that showed elevated MS parameters were selected and randomly allocated into various groups and treated as follows: normal control group, received water and solvent vehicle; FED-control group, continued on 10% fructose in drinking water and solvent vehicle. Other drug-treated groups were given 10% fructose in drinking water plus pioglitazone (7mg/kg), α-lipoic acid (600mg/kg), taurine (600mg/kg), chromium picolinate (500mg/kg) and a combination of pioglitazone with α-lipoic acid, taurine or chromium picolinate. Drugs were orally administered starting from the 13^{th} week after initiation of the diet and continued for extra 6 weeks. Another group was fed on normal diet and served as normal control group and received solvent vehicle. Animal weights were recorded throughout the period of study for calculation of body weight gain. By the end of the treatment period, animals were fasted for 12 h and blood samples were collected from the retro-orbital sinus and used for biochemical analysis.

Determination of body weight gain

The percentage of body weight gain was mathematically calculated using the following formula:

Body weight gain%=

$$\frac{\text{Final body weight (after treatment)} - \text{Initial body weight}}{\text{Initial bood weight}} \times 100$$

Biochemical estimations

Serum glucose level was estimated using glucose kit (Spinreact, Spain, **Trinder**, **1969**) and expressed as mg/dl. Serum glycated hemoglobin (HbAIc) was determined by the method of **Trivelli et al**. **(1971)** using HbAIc kit (Teco Diagnostics). The percentage HbAIc was determined by measuring the absorbance at 415nm of both HbAIC fragment and total hemoglobin. The ratio of both absorbances represents percent glycated hemoglobin. Serum triglycerides (TG) were determined colorimetrically by the method of **Schettler** (1980) and calculated as mg/dl. Total serum cholesterol (TC) was determined spectrophotometrically by the method of **Richmond** (1973) and expressed as mg/dl. Serum high density lipoprotein (HDL) was determined by an enzymatic colorimetric method (**Burstein et al**., 1970) and expressed as mg/dl. Serum low density lipoprotein (LDL) was indirectly estimated by the method of **Fridewald et al**. (1972) and expressed as mg/dl. Serum malondialdehyde (MDA) was assayed as a measurement of lipid peroxidation according to the method of **Mihara and Uchiyama (1978).** Concentration of MDA in serum was calculated as nmol/ml. Blood glutathione peroxidase (GPX) activity was determined by the method of **Paglia and Valentine (1967)**, which is based on oxidation of glutathione by GPX resulting into a decrease in absorbance at 340nm. GPX concentration is calculated as U/ml. Superoxide dismutase (SOD) was estimated according to the method of **Marklund and Marklund (1974)** and calculated as U/ml.

Statistical analysis: The values of the measured parameters were presented as mean ± S.E.M. Comparisons between different treatments were carried out using one way Analysis of Variance ANOVA) followed by **Tukey-Kramer** as post ANOVA multiple comparisons test. Differences were considered statistically significant when $p<0.05$.

III. Results

Effect of 6-week treatment with pioglitazone, α-lipoic acid, taurine or chromium picolinate and their combinations on body weight gain in fructose-enriched diet (FED) fed rats: Induction of insulin resistance was associated with increased body weight gain (23.5%). Treatment with pioglitazone significantly increased body weight gain (28%).Treatment with α-lipoic acid or chromium did not affect body weight gain. Taurine significantly augmented body weight gain by 39%. This effect was synergized with pioglitazone (55%) (Fig.1).

Effect of 6-week treatment with pioglitazone, α-lipoic acid, taurine or chromium picolinate and their combinations on fasting blood glucose (FBG) and glycated hemoglobin (HbAIc) in fructose-enriched diet (FED) fed rats:

Fructose-induced insulin resistance showed elevated levels of blood glucose (134%) and HbAIc (64%). Treatment with pioglitazone, αlipoic acid, taurine or chromium resulted in a significant reduction of elevated FBG by 65%, 45%, 54% and 55% respectively. Combination of pioglitazone with α-lipoic acid or taurine significantly reduced FBG by 64% and 67% respectively, whereas combination of pioglitazone with chromium normalized FBG. Treatment with pioglitazone , taurine or chromium significantly reduced HbAIc by 44% and 47% and 34% respectively. Combination of pioglitazone with α-lipoic acid, taurine or chromium significantly reduced HbAIc by 57%, 50% and 47% respectively (Table 1).

Effect of 6-week treatment with pioglitazone, α-lipoic acid, taurine or chromium picolinate and their combinations on lipid profile in fructose-enriched diet (FED) fed rats: Fructose-induced metabolic syndrome resulted in significant

increase in serum TG, TC, and LDL level almost by 16%, 29%, and 62% respectively. The level of HDL was reduced (26%). Treatment with pioglitazone significantly decreased serum TG, TC, and LDL by 20%, 13%, and 22% respectively, while increased HDL by 28%. Similarly α-lipoic acid reduced TG, TC by 15% and 5% with a significant increase in HDL by 30%. Taurine reduced TG, TC, and LDL by 22%, 81%, and 11% respectively, while normalizing HDL. Chromium reduced TG and LDL by 8% and 21% respectively without affecting TG level but normalized HDL. Co-administration of pioglitazone and α-lipoic acid significantly reduced TG, TC, and LDL by 48%, 12%, and 14% respectively, while augmented HDL by 25%, which reflects a considerable improvement of lipid profile. Combination of pioglitazone with taurine significantly decreased LDL by 11%, elevated TG by 9% but did not change TC level. Meanwhile, HDL was normalized (Table 2).

Effect of 6-week treatment with pioglitazone, α-lipoic acid, taurine or chromium picolinate and their combinations on oxidative stress parameters in fructose-enriched diet (FED) fed rats: Insulin-resistant rats showed a significant reduction in SOD, GPX by 85% and 74% respectively, whereas MDA was elevated by 145% (Fig.2,a,b&c). Treatment with pioglitazone significantly increased SOD by 10% while both GPX and MDA were normalized. Treatment with α-lipoic acid reduced MDA content and normalized both SOD and GPX. Taurine significantly increased SOD and GPX by 21% and 76% respectively and normalized MDA. Chromium significantly increased serum SOD by 8% but it normalized MDA. Administration of pioglitazone and α-lipoic acid normalized GPX and MDA but did not change SOD acticity. Co-administration of pioglitazone with taurine elevated both SOD and GPX and reduced MDA content. Administration of both pioglitazone and chromium normalized all parameters, namely, SOD, GPX and MDA (Fig.2,a,b&c).

In conclusion, this study proves the benefits of co-administration of α-lipoic acid, taurine or chromium with pioglitazone in FED-induced insulin resistance models in rats.

IV. Discussion

The investigation of agents of possible value in amelioration of serious problems of metabolic syndrome (MS) has become very important for the management of MS. An oxidant-antioxidant imbalance exists in diabetes mellitus (DM) so that an inverse correlation exists between blood glucose level and antioxidant status. A lower antioxidant defense is a common factor of uncontrolled DM. Antioxidants have thus received a great deal of attention with respect to their efficacy in treating the insulin resistance syndrome (IR) complications (**Nirmala et al., 2015)**.

Fructose-enriched diet (FED) - fed rats model for induction of MS in rats is an ideal means of investigating IR syndrome. This model provides a convincing evidence that dietary imbalance may initiate the development of MS (**Huang et al., 1997**). Male rats were used in this study because of their higher susceptibility towards development of insulin resistant diabetes as compared to female rats (**Santure et al**., **2002; Brenner et al., 2003**).

In the present study, there was a significant increase in body weight gain of rats maintained on FED for 16 weeks. This is in harmony with the reports of other investigators that fructose promotes obesity more than glucose as it enhances food intake without stimulating thermogenesis (**Levine, 1986,; Miller et al., 2002**). Moreover, fructose is favored by the liver to be metabolized into lipids which leads to weight gain, increased abdominal obesity and insulin resistance (**Elliott et al., 2002**). Increased body weight gain was associated with hyperglycemia, dyslipidemia and pronounced oxidative stress. FED-fed rat model provides a convincing evidence that dietary imbalance may initiate the development of MS (**Huang et al., 1997**). Indeed, FED increases fasting glycemia leading to hepatic insulin resistance in healthy men (**Faeh et al., 2005; Rizkalla, 2010**). In the current study, FED-fed rats showed elevated levels of serum TG, TC, and LDL associated with a decreased level of HDL. These results are in harmony with **Ackermann et al. (2005)** and **Nakagawa et al. (2006).** On the other hand, HDL level was lowered in FED-fed rats. This finding is in agreement with that of **Ohmori et al. (2004)** who observed that FED reduced serum HDL in rats.

Hyperglycemia produces ROS via glucose auto-oxidation and protein glycation causing local oxidation damage (**Maxwell et al., 1997**). So, measurement of total anti-oxidant status is likely to be valuable for understanding the relationship of oxidative stress and insulin resistance (**Yaworsky et al., 2000**). Measurement of MDA is a reliable marker of oxidative stress in diabetes (**Zadeh et al., 1997; Nacitarhan et al., 1995**). In the present study, a significant increase in serum MDA along with a significant inhibition of blood SOD and GPX enzyme activities were demonstrated in IR-diabetic rats. This is in accord with previous studies reporting similar changes in alloxan and streptozotocin- diabetic rats (**Coldiron et al., 2002**). Furthermore, **Martin-Gallan et al. (2003**) demonstrated a lower activity of GPX with a higher level of MDA and lipid peroxides in young type I diabetic patients. The anti-oxidant status was diminished by high fructose consumption and improved by bread, rice and macaroni consumption (**Santure et al., 2002).** Furthermore, the results of the current study revealed that FED feeding reduced the activities of the anti-oxidant enzymes, GPX and SOD. This is in agreement with **Delbosc et al. (2005)** who reported that FED increases oxidative stress in rodents. Prolonged exposure of rats to hyperglycemia leads to inhibition of SOD and other anti-oxidant enzymes (**Nadhini et al., 2005**).

The results of the present study indicate that pioglitazone normalized glucose and glycated hemoglobin values. As an insulin sensitizer, pioglitazone has been effective in lowering blood glucose level in IR rats. This is supported by **Ding et al. (2005)** who found that treatment with pioglitazone improved insulin sensitivity in streptozotocin (STZ) and high sucrose-fed diet induced obesity in rats. A potential mechanism by which pioglitazone improves insulin action includes direct stimulation of glucose uptake or oxidation and disposal in skeletal muscles, facilitation of glucose transport and enhancement of glycogen synthesis (**Smithet al., 2001**). Thiazolidinediones ameliorate IR in muscle tissues by suppression of muscle lipid storage and the activity of a protein kinase isoforms (**Zinn, 2008**). Improvement of glucose homeostasis by pioglitazone may be achieved by systemic insulin sensitization or by direct action of a nuclear

peroxizome proliferator-activated receptor- γ (PPAR-γ) on the transcription of genes involved in glucose disposal (**Kalofoutis et al., 2007).**

In the present study, treatment of IR rats with α-lipoic acid produced a significant lowering of blood glucose as well as MDA levels. On the other hand, serum SOD and GPX activities were increased This is in accordance with **Borcea et al. (1999)** who observed that α-lipoic acid lowered plasma peroxide level in diabetic patients; **Ziegler (2003)** who reported that α-lipoic acid reduced the symptoms of diabetic peripheral neuropathy; **Arivazhangan et al. (2001)** who found that α-lipoic acid reduced MDA in the brain regions of aged rats, and **Evans and Golder (2000)** who repoted that alpha lipoic acid improves insulin sensitivity in patients with type II dabetes.. Co-administration of pioglitazone and α-lipoic acid markedly reduced serum TC and LDL levels, but HDL was increased. This may be attributed to an augmented effect of both agents on lipid profile parameters so that peroxidation of lipids by free radicals burden in diabetic oxidative stress could be ameliorated by ROS scavenging cabability of α-lipoic acid (**Smith et al., 2004**).

The results of the present study revealed that taurine reduced blood glucose and glycated hemoglobin levels together with considerable enhancements of lipid profile and oxidative stress biomarkers. Other studies reported that taurine treatment produced similar effects. Taurine treatment resulted in a reduction of the elevated blood glucose, glycated end products, diabetes-evoked oxidative stress and lipid profile biomarkers (Huang **et al., 2008; Lin et al., 2010; Das et al., 2012**). It could be effective in removing fatty liver deposits in rats (**Mc Call, 2005**). It also could act as an antioxidant (**Sinha et al., 2008**) and prevent exercise-induced oxidative stress (**Zang et al., 2004**), and lowered blood cholesterol and LDL contents. Taurine was demonstrated as a potent antioxidant that improves drug-induced type I diabetes in rats and that it could ameliorate metabolic alterations in insulin resistance (**Das et. al., 2112**).

Reports by **Murakami et al. (1999)** indicated that taurine administration to mice lowered serum LDL and elevated HDL. This effect might have been due to taurine's ability to promote the degradation of detrimental cholesterol to relatively harmless bile acids (**Lim and Kang, 1998)**. Dietary supplementation of taurine is able to correct abnormal elevations of MDA and depletion of glutathione in diabetes (**Lim et al., 1998**).

Administration of chromium picolinate produced significant reductions in blood glucose and glycated hemoglobin levels of IR rats. It has been reported that chromium deficiency in rats may result in glucose intolerance in diabetics (**Person et al., 2008**). According to **Striffler et al. (2001**), a biologically active form of chromium enhances the effect of insulin on glucose metabolism through enhancement of insulin receptor sensitivity towards glucose utilization. Chromium was found to work closely with insulin by facilitating the uptake of glucose in cells (**Anderson et al., 2001; Jain and Kannan, 2001**). Chromium has been reported to increase insulin binding to cells, insulin receptor number and activate insulin receptor kinase leading to enhancement of insulin sensitivity (**Krejperio, 2001; Krol and krejpecio, 2010**). Since chromium picolinate reduced insulin resistance, this essential trace element could therefore have wide effects on abnormal blood lipids together with lowering of blood glucose levels (**Striffler et al., 2001**). Besides, the free radical parameters namely GPX and SOD activities were normalized. Chromium treatment of IR rats resulted into marked reduction of TG level. This is in agreement with **Sahin et al. (2007)** who observed that blood TG of STZ-diabetic rats were markedly reduced after chromium supplementation. **Feng et al. (2015)** reported that chromium malate produced a better enhancement of glycometabolism and lipid metabolism as compared to other chromium compounds in type II diabetic rats.

The current investigation has proved the antioxidant potential of chromium whether given alone or along with pioglitazone. This study also demonstrated that chromium administration to FED-fed rats was associated with elevation of plasma GPX activity. Moreover, chromium administration resulted into reduction of elevated levels of MDA in IR-rats. In line with these findings, **Esen et al., (2009)** found that supplying rats with high chromium diet elevated the activities of antoxidant enzymes such as catalase, SOD, and GPX. Furthermore, **Martin et. al. (2006); Hummel et al. (2007)** reported that chromium levels in diabetic subjects are lower as compared to normal subjects and that a correlation exists between plasma insulin and plasma chromium levels, so that a low chromium level would lead to incidence of type II diabetes.

V. Conclusion

The findings of the present study prove the benefits of co-supplementation of pioglitazone and chromium picolinate as an insulin sensitizer micronutrient as well as with the tested antioxidants, namely α-lipoic acid and taurine. Pioglitazone along with each of the tested compounds offer further improvements to the markers of IR, including hyperglycemia, dyslipidemia and exaggerated oxidative stress.

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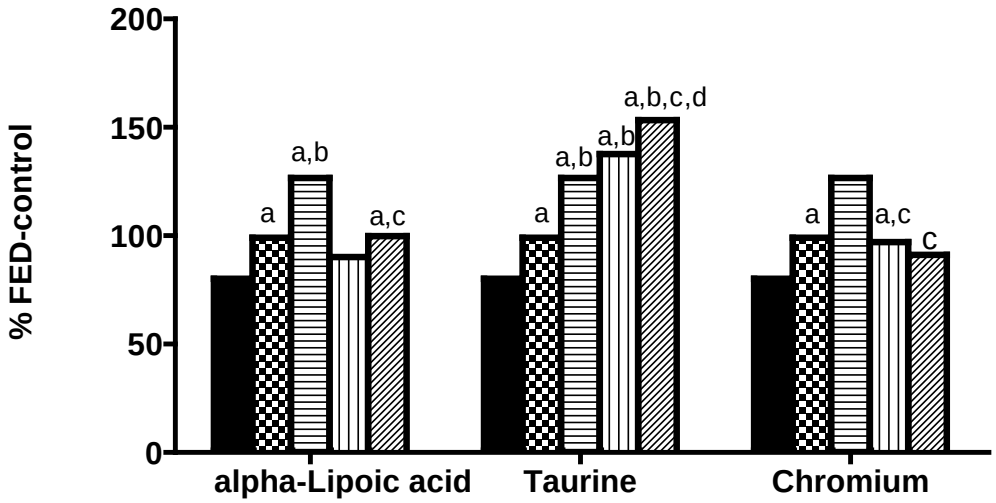

Figure (1): Effect of 6-week treatment with pioglitazone, alpha-lipoic acid, taurine, chromium picolinate and their combinations on body weight gain, in fructose enriched diet (FED) fed rats.

N=6-8 rats per group. Each value represents the mean ± SE of the mean.
Statistics were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test.
[a]Significantly different from normal group at p<0.05.
[b]Significantly different from FED control group at p<0.05.
[c]Significantly different from pioglitazone-treated group at p<0.05.
[e]Significantly different from taurine-treated group at p<0.05

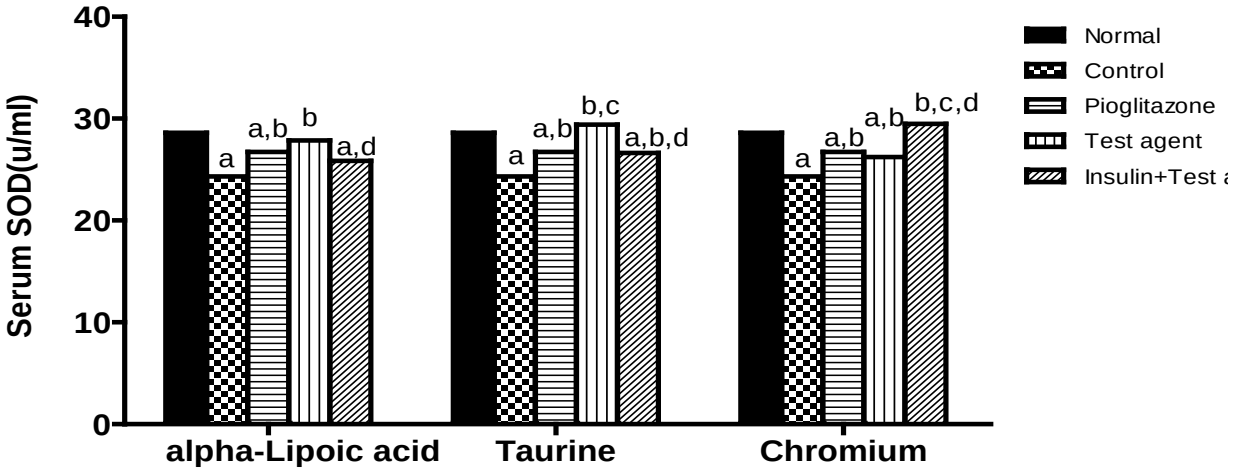

Figure (2-a): Effect of 6-week treatment with Pioglitazone, alpha-lipoic acid,taurine and chromium picolinate and their combinations on SOD, in fructose enriched diet (FED) fed rats.

N=6-8 rats per group. Each value represents the mean ± SE of the mean.
Statistics were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test.
[a]Significantly different from normal group at p<0.05.
[b]Significantly different from FED control group at p<0.05.
[c]Significantly different from pioglitazone-treated group at p<0.05.
[d]Significantly different from Lipoic acid-treated group at p<0.05.
[e]Significantly different from taurine-treated group at p<0.05.
[f]Significantly different from chromium-treated group at p<0.05.

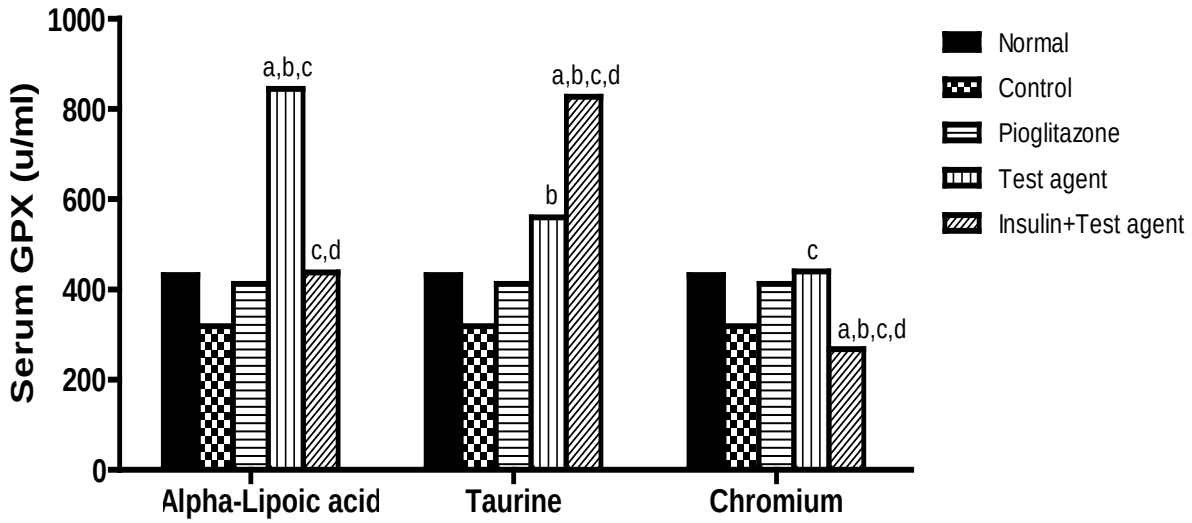

Figure (2-b): Effect of 6-week treatment with Pioglitazone, alpha-lipoic acid,taurine and chromium picolinate and their combinations on GPX, in fructose enriched diet (FED) fed rats.

N=6-8 rats per group. Each value represents the mean ± SE of the mean.
Statistics were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test.
[a]Significantly different from normal group at p<0.05.
[b]Significantly different from FED control group at p<0.05.
[c]Significantly different from pioglitazone-treated group at p<0.05.
[e]Significantly different from taurine-treated group at p<0.05.

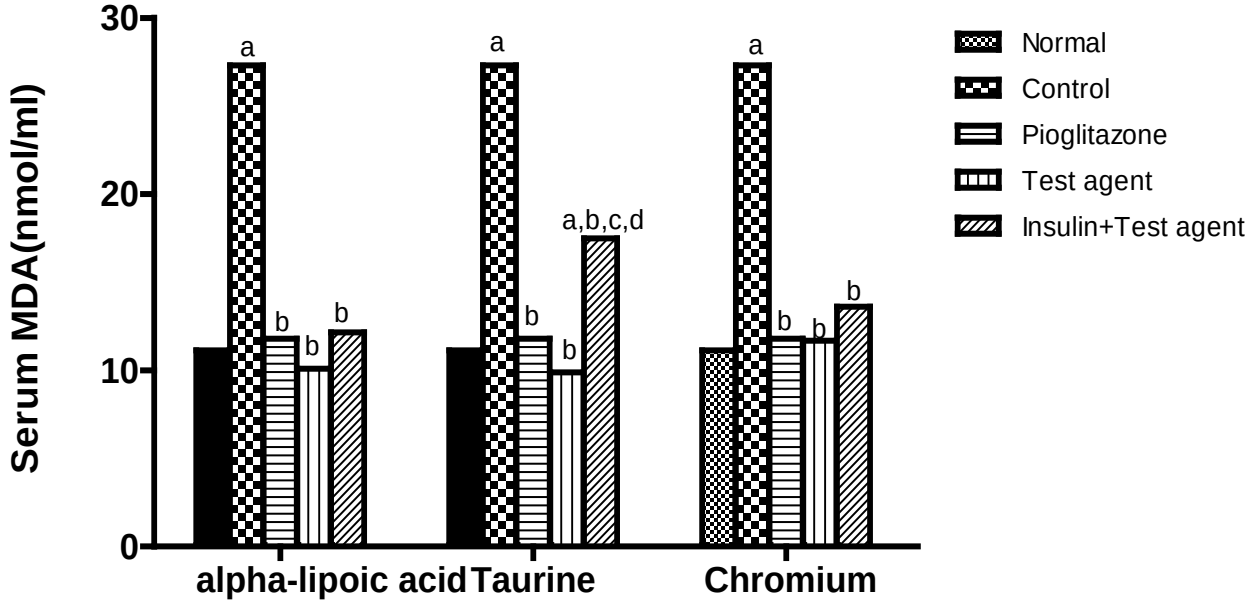

Figure (2-c): Effect of 6-week treatment with Pioglitazone, alpha-lipoic acid,taurine and chromium picolinate and their combinations on MDA, in fructose enriched diet (FED) fed rats.

N=6-8 rats per group. Each value represents the mean ± SE of the mean.
Statistics were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test.

Parameters/drugs & doses	FBG (mg/dl)	HbA1c (mg%)

[a]Significantly different from normal group at p<0.05.
[b]Significantly different from FED control group at p<0.05.
[c]Significantly different from pioglitazone-treated group at p<0.05.
[d]Significantly different from Lipoic acid-treated group at p<0.05.
[e]Significantly different from taurine-treated group at p<0.05.
[f] Significantly different from chromium-treated group at p<0.05.

Table (1): Effect of 6-week treatment with pioglitazone, alpha-lipoic acid, taurine, chromium picolinate and their combinations on fasting blood glucose (FBG) level and glycosylated hemoglobin (HbA1c) in fructose enriched diet (FED) fed rats.

Normal control (Saline; p.o.)	122.0 ± 1.95	4.73±0.11
Control (Saline; p.o.)	285.71±16.32 [a]	7.76±1.97 [a]
Pioglitazone (7mg/kg/; p.o)	98.75 ± 8.33 [b]	4.31 ± 0.15 [b]
Lipoic acid (600 mg/kg; p.o.)	155.9 ± 9.85 [b]	7.35 ± 0.18 [a]
Taurine (600 mg/kg/; p.o.)	130.4 ± 4.54 [b]	4.08 ± 0.1 [b]
Chromium (500 mg/kg/; p.o.)	127.3 ± 5.2 [b]	5.13 ± 0.16 [b]
Pioglitazone + Lipoic acid	102.5 ± 7.64 [b,d]	3.35 ± 0.13 [b,d]
Pioglitazone + Taurine	94.5 ± 3.83 [b,d]	3.88 ± 0.18 [b]
Pioglitazone + Chromium	84.25 ± 6.93 [a,b,d]	4.1 ± 0.14 [b]

N=6-8 rats per group. Each value represents the mean ± SE of the mean.
Statistics were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test.
[a]Significantly different from normal group at p<0.05.
[b]Significantly different from FED control group at p<0.05.
[d]Significantly different from Lipoic acid-treated group at p<0.05.
[e]Significantly different from taurine-treated group at p<0.05.
[f] Significantly different from chromium-treated group at p<0.05.

Table (2): Effect of 6-week treatment with Pioglitazone, alpha-lipoic acid (LA), taurine, chromium picolinate and their combinations on serum lipid profile in fructose enriched diet (FED) fed rats.

Parameters/ drugs & doses	TG mg/dl	TC mg/dl	HDL mg/dl	LDL mg/dl
Normal control (Saline;p.o.)	30.58±0.48	57.37±0.93	29.54±0.29	24.59±0.48
Control (Saline;p.o.)	35.47±0.16[a]	74.43±0.72[a]	21.89±0.31[a]	39.93±0.2[a]
Pioglitazone (7mg/kg/;p.o)	28.53±0.27[b]	64.98±0.32[a,b]	28.06±0.39[a,b]	31.20±0.45[a,b]
Lipoic acid (600mg/kg;p.o.)	30.08±0.78[b]	70.93±0.43[a,b,c]	28.43±0.14 [b]	37.15±0.35[a,c]
Taurine(600mg/kg/day;p.o.)	27.71±0.38[a,b]	68.89±0.49[a,b,c]	28.19±0.26 [b]	35.55±0.51[a,b,c]
Chromium(500mg/kg/day;p.o.)	34.64±0.27[a,c]	68.73±0.28[a,b,c]	30.33±0.21[b,c]	31.53±0.39[a,b]
Pioglitazone + Lipoic acid	18.29±0.29[a,b,c,d]	65.24±0.39[a,b,d]	27.36±0.23[a,b]	34.31±0.09[a,b,c,d]
Pioglitazone + Taurine	38.5±0.51[a,b,c,d]	72.20±0.59[a,c,d]	28.65±0.22 [b]	35.73±0.68[a,b,c]
Pioglitazone + Chromium	31.64±0.81[b,c,e]	67.49±0.26[a,b,c]	25.38±0.31[a,b,c,d]	38.98±0.17[a,c,d]

N=6-8 rats per group. Each value represents the mean ± SE of the mean.
Statistics were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparisons test.
[a]Significantly different from normal group at p<0.05.
[b]Significantly different from FED control group at p<0.05.
[c]Significantly different from pioglitazone-treated group at p<0.05.
[d]Significantly different from Lipoic acid-treated group at p<0.05.

[e] *Significantly different from taurine-treated group at $p<0.05$.*
[f] *Significantly different from chromium-treated group at $p<0.05$.*

Study of Random Urinary Calcium – Creatinine Ratio in Prediction of Pre-Eclampsia

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Abstract- Pre-eclampsia is defined as development of hypertension and proteinuria (> 300mg urinary protein in 24 hrs.) after 20th week gestation. Hypertension is defined as blood pressure greater than 140/90 mm Hg or a rise in blood pressure of 30/15 mm Hg from the baseline confirmed by two measurements 6 hrs. apart. The objective of the study is to estimate urinary Calcium-Creatinine ratio in cases of preeclampsia.

Urinary Calcium (10.53+ 3.12mg/dl),Urinary Creatinine (50.38+7.92 mg/dl),Urinary Calcium –Creatinine ratio (0.14 + 0.02) was determined in a spot urine sample in 50 Preeclamptic women as well as asymptomatic pregnant women after 20 weeks of gestation, who attended the antenatal OPD at Basaveshwara Medical College and Hospital. In preeclampsia, It is noticed that Urinary Calcium, Urinary Creatinine and Urinary Calcium : Creatinine ratio is significantly decreased . Extensive changes is seen in the renal system in pre-eclampsia. As a part of the end organ pathology, pre-eclamptic glomeruli undergoes structural changes with pronounced endothelial vacuolization and hypertrophy of the cytoplasmic organelles, first defined as glomerular endotheliosis.

A Case- Control Comparative study was done with Preeclamptic pregnant and normal pregnant women both from out patient and in patient of Basaveshwara Medical College Hospital and Research Centre, Chitradurga, according to the criteria .

Index Terms- Pre eclampsia, Urinary calcium, Urinary Creatinine, Urinary Calcium/ Creatinine ratio

I. INTRODUCTION

Pre-eclampsia is defined as development of hypertension and proteinuria (>300 mg urinary protein in 24hrs.) after 20th week gestation. Hypertension is defined asa blood pressure greater than 140/90 mm Hg or a rise in blood pressure of 30/15 mmHg from the base line confirmed by two measurements 6 hrs. apart[1] .

Pre-eclampsia is a leading cause of maternal and perinatal morbidity and mortality worldwide. Early diagnosis and treatment helps to reduce it to a minimum and therefore the importance of identifying the women at risk.Preeclampsia occurs in about 5-7 % of pregnancies. It is known to affect the function of various organs involving metabolism. The most important feature in toxemia of pregnancy is hypertension which is supposed to be due to vasospastic phenomenon in kidney, uterus, placenta and brain .

Many studies have been conducted to rule out the etiology. Early screening and diagnostic tests like lipid profile, oxidant and antioxidant status etc. but among these, serum and urine calcium levels and calcium metabolism have been studied extensively in Preeclampsia and various conflicting results are given. These studies were conducted to know alterations in Serum and Urinary calcium levels in all PIH cases including Preeclampsia .

Renal function changes are seen in symptom free women in whom preeclampsia will eventually develop. Regulation of intracellular calcium plays a key role in prevention of preeclampsia in the pregnant women. Pregnant women who develop severe preeclampsia have significant low dietary calcium intake compared to normotensive women. A calcium supplement has been hypothesized to reduced chances of PIH and pre-eclampsia .

II. MATERIALS AND METHODS

a) Inclusion Criteria

50 pregnant women at period after 20 weeks of gestation both from out patients and in patient of Basaveshwara Hospital who were following up with their with regular antenatal checkups, followed with regular routine blood and Urine investigations –i.e. Hb, RBS, VDRL, urine routine examination for protein, sugar, pus cells, epithelial cells are examined.

b) Exclusion criteria

Pregnant women who are previously known diabetic, hypertensive and suffering from any major illness (mainly renal and hepatic) are excluded from the study

Methods:-

Study group will be followed up every four weeks from 28th week of gestation and spot urine sample was collected for Biochemical evaluation of urinary Calcium and Creatinine. Urinary Calcium and Urinary Creatinine were estimated by Erba's Semi autoanalyzer. Urinary Calcium was estimated by Arsenazo Dye method and Urinary Creatinine was estimated by Jaffe's method.

The results were statistically analysed with Students "t-test". A case control comparative study was done with Preeclampsia and normal pregnant women accordingly to the criteria.

III. Results & Discussion

The present study included a total number of 100 subjects consists of 50 Pre eclamptic cases and 50 normal pregnant women.

Table-1: The Urinary Calcium, Creatinine, Calcium-Creatinine ratio in Preeclamptic women and normal Pregnant women.

Groups	Urinary Calcium (mg/dl)	Urinary Creatinine (mg/dl)	Urinary Calcium/Creatinine Ratio
Preeclamptic Women (n=50) [cases]	10.53+3.12***	50.38 + 7.92**	0.14+ 0.02***
Normal pregnant Women (n=50) [controls]	26.30+ 5.24**	83.34 + 17.49**	0.33+ 0.06**

Note:-
1.The number in parenthesis shows the number of samples.
2. Values are expressed as their Mean ± SD.
3. p value * p<0.05, ** p<0.01, *** p<0.001.

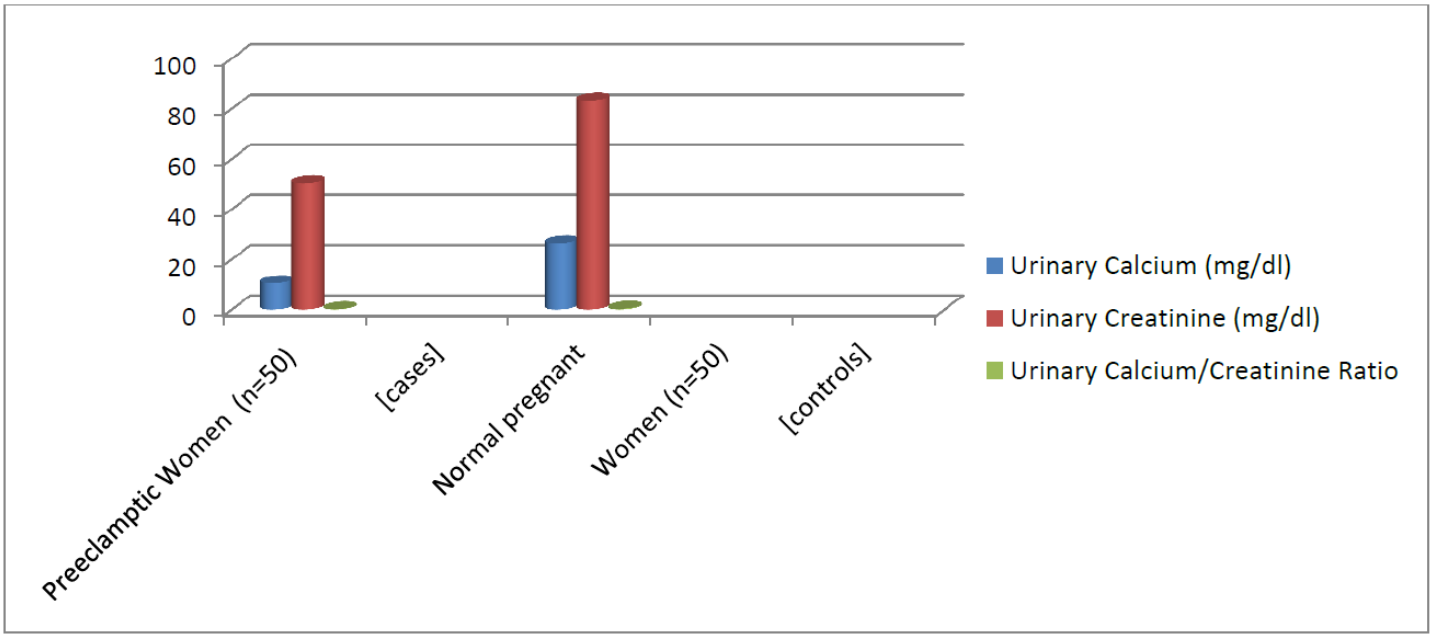

Figure I :- Comparison of Urinary Calcium, Creatinine , Calcium-Creatinine ratio in Preeclamptic women and normal Pregnant women.

The predominant pathology in preeclampsia is endothelial dysfunction which sets as early as 8-18 weeks, however signs and symptoms appear as late as in third trimester .To prevent the occurance of preeclampsia, various predictors have been proposed.

Here, in Table-1 it shows a comparative study between Preeclampsia and normal pregnant women with parameters of Urinary Calcium, Urinary Creatinine , Urinary Calcium/ Creatinine Ratio.

It is seen that the Urinary Calcium in Preeclampsia cases is significantly decreased (p<0.01) as compared to normal pregnant women. Halhali A, Szmidt- Adjide Segovia B. L. et al have reported that hypocalciuria was associated with preeclampsia and could be considered a risk factor for development of preeclampsia in pregnancy[2,3]. Sanchez Ramos et. al.[4] , Taufieldet. Al[5] have reported decreased calcium in third trimester of PIH cases. Bilgin et.al.[6] have reported hypocalciuria in cases of PIH compared to normal pregnant women .Ramos et.al.[7] reported that 24 hour Calcium < 100mg may confirm suspected case of preeclampsia.

The urinary Creatinine level in Pre eclamptic cases is decreased as compared to (p<0.01) normal pregnant women. Urinary Creatinine is also selected as its value is almost constant whole day in excretion by urinary route.

The mean level of Urinary Calcium : Creatinine ratio shows statistically significant and decreases ($p < 0.001$) in Pre-eclampsia cases as compared to control group. Ozcan et al [8] who investigated the predictive value of decreasing calcium to creatinine ratio in a spot urine sample as early as in 1995 reported that it might be an effective marker for preeclampsia. Saudan[9] , has reported a sensitivity of only 68% and specificity of 70% and Izumi et al [10] found that it had limited value in prediction of preeclampsia, but the threshold value used was 0.10 by the former and Izumi et al carried out the test in early pregnancy, at less than or equal to 12 weeks of gestation. Kazeroomi[11] evaluating between 20-24 weeks of gestation and Karetal[12] evaluating the predictive value of CCR at less than or equal to 0.04 between 20-34 weeks of gestation (similar to our study), have reported that it was a satisfactory test for prediction of preeclampsia and could be an effective method for screening asymptomatic women for preeclampsia. Rodriquez et al[13]evaluated the role of decreasing calcium creatinine ratio and micro albuminuria in prediction of preeclampsia as early as in 1988 and have concluded that these tests may be useful screening tools in prediction of preeclampsia.

IV. Conclusion

Preeclampsia is a major cause for concern worldwide and there has been a constant search to find means for prediction and prevention. An availability of a good screening test would initiate more research in this direction and would ultimately pave the way for implementation of measures for primary prevention . Estimation of Calcium -Creatinine ratio in a spot urine sample is a simple test, easily performed hence assures patient compliance. It has a good predictive value and justifies the cost and is suited to be adopted as a screening tool for preeclampsia. It can therefore be recommended as a screening test for preeclampsia and could be offered to all asymptomatic pregnant women between 20-24 weeks of gestation during their routine antenatal visit.

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An Experimental Study on Compressive Strength and Splitting Tensile Strength of Concrete with Partial Replacement of Cement with Stone Quarry Dust

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Abstract- Instead of using conventional approach researchers are, nowadays, taking interest in replacing the waste material with the ingredients of concrete to achieve the following benefits. First benefit is to minimize the pollution, second is to make the concrete cost efficient and third is to enhance the properties of the concrete i.e. Compressive Strength and Splitting Tensile Strength of Concrete. Cement is being replaced with different types of waste materials to achieve the aforementioned benefits. This research paper reveals the effect of the partial replacement of cement with the Stone Quarry Dust on Compressive Strength and Splitting Tensile Strength of concrete. Cement was replaced in the following percentages to test the samples; 0%, 15%, 25% and 35%. It was found after testing that strength was increased 2 time for Q_{25} sample.

Index Terms- Concrete, Water/Binder Ratio, Stone Quarry Dust, Compressive Strength, Splitting Tensile Strength, Partial Replacement.

I. Introduction

Concrete is a composite material made from cement, water, coarse and fine aggregate. The waste material, if not catered properly, directly damages the health. Polluting the environment is considered an offensive crime in most of the countries. There are different types of waste materials being used in the industry such as, Stone Quarry dust, "Fly Ash, Rice Husk, Clay Brick, Metakaolins, Palm Oil Fuel Ash, Bamboo Leaf Ash, Volcanic Ash, Ground Nut Husk Ash, Waste Glass Slurry, Glass Powder, Solid Wastes, Quarry Dust, Marble Dust Powder"[1-13] and etc. In an underdeveloped country like Pakistan, The construction is taking place at such a high pace that it is inevitable to stop the Stone Quarry blasting and thus the air pollution. Pakistan is rich in its minerals and known as the best aggregate producing country in the world. To produce aggregates, Stone Quarry blasting is essential and naturally production of Quarry dust also associates with it. Stone Quarry Dust results in harmful diseases like Lungs cancer, Asthma, Eye diseases and etc. Our aim was to replace the cement with the Stone Quarry dust so that it might result in an environment friendly step. Hence cement was replaced with the Stone Quarry dust to analyze the results.

Table 1: Designation of Samples for different replacements

Designation	Percentage Replacement by Weight of Cement
Q_0	0%
Q_{15}	15%
Q_{25}	25%
Q_{35}	35%

The materials used were brought from the surroundings of Taxila.150x150x150 mm cubes and cylinders having the diameter of 150 mm and height 300 mm were used.

II. Literature Review

"A.V.S.Sai. Kumar and Krishna Rao in 2014 did research on the similar project by replacing the cement with the quarry dust. They replaced at 0%, 10%, 20%, 25% and 30% and found that 25% replacement gives the optimum results. The description of the materials is tabulated in Table-2."[14]

Table 2: Description of materials used in the research work

Material	Description
Cement	Portland Pozzolana cement conforming to IS: 269-1976 and IS: 7031-1968. 53 Grade Cement.
Quarry Dust	Quarry collected from local stone crushing units. It was initially dry in condition when collected and was sieved by IS: 90 micron sieve before mixing in concrete.
Fine Aggregates	The fine aggregate used is natural sand obtained from the river Godavari. Specific Gravity was 2.57
Coarse Aggregates	Coarse aggregate obtained from local quarry processing units has been used for this study. Specific Gravity was 2.78
Water	Ordinary potable tap water available in laboratory was used for mixing and curing of concrete.

"Venkata Sairam Kumar N, Dr. B. Panduranga Rao and Krishna Sai M.L.N also did the research on the similar project and replaced the cement with the quarry dust in following

percentages; 0%, 5%, 10%, 15%, 20%, 25%, 35% and 40%. They used 150x150x150 mm cubes for the testing using different mix and water/cement ratios. From their experimental results they have inferred that replacing 25% cement with quarry dust has increased the hardened concrete properties. The description of the materials is tabulated in Table-3."[15]

Table 3: Description of materials used in the research work

Material	Description
Cement	Portland Pozzolana cement of 53Grade was used in this study.
Quarry Dust	Collected from local stone crushing units of Chowdavaram village, Guntur, Andhra Pradesh. It was initially dry in condition when collected and was sieved by IS: 90 micron Sieve before mixing in concrete. Specific gravity observed for quarry dust is 2.5.
Fine Aggregates	Krishna river sand having specific gravity of 2.61 and fineness modulus of 2.9 has been used as fine aggregate for this study.
Coarse Aggregates	Obtained from local quarry units has been used for this study. Maximum size of aggregate used is 20mm with specific gravity of 2.73.
Water	Ordinary potable tap water available in laboratory was used for mixing and curing of concrete.

III. MATERIALS

A. Cement

Ordinary Portland cement was used in this study. The properties of the cement are tabulated in Table-4.

Table 4: Results of different Tests performed on Cement

Sr. No.	Property	Test Result
1	Normal Consistency	29%
2	Specific Gravity	3.04
3	Initial Setting Time	1.25 Hours
4	Final Setting Time	3.5 Hours
5	Maximum Strength	8500 psi

B. Stone Quarry Dust

There are number of Stone quarries in Margalla Hills around Taxila city. For this case study we brought the Quarry dust from one of the Stone Quarries in Margalla Hills. The quarry is known for producing Basic aggregates. The dust of these Quarries is effecting 5-10 Km^2 surrounding area. The properties of the quarry dust are tabulated in Table-5.

Table 5: Results of different tests performed on Stone Quarry Dust

Sr. No.	Property	Test Result
1	Specific Gravity	2.54-2.60
2	Bulk Relative Density (Kg/m^3)	1750
3	Moisture Content (%)	0%
4	Particle Size	Passing Sieve No.200

C. Fine Aggregates

Fine aggregates were brought from Lawrence Purr Sand quarry. This quarry is known for producing best sand in the region. Properties of the sand are tabulated in Table-6.

Table 6: Results of different tests performed on Fine Aggregates

Sr. No.	Property	Test Result
1	Specific Gravity	2.7
2	Fineness Modulus	2.4
3	Bulk Density i) Loose ii) Compacted	 i) 1367 Kg/m^3 ii) 1675 Kg/m^3

D. Coarse Aggregates

Coarse aggregates were bought from the local crush suppliers of Taxila Quarries. Properties of the coarse aggregates are tabulated in Table-7.

Table 7: Results of different tests performed on Coarse Aggregates

Sr. No.	Property	Value
1	Specific Gravity	2.5
2	Bulk Density iii) Loose iv) Compacted	 i) 1237 Kg/m^3 ii) 1550 Kg/m^3
3	Nominal Maximum Size	7/8 inches

E. Water

Ordinary potable tap water available in the laboratory was used for the casting and curing of the cubes and cylinders. Properties of the water are tabulated in Table-8.

Table 8: Results of different tests performed on Water

Sr. No.	Property	Value
1	pH	7.15
2	Taste	N/A
3	Appearance	Clear
4	Turbidity (NTU)	4.23

F. Casting Specifications

Samples were casted using 1:2:4 mix ratio and Water/Binder Ratio of 0.55. This was taken because commonly this mix ratio is used in simple constructions subjected to less loads.

Table 9: Casting details

Sr. No.	Description	Used
1	Mix Ratio	1:2:4
2	Water/Binder Ratio	0.55

I. Casting and Testing Details

To determine the Compressive strength of concrete 36 cubes having the dimensions 150x150x150 mm were casted using the mix ratio 1:2:4 and Water/Binder ratio 0.55. Cement was replaced with the stone quarry dust in the following percentages, 0%, 15%, 25% and 35%. For each percentage 9 cubes were casted. Tests on 7, 14 and 28 days were carried out. For each day testing 3 cubes were tested. This was done to minimize the error by taking the average value of the compressive strength.

To determine the splitting tensile strength of concrete 36 cylinders having 150mm diameter and 300 mm height were casted using the mix ration 1:2:4 and water binder ratio 0.55. Cement was replaced with the stone quarry dust in the following percentages, 0%, 15%, 25% and 35%. For each percentage 9 cylinders were casted. Tests on 7, 14 and 28 days were carried out. For each day testing 3 cubes were tested. This was done to minimize the error by taking the average value of the splitting tensile strength.

Samples were prepared using the electric drum. Before casting of cubes/cylinders molds were properly oiled and cleaned. For smooth surface, plates underneath the molds were placed. Slump was taken for each partial replacement. Tamping was done in 3 layers with the help of square tamping rod for the cubes and cylinders. After pouring the concrete in the required molds their surfaces were smoothen and then left for 24 hours to set. After 24 hours cubes and cylinders were de-molded and placed in the curing bath for the required period of time.

For the testing purpose, 24 hours prior to testing, the required cubes/cylinders were taken out of the curing bath and placed in an open space to let them dried.

"Compressive strength tests"[3] and "Splitting Tensile Strength"[4] were carried out under the BS 4550-3.4:1978 standard and ASTM C496/C 496M-04 respectively.

IV. RESULTS

"Slumps were taken according to ASTM Standard using specified equipment's. The results obtained indicate that admixtures might be needed for increasing the workability of concrete. Moreover it was also seen that there was an increase in slump when cement was replaced with Stone Quarry dust by 25%."[5]

Table 10: Slump for different Samples

Replacement	**Q_0**	**Q_{15}**	**Q_{25}**	**Q_{35}**
Slump (mm)	45	40	48	43

Table 11 shows Splitting Tensile Strength values for Q_o, Q_{15}, Q_{25} and Q_{35} on different ages of concrete.

Table 11: Compressive Strength Test Results for different samples on varying ages of Concrete

Sr. No.	Mix Ratio	Testing Days	Water Binder Ratio	Q_0 MPa	Q_{15} MPa	Q_{25} MPa	Q_{35} MPa
1	1:2:4	07	0.55	**6.39**	**4.95**	**8.04**	**4.95**
2	1:2:4	14	0.55	**7.25**	**5.02**	**9.97**	**5.53**
3	1:2:4	28	0.55	**8.97**	**5.17**	**13.85**	**6.67**

Figure 1 shows the variation in compressive strength for Q_0, Q_{15}, Q_{25}, Q_{35} on 28 days age of concrete specimen. This figure depicts 155% increase in strength for Q_{25} sample than that of Q_0 sample.

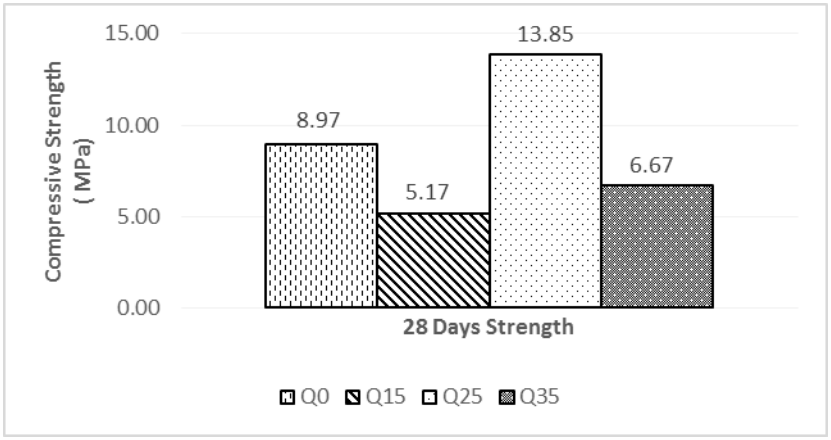

Figure 1: Variation in compressive strength

Figure 2 shows a variation in compressive strength against different replacements of stone quarry dust with cement. The figure depicts increase in strength with an increase in age of concrete specimen. Q_{25} sample has comparatively greater strength than that of other samples.

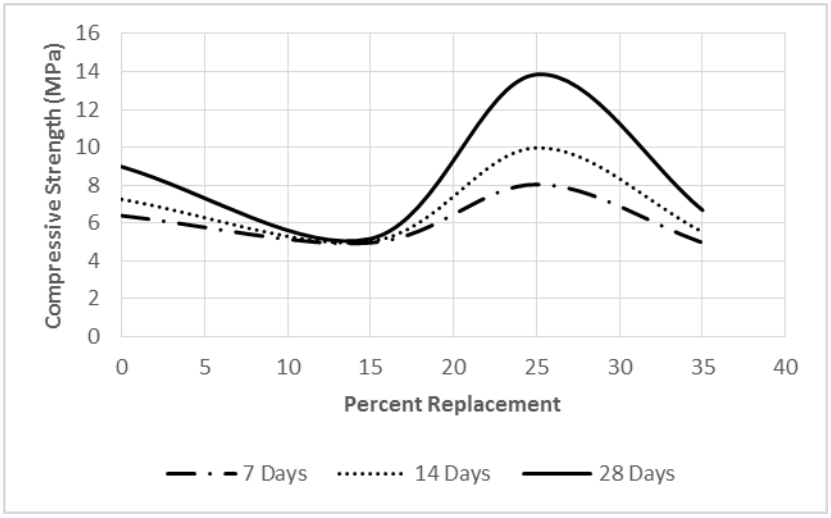

Figure 2: Variation in Compressive Strength against different replacements

Figure 2 shows variation in compressive strength of concrete specimen against different percentages. This shows greater strength of concrete at 28 days age than that of 7 days and 14 days.

Table 12: Splitting Tensile Test results of different samples on varying ages of concrete specimen

Sr. No.	Mix Ratio	Testing Days	Water/ Binder Ratio	Q_0 MPa	Q_{15} MPa	Q_{25} MPa	Q_{35} MPa
1	1:2:4	7	0.55	**0.65**	**0.53**	**0.85**	**0.45**
2	1:2:4	14	0.55	**0.70**	**0.56**	**1.04**	**0.62**
3	1:2:4	28	0.55	**0.88**	**0.66**	**1.5**	**0.92**

Table 12 shows Splitting Tensile Strength values for Q_o, Q_{15}, Q_{25} and Q_{35} on different ages of concrete.

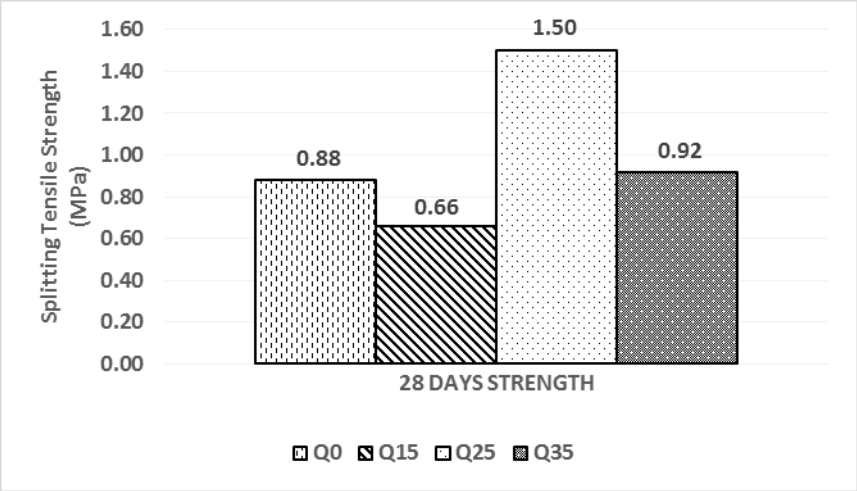

Figure 3: Variation in Splitting Tensile strength

Figure 3 shows the variation in compressive strength for Q_0, Q_{15}, Q_{25}, Q_{35} on 28 days age of concrete specimen. This figure depicts 155% increase in strength for Q_{25} sample than that of Q_0 sample.

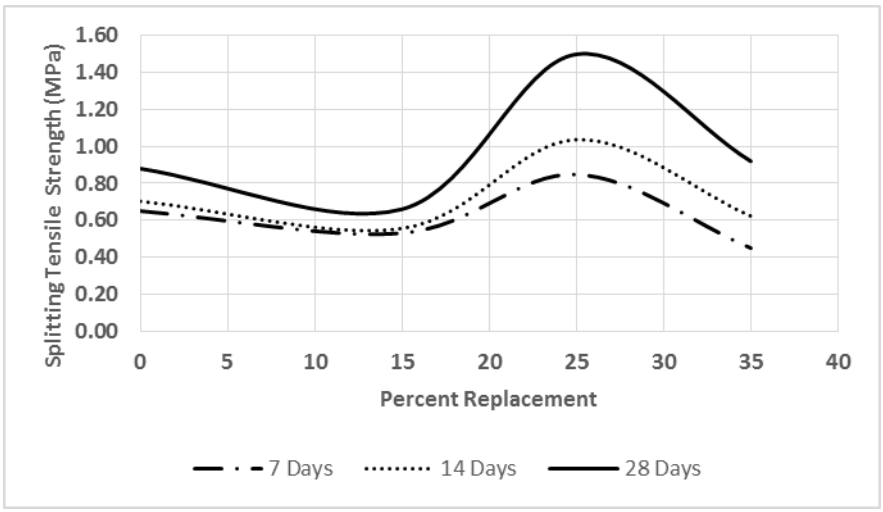

Figure 4: Variation in Splitting Tensile Strength against different replacements

Figure 4 shows variation in splitting tensile strength of concrete specimen against different percentages. This shows greater strength of concrete at 28 days age than that of 7 days and 14 days.

V. CONCLUSION

After the thorough research work on the aforementioned subject different conclusions were drawn out. These conclusions are purely based on the observations and results of the research work. Following conclusions were drawn out from this study.

1. Compressive Strength and Splitting Tensile Strength were increased approximately 2 times after replacing cement with 25% Stone Quarry dust.
2. Q_{25} yielded optimum results.
3. Slump for Q_{25} mix was greater than that of Q_0, Q_{15} and Q_{35} mixes.
4. Since the slump was in low range, therefore, to increase the workability of concrete admixtures can be used.

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Important factors of BPR for ICT in Education Institutes at Delhi (India)

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Abstract- The premise of this research paper is to identify the important factor of Business Process Re-engineering(BPR) with an aim to improve the efficiency of institutions by eliminating redundant efforts / activities. This empirical study takes on primary data concerning to BPR of fifty institutes of Delhi i.e., Union territory of India. Important factors have been identified using data reduction technique Principal Component Analysis (PCA)[Tool: SPSS version 20.0]. The result states that among twenty numbers of different attributes three attributes are significant.

Index Terms- Information and Communication Technology(ICT), Business Process Re-engineering(BPR), Principal Component Analysis(PCA)

I. INTRODUCTION

During the rise of the Internet, governments on all continents have discovered the amazing potential that technology opens up for education (Kumpulainen, Kari. 2007). ICT integration also helps us to make education more accessible and affordable. ICT can be implemented in any institution with the help of reengineering.

As per the present scenario, the total number of universities in India is 567 of which 42 are Central Universities, 285 State Universities, 130 Deemed Universities and 112 Private Universities. In Delhi, there are 4 Central Universities, 5 State Universities, and 11 Deemed Universities. There are 395 Colleges running under these Universities. In all these Colleges and Universities, there are different infrastructures in use.

This research covers the prime institutions of Delhi to find out different BPR policies, strategies or procedures adopted by different institutions to incorporate IT in different prime institutions of Delhi.

According to **Hammer and Champy (1993)** "Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service and speed."[5]So BPR is the starting points of re-design any business activity without this change is not feasible. There are different observations given by different authors for BPR as explained in the following section. To carry on the present research work a vast literature available on BPR was thoroughly reviewed.

The brief description of literature studied from 1990 to 2013 is given below.

The concept of BPR was first presented by **Devenport and Short(1990).** They stated that BPR as an extension of industrial engineering.[2] **Davenport & Short (1990**) described BPR is the analysis and design of workflows and processes within and between organizations and its relationship with IT[2]. **Teng et al. (1994)** explained BPR as "the critical analysis and radical redesign of existing business processes to achieve breakthrough improvements in performance measures."[11] **Sprawls** stated that Re-engineering is effected by changing educational needs, alternative learning opportunities, availability of Digital technology, and Enhancing performance of both students and teachers.[9] **Bizhan** explained re-engineering is a radial redesign of organization processes by using power of modern technology and power of people involved in operation.[7] **Malhotra(1998)**, stated that BPR is "the analysis and design of workflows and process within and between organization"[6] **Subramanian et. al.(1999)**, have stated that re-engineering is must for this ever-changing world is which is driven by the three Cs: Customer, Competition and Change.[10] According to **Gunasekaran and Kobu(2002),** BPR required organizational restructuring, changes in employee's behaviour with a view to accommodating and facilitating radical changes for achieving dramatic improvements in business performance with the help of IT.[4] **Fagan (2003)**, described the approaches that have been used to classify e-commerce and e-government IT applications and explores their relevance to higher education.[3] **Balaji(2004)**, focussed on the impact of BPR as a tool for improving efficiency and performance in an educational institute in New Zealand.[1] **Apeejay Stya Education Research Foundation(2013),** had given the objective of re-engineering to be the enhancement of both the effectiveness and the efficiency of various educational activities.[8]

After reviewing the above literature, it is concluded that none or very few studies were carried out in reference to prime institutions of Delhi. This research work is definitely an attempt to fill up this gap.

II. METHODOLOGY

The methodology used to collect data for this research is through survey and interview method. For this research hypothesis taken into consideration is:

There is wide variation in the BPR practices, its adoption, advantages / opportunities to different educational institutions and different users.

Hypothesis is an assumption or proposed phenomenon for which some method requires to test it.

Thus to justify the above hypothesis it was necessary to analyze the important parameters among various attribute by using the data reduction techniques. For this statistical package called SPSS version 20.0 is used. A methodology of PCM a statistical data mining technique is used for analyzing the primary data. PCM is a statistical approach that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). The statistical approach involving finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions (factors) with a minimum loss of information.

For conducting factor analysis first the reliability of data is checked, then co-relation between different variables are checked and to conduct PCM variance in different variables their communality is analyzed. Then through extraction method variance is computed and component matrix is taken out to give result of main factors extracted as explained in the following section.

III. ANALYSIS INTERPRETATION

For analyzing data through PCA factor analysis has been done on data of fifty institutions to identify the important parameters among various attribute by using data reduction techniques. For the purpose the reliability of the primary dataset has been checked. To check the reliability Cronbach's Alpha statistics technique is used as given in Table 1.

Table 1 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.760	.745	9

If the result of this operation is less than .5; then it states that the data is not reliable for the application of Factor Analysis but as given in Table 1 value of Cronbach's Alpha is .745. This means further analysis can be done but whether PCM can be applied on that data, there is need to apply KMO and Bartlett's Test as shown in Table2. In KMO and Bartlett's Test where KMO tells the proportion of common variance in our variables. If this is greater than .50 we can proceed with the analysis. In this work it is .739 which is positively acceptable. The Bartlett's Test of Sphericity tells us if the correlation matrix is factorable. The significant value tells us 0 and we should proceed to the formal PCA analysis as shown in Table 3.

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.739
Bartlett's Test	Approx. Chi-Square	332.193
	Df	36
	Sig.	.000

The first section of Table 3 shows the Initial **Eigen values** or amount of variance in the original variables accounted for by each component. The **% of Variance** column gives the ratio, expressed as a percentage, of the variance accounted for by each component to the total variance in all of the variables. The **Cumulative %** column gives the percentage of variance accounted for by the first n components. For example, the cumulative percentage for the second component is the sum of the percentage of variance for the first and second components. For the initial solution, there are as many components as variables, and in a correlations analysis, the sum of the eigen values equals the number of components. Since that eigen values greater than 1 be extracted, so the first three principal components form the extracted solution.

Table 3 : Extraction Method: Principal Component Analysis. (Total Variance)

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.674	51.929	51.929	4.674	51.929	51.929	3.721	41.346	41.346
2	1.782	19.805	71.734	1.782	19.805	71.734	1.967	21.858	63.205
3	1.147	12.744	84.478	1.147	12.744	84.478	1.915	21.273	84.478
4	.435	4.834	89.312						
5	.333	3.696	93.007						
6	.241	2.673	95.680						
7	.175	1.946	97.626						
8	.128	1.418	99.044						
9	.086	.956	100.000						

Sum of Square column of the Table 3 shows the extracted components. They explain nearly 84% of the variability in the original 09 variables, so we can considerably reduce the complexity of the data set by using these components, with only a 16% loss of information

Table 4 : Extraction Method: Principal Component Analysis

	Component		
	1	2	3
Senior Management Support	**.927**	.145	-.060
Do you prefer web based services instead of manual services?	**.911**	.085	.024
Lack of training facilities	**.892**	-.045	.219
Clear BPR/ management policies and procedures	**.881**	-.079	.206
Reluctance among staff to use electronic resources/ employee resistance	**.714**	-.052	.578
Difficult to recruit or retain ICT qualified staff	**.621**	.482	-.325
Lack of budget for ICT	-.374	**.807**	.300
Lack of digital qualified staff in the library	.280	**.774**	-.417
Inadequacies of existing digital resources	-.549	.509	**.590**

In Table 4 Component matrix has been a countercheck to Table 3 Total Variance. The table shows that in the 09 item of variable set there are three factors, which are accounted for the study. The bold numbers in the column 2 states that the numbers in-group frame the factor 1. Similarly, column number 3 having four bold numbers frames the component of second factor and for factor 3 there is only one item.

Factor 1 (**Management Policy and Inadequate Budget**) states that highest total number for initial Eigen value is 4.674 and this value is framed by grouping of six item set. The highest component score is .927 and the minimum is .621. The factor states that even senior management staff support to opt for web based services, but lack of budget for providing training among the non-technical people causes less interest for opting the training. Management / BPR policies also affect the new recruitments. **Factor 2(Unqualified Staff)** stands at the second rank with the initial Eigen value of 1.782 as its total number. This value is the combination of two attributes whose component score range lies from .807 to .774. The idea for framing this factor is that the lack of budget causes the non-awareness among the staff to opt for web-based services. **Factor 3(Inadequate Digital Resources)** explains the third status with the initial Eigen value of 1.147 as its total number. This value is the combination of only one attributes whose component score is .590. This factor retains the outliers in the sense that this item was usually opted by exceptional respondents only. This factor believes that Inadequacies of existing digital resources may be issue of concern.

IV. CONCLUSION

After analyzing the result, it is well understood that there are three factors which are accounted for data reduction using PCA in factor analysis. So after analysing the result, it has been stated that only 3 factors are important, so we need not to take all the attributes but we can consider only 3 factors for further analysis to explore BPR policies of different institutions of other states also.

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Ectrodactyly, Ectodermal Dysplasia with Cleft Palate: A Case Report

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Abstract- Ectrodactyly-ectodermal dysplasia-cleft lip or palate syndrome (EEC syndrome) is characterized by the triad of ectrodactyly, ectodermal dysplasia and facial clefting (lip/palate). However, manifestation of all the three anomalies is very uncommon. The incomplete forms, with absence of one or more of the cardinal signs, are often noted. Neither of the two cases, recently reported from India, had all the three anomalies. We report a case of EEC with all three classical features

Index Terms- Ectrodactyly, Ectodermal dysplasia, cleftpalate

I. INTRODUCTION

Ectrodactyly-ectodermal dysplasia-cleft lip or palate syndrome (EEC syndrome) is characterized by the triad of ectrodactyly, ectodermal dysplasia and facial clefting (lip/palate). It was first described by Cockayne in 1936.[1] The simultaneous presence of these three anomalies is extremely rare.[2] Apart from these cardinal features, lacrimal abnormalities, urogenital abnormalities, mental retardation and conductive deafness may be present.

EEC is inherited as autosomal dominant trait of low penetrance and variable expressivity. Sporadic cases have also been reported. There were two interesting (one familial and one sporadic) case reports of EEC from India in 2006-[3,4] Neither of them had the combination of all three anomalies. We report an autosomal dominant familial case in a neonate with all classical features of EEC.

II. CASE REPORT

A 14 days old term male neonate, birth weight of 2.9 kg, 2nd born, out of non-consanguinous marriage was admitted to SRM Medical college hospital nicu unit, for severe pallor (Hb-5.3gm) with history of preceding jaundice, secondary to Rh incompatibility (mother A-ve, baby A+ve) .

On examination, multiple congenital anomalies were noted. Systemic examination revealed no abnormality clinically. Rh incompatibility and anemia were treated accordingly. Baby was investigated further for other possible associated anomalies.

Figure 1 shows midline cleft palate.

Figure 2 shows ectrodactyly of both foot, left foot shows big toe, fusion of 3rd and 4th toe and missing of 2nd and 5th toe. Left foot shows big toe and prominence of 3rd and 4th toe, absence of 2nd and 5th toe.

Figure 3 shows ectodermal dysplasia in form dystrophic nails in 2nd and 3rd finger.

Figure 4 shows ear anomaly (prominent anti-helix).

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 5, showing feet deformity of his Mother.

III. DISCUSSION

Ectrodactyly refers to deficiency or absence of one or more of central digits of hands and feet. Ectodermal dysplasia involves organs derived from embryonic ectoderm. These abnormalities involve both the superficial ectodermal layer as well as the deeper mesoectodermal layer, formed from the neural crest. Other ectodermal anomalies include mild hypohidrosis; coarse, dry hair with hypotrichosis; xerostomia; dystrophic nails; dental enamel hypoplasia with microdontia. Associated anomalies include blepharophimosis, lacrimal duct anomalies, deafness, choanal atresia and abnormalities of genitourinary tract.

The EEC syndrome results from simultaneous ectodermal and mesodermal developmental defects. Although any of the three cardinal signs can present with variable expression and can occur as a separate entity each, combination of all three anomalies appears to be a rare occurrence. [2] There is lot of doubt whether the incomplete forms reflect a reduced expression of the gene or one or more separate clinical entities. Some authors claim that clefting in EEC always involves the lip with or without the palate and use this marker as means to distinguish from other syndromes. However Buss *et al*. suggested that the diagnostic criteria of EEC should include ectodermal dysplasia other than two of the following additional features: ectrodactyly, cleft lip/palate and lacrimal duct abnormalities. [5]

Thakkar and Marfatia[3] reported a family with ectrodactyly and ectodermal dysplasia without cleft lip/palate. According to Wallis *et al*., who reported a similar presentation with ectrodactyly and ectodermal dysplasia (hypotrichosis and abnormal dentition) without cleft lip/palate, this represents a distinct clinical entity. [6]

There was another report of a sporadic case by Cyriac and Lashpa. Besides ectrodactyly and cleft palate, the patient had maxillary hypoplasia and low-set ears. But he did not have ectodermal dysplasia. [4]

Paucity of reports of EEC cases with all manifestations has prompted us to report this case. Our patient had the triad of ectrodactyly involving feet; ectodermal dysplasia in form of dry rough skin with sparse, hypopigmented hair; and midline cleft palate, associated with dystrophy of finger nails, deformed ear, and broad nasal bridge. USG abdomen and 2D Echocardiogram were normal. All the characteristic features of EEC were noted. Mother had the minor deformity of feet (Shown in Figure 5) suggesting that it is autosomal dominant inheritance which is the commonest form of familial variety.

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Interleukin 6 as a Biomarker of Ischemic Heart Disease

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***Abstract*-** Interleukin 6 (IL-6) is a multifunctional 21-27kDa glycopeptide with 184 amino acid residues. IL-6 is also responsible for various proinflammatory and anti-inflammatory processes (Agorastos *et al*., 2014). This study aimed to determine if Interleukin 6 can be used as a biomarker of Ischemic heart disease (IHD). The study employed twenty-four (24) patients and was divided into two groups: IHD patients (n=12) and patients without IHD (n=12). Plasma samples were obtained and IL-6 levels were determined through an Enzyme-Linked Immunosorbent Assay. Results show that there is a significant difference (p<0.001) in the IL-6 levels of IHD patients (median of 33 pg/mL) from patients without IHD (median of 3.8 pg/mL). Based on these findings, those with an increased IL-6 level ($\geq$ 5 pg/mL) are 25.0 times more likely to have IHD than those without increased IL-6 levels. Furthermore, it was found that for every 1 pg/mL increase in IL-6, the chances of developing the disease increases by 1.24 [$CI_{95\%}$: 1.03 to 1.48]. From these findings, it can be inferred that Interleukin 6 can be used as a biomarker of ischemic heart disease.

***Index Terms*-** Interleukin 6, Ischemic Heart Disease, Biomarker, Predictor

I. INTRODUCTION

Since the discovery of Interleukin 6 (IL-6), it has been known as a main pro-inflammatory and pleotropic cytokine along with Interleukin 1 (IL-1) and Tumor necrosis factor alpha (TNF-α), exhibiting a wide range of cellular and humoral effects associated with inflammation, host defense, and tissue injury (Croker *et al*., 2012). It is also said that IL-6 is significantly involved in both physiological and pathological processes such as granulocyte production and maturation, T cell differentiation and acute phase protein production. Lind (2003) clearly states that IL-6 plays a vital role in acute phase response. It also plays an important part as a primary mediator of C-reactive protein production. As what Silva and Pais de Lacerda (2012) state, the production of C-reactive protein is mainly done by the liver and is induced by the secondary inflammatory cytokine, Interleukin 6.

The National Institute of Diabetes and Digestive and Kidney Diseases in 2013 defined ischemic heart disease as a disease caused by the thickening of the walls of the coronary arteries. It may lead to heart attack once deposits of cholesterol, which result in the narrowing of arteries, block the supply of nutrients and oxygen in the blood. Ischemic heart disease (IHD) is also the leading cause of cardiovascular mortality worldwide, with greater than 4.5 million deaths occurring in the developing world (Okrainec *et al*., 2004). According to the Global Burden of Disease Study, the developing countries contributed 3.5 million of the 6.2 million global deaths from IHD in 1990 (Backer, 2009). While in 2008, the World Health Organization (WHO) reported an estimated death of 17.3 million people from cardiovascular *disorders* (CVD), representing 30% of all global deaths. Of these deaths, an estimated 7.3 million were due to ischemic heart disease. In the year 2010, approximately 3.8 million men and 3.4 million women worldwide died from the said disease. The projections estimate that the developing countries will account for 7.8 million of the 11.1 million deaths due to IHD in 2020 (Backer, 2009). In the Philippines, cardiovascular disorders are among the leading causes of deaths among Filipinos. The latest WHO data published in April 2011 state that deaths due to Ischemic heart disease reached 57,864 or 13.73 % of total deaths. While in the year 2012, the Philippine National Statistics Office (NSO) stated that five (5) out of ten (10) Filipinos die of heart disease (Sindico, 2012).

According to Rimmerman (2013), certain markers are usually treated as detectors for inflammatory processes such as ischemic heart disease. Some of these markers, which provide significant information regarding a patient's diagnosis and prognosis, are Troponin I and C-reactive protein (Zakynthinos and Pappa, 2009). Recent researches, however, suggest that Interleukin 6 (IL-6) is a better and a more specific marker for this disease. Lee *et al.* (2007) further conclude that IL-6 values were independent of CRP, but not vice versa, suggesting that IL-6 increases at an earlier atherosclerotic state. It is for this reason that the principal investigators focused on Interleukin 6 as a predictor for the leading cause of cardiovascular mortality worldwide, ischemic heart disease.

II. MATERIALS AND METHODS

A. Research Locale

Ischemic heart disease (IHD) respondents were gathered from patients of the Our Lady of the Angels, Multi-specialty and Diagnostic Clinic in Sta. Maria, Bulacan. On the other hand, non-IHD respondents were recruited by the principal investigators.

B. Methods of Screening Participants

The researchers asked permission from the attending physician to conduct a study involving patients with IHD as participants. Respondents, including those recruited by the researchers as non-IHD participants, were given consent forms

asking for their voluntary participation in this study. Questionnaires were distributed to gather information regarding the patient's lifestyle including demographic data, body mass index (BMI), smoking status, and medical history which includes a family history of IHD, presence and duration of IHD, presence and duration of diabetes, and history of myocardial infarction. These important data gathered were evaluated based on constructed inclusion/exclusion criteria and those who passed the screening process were accepted as part of the sample population.

C. Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were constructed to select appropriate participants for the study. The following criteria were based on the study of Xiao *et al.*, (2011) among coronary angiographic patients.

Inclusion Criteria

- Age Range: 30 years old and above
- Gender: Male/Female
- Willing to participate in the study and has given a consent form

Ischemic Heart Disease Patients

- Patients who have ischemic heart disease as evidenced by their electrocardiogram (ECG) results

Patients without Ischemic Heart Disease

- Those who are free from ischemic heart disease based on their ECG results

A cardiology consultant was the one who validated, upon reading of the ECG, whether or not the patient have IHD.

Exclusion Criteria

- Presence / history of liver disease
- Women on hormone replacement therapy
- Patients with lymphoma, lupus, giant cell arteritis, rheumatoid arthritis, inflammatory bowel disease, osteomyelitis, and Crohn's disease
- Pregnant women
- Patients with other infections, cancer, and immunologic diseases (rheumatic fever)
- Patients with decreased perfusion pressure, hypotension, and hypovolemia
- Patients with decreased blood oxygen content, anemia, and pulmonary diseases leading to impaired oxygenation of blood by the lungs
- Patients with tachycardias

Ischemic Heart Disease patients

- Patients with cardiovascular disorders other than IHD

Patients without Ischemic Heart Disease

- Those who have abnormal ECG results suggestive of IHD

D. Methods of Selecting Accepted Respondents from Screened Participants

Those who passed the inclusion and exclusion criteria were eligible to be part of the sample population. Accepted respondents were grouped as patients having IHD and patients without IHD.

E. Blood Collection

Collection was done in the morning since Interleukin 6 exhibits a diurnal variation (Agorastos *et al.*, 2014).

F. Blood Sample Processing and Clinical Laboratory Analysis

All samples were taken in the laboratory within the day of collection to separate the plasma from whole blood. Afterwards, the plasma was placed in their respective eppendorf tubes and then stored at a - 20° C frost-free freezer until such time that Interleukin 6 levels were measured through an Enzyme-Linked Immunosorbent Assay (ELISA) test kit (Ebioscience Human IL-6 ELISA Ready Set Go; *cat # 88-7066-86*). The ELISA reader available at the Medical Technology Research Laboratory of the University of Santo Tomas was used. Excess specimens were placed in the infectious waste and disposal was coursed through the University of Santo Tomas, Faculty of Pharmacy laboratory where the ELISA procedure took place. Total cholesterol levels of ischemic heart disease patients were tested at the Our Lady of the Angels Multi-specialty and Diagnostic Clinic. Total cholesterol levels of patients without IHD, on the other hand, were tested at the New World Diagnostic Laboratory.

III. RESULTS

Table 1. Demographic Profile of Ischemic and Non-Ischemic Patients

Demographics	With IHD	Without IHD	*p*-value
Age	55.7 ± 4.2	49.0 ± 2.3	0.180
Gender: Male	4 (33.3%)	6 (50 %)	
Female	8 (66.7%)	6 (50%)	0.680

Values expressed as mean ± SEM, n=12. *P*-values are based on Independent T test & Fisher's exact test.

A total of 24 patients were included in the study. Those with ischemic heart disease (IHD) have a mean age of 55.7 years and are composed of 4 (33.3 %) males and 8 (66.7%) females. On the other hand, those patients without IHD have a mean age of 49 years and are composed of 6 (50%) males and 6 (50%) females. Furthermore, the mean age ($t_{17} = 1.396$, $p = 0.180$) and gender ($p = 0.680$) of Ischemic and non-ischemic patients do not differ.

Table 2. Interleukin 6 (IL-6) Levels of Ischemic and Non-Ischemic Patients

Interleukin 6 Level	With IHD (n=12)	Without IHD (n=12)	Z-Stat	*p*-value
IL-6 level (in pg/mL)	33 [28.3 to 45.5]	3.8 [1 to 11.94]	3.784	<0.001

Values expressed as median [IQR].

Table 2 summarizes the IL-6 levels of all patients with and without ischemic heart disease. The IL-6 of ischemic patients is significantly higher [Z=3.784, p<0.001] than the non-ischemic patients.

Table 3. Number of Above Normal and Normal Interleukin 6 Levels Among Patients with and without Ischemic Heart Disease

IL-6 level (in pg/mL)	With IHD (n=12)	Without IHD (n=12)	Odds Ratio [CI]	*p*-value
Above normal (≥ 5)	12 (100%)	6 (50%)	25.0 [1.21-516.7]	0.037
Normal (< 5)	0 (0%)	6 (50%)		

Table 3 categorizes the IL-6 levels of both groups into Above Normal (≥ 5 pg/mL) and Normal (< 5 pg/mL) IL-6 levels. This is according to the study done by Mojominiyi *et al.* (2002) which defined that the concentration of IL-6 in apparently normal subjects is less than 5 pg/mL. All 12 (100%) Ischemic heart disease patients have above normal IL-6 levels. Of all patients without ischemic heart disease, 6 (50%) have an IL-6 level above the normal range and 6 (50%) within the normal range. Odds ratio of 25.0 [$CI_{95\%}$: 1.21-516.7] indicates that those with increased IL-6 are 25.0 times more likely to develop ischemic heart disease.

Table 4. Univariate Logistic Regression Results of IL-6 to Ischemic Heart Disease

Variable	Coefficient	*p*-value	ODDS RATIO	
			Estimate	95 % CI
IL-6	0.212	0.023	1.24	1.03-1.48

Table 4 shows that for every 1 pg/mL increase in IL-6, the odds of having ischemic heart disease increases by 1.24 [$CI_{95\%}$:1.03-1.48].

Table 5. Univariate Linear Regression Results of the Variables Considered in IL-6 Level Measurement

Variables	Coefficient	*p*-value
Age	0.056	0.907
Gender	-1.531	0.893
IHD	2.816	0.301
Family Hx	3.028	0.793
CHOLE	3.431	0.342
BMI	0.297	0.794
MI Hx	-0.963	0.800
DM	-0.261	0.887
Smoking	14.000	0.437

Legend: IHD = Presence and duration of Ischemic heart disease (IHD); Family Hx = Family history of IHD; CHOLE = Total cholesterol levels; BMI = Body mass index; MI Hx = History of Myocardial infarction; DM = Presence and duration of type 2 Diabetes mellitus; Smoking = smoking status

As shown in Table 5, age (p= 0.907), gender (p= 0.893), presence and duration of IHD (p= 0.301), family history of IHD (p= 0.793), total cholesterol levels (p= 0.342), body mass index (p= 0.794), history of myocardial infarction (p= 0.800), presence and duration of type 2 DM (p= 0.887), and smoking status (p= 0.437) do not affect the IL-6 levels of patients with and without ischemic heart disease.

IV. DISCUSSION

Results of the conducted study are in parallel with the study done by Tentolouris *et al.* (2004), which states that IL-6 levels are greater in patients with Ischemic cardiomyopathy. In addition, the study of St-Pierre, *et al.* (2005) states that elevated IL-6 level is an independent risk factor of ischemic heart disease in men. The abovementioned study also states that high plasma IL-6 levels were associated with a 70% greater risk of IHD which further supports the findings of the conducted study.

Based from the abovementioned studies, it is inferred that IL-6 is significantly correlated with IHD. This present research however, did not only align to the results of Tentolouris *et al.* (2004) and St-Pierre, *et al.* (2005), but it also showed that IL-6 can be used as a biomarker of IHD among Filipinos. Further, the chances of developing IHD for every 1 pg/mL increase in the IL-6 level and the risk of developing IHD if someone has an above normal IL-6 level were also determined in the conducted research.

According to Tousoulis, *et al.* (2006), inflammatory processes are involved in both progression and stability of atherosclerotic coronary plaque formation. Assier *et al.* (2010) further assert that IL-6, being an inflammatory cytokine, is a key player in inflammation since IL-6 regulates the acute phase response, one of the earliest responses to immunological stress. A possible mechanism in which IL-6 contributes to the development of IHD has been suggested. First, IL-6 stimulates acute phase response and the hepatic production of acute phase proteins which include CRP and fibrinogen, proteins both known as strong risk factors for IHD. This in turn increases blood viscosity and promotes platelet proliferation and activity. Next, deposition of fibrinogen in the vessel wall is promoted by autocrine and paracrine activation of monocytes by IL-6. Then, a decrease in activity and plasma levels of monomeric lipoprotein lipase is induced by IL-6, resulting in an increase in lipid uptake of macrophages. Lastly, the hypothalamic-pituitary-adrenal axis is activated by IL-6. This is associated with obesity, hypertension and insulin resistance (Su *et al.*, 2013).

The variables found on Table 5 were based on a study by Dans *et al.* (2005) on the prevalence of atherosclerotic risk factors among Filipinos. The results of this study are in contrast to the studies of Mitchell *et al.* (2007) and Boudi *et al.* (2012) wherein a positive correlation between the presence of increased IL-6 levels and those risk factors mentioned above has been found. The reason for this contradiction is that the number of samples from the computed sample size in this study is much appropriate for establishing an association between IL-6 levels and ischemic heart disease, whether or not IL-6 can be used as a biomarker of ischemic heart disease, and is limited when used for correlating various risk factors to IL-6 levels since, according to Schönbrodt and Perugini (2013), in contrast to associations, correlations generally require larger sample sizes.

V. CONCLUSION

Based on the findings of the study, the researchers hereby make the following conclusions:

1. The Interleukin 6 (IL-6) levels of ischemic patients is significantly higher [Z=3.784, p<0.001] than the non-ischemic patients. Thus, there is a significant difference between the IL-6 levels of ischemic heart disease (IHD) patients and patients without IHD.
2. Those with increased IL-6 levels (IL-6 $\geq$ 5 pg/mL) are 25.0 times more likely to develop ischemic heart disease. Thus, Ischemic heart disease is significantly associated with Interleukin 6.
3. Results of logistic regression showed for every 1 pg/mL increase in Interleukin 6, the risk of developing ischemic heart disease increases by 1.24 [$CI_{95\%}$:1.03-1.48]. Therefore, it can be inferred that IL-6 can be used as a predictor for ischemic heart disease.
4. Results of linear regression showed that age (p= 0.907), gender (p= 0.893), presence and duration of IHD (p= 0.301), family history of IHD (p= 0.793), total cholesterol levels (p= 0.342), body mass index (p= 0.794), history of myocardial infarction (p= 0.800), presence and duration of type 2 DM (p= 0.887), and smoking status (p= 0.437) do not affect the IL-6 levels of patients with and without Ischemic heart disease. This can be caused, however, by the limited number of samples used in this study for the correlation of the factors mentioned above with IL-6 level since according to Schondbordt and Perugini (2013), in contrast to associations, correlations generally require larger sample sizes.
5. Research work can further be initiated towards the use of a more intensive screening procedure in addition to the questionnaire in order to classify future respondents in a more distinct way. Also, the IL-6 levels of the patients should be compared side by side with the gold standard (ECG results) so that a more significant finding regarding the use of IL-6 as a biomarker and predictor of IHD could be established. Since this study only considered the total cholesterol levels of both ischemic and non-ischemic patients, the researchers also highly suggest for the future respondents to undergo lipid profile, so that low density lipoproteins (LDL) and high density lipoproteins (HDL) could also be determined. Further, the investigators recommend for the future researchers to go above the minimum number of samples based on the computed sample size, since a larger sample size could not only determine the association of IL-6 with IHD, but it could also provide a better correlation of the various risk factors and IL-6 levels.

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Structural Design Criteria & Design Loads on Delhi Metro Rail and Checking of Safety of Radial Joints in Tunnel Lining Segments

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Abstract- The authors have checked the Design Criteria & Design Loads being adopted in Delhi Metro Rail and have also checked the safety of Radial Bolts used in tunnel lining segment by DMRC. The research paper thus shall help in detailing the design criteria & design loads in the most successful and time bound Metro Rail work being executed by DMRC in NCR Region comprising of New Delhi/Old Delhi and surrounding areas of UP & Haryana states. The Delhi Metro Rail network is a masterpiece and a landmark civil work in India and matches with all International standards and practices adopted to suit local conditions. All other Metro Rail networks in India are following the knowledge and experience of Delhi Metro Rail as the main guiding factor. Further, in this research paper the safety of most important Radial Bolts being used in Reinforced Cement Concrete segments is checked in both radial and circumferential directions against the moment and axial shear force at the two critical points, i.e. at the Crown and at the Springing, in the Circular tunnel lining segments. In detailed calculations, the design of radial bolts is found to be safe from International Standards and thus through this paper, the authors emphasize the importance of checking of safe bolt design in tunnel lining segment along with the design criteria and design loads.

Index Terms- — Bursting Check of Radial Joints in Tunnel, Design Criteria for Tunnel, Design Loads for Tunnel, Design of Radial Joints in Tunnel, , Joints in Tunnel Lining Segments.

1. INTRODUCTION

The Delhi Metro Rail Corporation(DMRC) has successfully completed Phase I and Phase II of Metro Rail network and presently Phase III works are in advanced stage of execution in New Delhi/Old Delhi/Gurgaon/Ghaziabad/Faridabad in NCR Region in India. Delhi Metro Rail Corporation has followed standard design parameters given below:

2. Design Parameters

Following are the major Design parameters while proceeding to plan, analyze and design the Metro Rail Underground Tunnels:

i) Characteristics of rock/soil mass and collection of engineering geological data-base from surface exposures and boreholes.
ii) Rock mass/soil classification and identification of potential failure modes.
iii) Structurally controlled and gravity driven failures and Stress induced, gravity assisted failures.
iv)Evaluation of static and dynamic possible failure modes.
v) Determination of in situ stress field in surrounding rock/soil mass.
vi) Checking of shear strength to potential failure surface.
vii) Calculation of factor of safety or risk of potential failures.
viii) Analysis of size of overstress zones around excavations
ix) Determination of support requirements.
x) Non-linear support-interaction analysis to design support.
xi) Design of support, taking into account excavation sequences availability of materials and cost effectiveness of the design.
xii) Installation of support with strict quality control to ensure correct bolt and cable lengths, anchoring, tensioning and grouting, and effective Shotcreting as required.
xiii) Monitoring of excavation and support behaviour to validate design and to permit modifications of future designs

3. Design Methods

There are three main categories of Design methods of Metro Rail Tunnel Linings

3.1 Direct Loading Method

In this method, the load is calculated based on the rock/soil depth on the tunnel using the finite element method. This load is independent of rock/soil-structure proportional stiffness. In this method, restrain effects of the rock/soil around the structure can be modelled by Winkler springs (compression only).

In cut and cover parts, considering the whole rock/soil weight on the tunnel crest – this is a realistic method to determine the internal forces on the tunnel.

3.2 Rock/Soil-Structure Interaction Method

In this method, the effect of rock/soil-structure proportional stiffness is taken into account to determine the internal forces of the structure. In order to determine the erection loads of the structural components, it is necessary to consider the rock/soil structure proportional stiffness plus the order and succession of the construction. To achieve, Convergence Confinement Method (CCM) or Numerical Methods (NM) or Finite Element Method (FEM) is used, with the limitations, advantages and applicability of each method is taken into account.

3.3 Fundamentals of Seismic Analysis

Effects of Ground motion on the tunnel during the earthquake is generally categorized into the following three classes:
a) Longitudinal Bending
b) Compression-Extension
c) Warping (In-Plane deformation of the structure section - Ovaling)

The mobilized strains in the structure due to longitudinal bending and compression extension are usually analyzed on the model of Beam on Elastic Bed at which the equivalent linear or non-linear springs must be considered. However, it is easy to decrease the longitudinal strains by using structural joints along the tunnel. In order to calculate the structural internal forces due to the ground shear displacements which cause ovaling in the structure, Seismic Intensity Method or Rock/Soil-Structure Interaction Method by using time history or displacement methods such as Response Displacement Method can be employed. The effects of Rock/soil-structure proportional stiffness around the tunnel must be taken into account anyway.

4. Design Load Conditions

Design load conditions considered while constructing Metro Rail Tunnels drilled by using NATM (New Austrian Tunnelling Methods) or TBM (Tunnel Boring Machine).
It is worth mentioning that in underground tunnels which are drilled using NATM method, the retaining system to control the tunnel stability comprises two stages of primary covering and final covering. The load distribution assumption between these two parts is highly effective in the design procedure.
Considering the special constructional conditions in this country plus the inaccuracies, it must be tried to make the primary covering that bear the erection loads alone as much as possible and avoid using the final covering capacity for that, otherwise it would be necessary to construct the final covering with a little distance from the primary covering to make sure that the primary covering is not supposed to bear the external loads singly for a long time. Thus, the primary covering will be designed for the erection loads and the final covering will be designed for the other loads on the tunnel.

4.1 Design loads considered in Metro Tunnels Lining

i) Dynamic forces due to earthquake
ii) Loads due to strength loss of the primary covering after a long term loads due to the probable saturation of the soil mass in NATM method
iii) Live loads due to the on ground traffic
iv) Live load due to the train movement, if applicable.
v) Dead load on Tunnels
vi) Ground pressure (soil/rock) surrounding tunnel
vii) Water pressure

4.2 Tunnel Structure Dead Load

Dead Load on Tunnel comprises the vertical load due to the tunnel weight which is distributed along the structure middle axis.

4.3 Ground Pressure (Soil or rock surrounding Tunnel)

Considering the soil/rock mass geo-mechanical properties along with the path, any method of direct loading or rock/soil-structure interaction can be employed to calculate the soil pressure. In cut and cover parts, all the soil/rock weight is applied to the structure in which lateral pressure will be calculated based son the tunnel walls displacements toward the side soil/rock mass and with respect to the lateral reaction coefficient of the soil. In other parts, which are constructed in underground methods, loading for primary structure must be determined considering the order of construction stages by taking the rock/soil-structure interaction into account.

4.4 Water Pressure

In case the underground water table is high with respect to the tunnel floor, the hydrostatic water pressure contribution must be considered to see the effect of water load on tunnel

4.5 Traffic/Vehicle Loads/ Train Loads

On ground vehicle loads/ train loads must be considered along with the grade level according to Indian Code of Practice for Bridge Loading. Besides the mentioned load, tunnels must be designed for a uniform load of 24 kN/m² on the road level separately. This uniform load should include the impact coefficient.

4.6 Seismic Loads

Considering the seismic danger in the project area as Delhi falls under Seismic Zone IV, the tunnel needs to be designed in a way such that both primary cover and the final cover are able to bear static and seismic loads simultaneously with the proper safety factors. In order to determine the seismic loads, soil-structure interaction must be considered along with the stiffness proportions between the structure and soil/rock.

5 Design of Radial Joints in Underground Tunnel Segments of Metro Rail

5.1 Safety Check of Radial Joints

The safety of Radial joints (flat type) being used in Delhi Metro Rail is required to be checked. At the joints of tunnel segments, bolts are treated as reinforcement to check whether they are safe against the moments and shear forces. Safety of joints is done in the same method as checking of safety of segments is done. Thus the points where maximum positive (Crown, say point A) or negative (Springing say point B) moments are generated, both the points are to be checked.
As per below Table in the segmental ring of tunnel lining, Joint A (Crown) has positive moment and Joint B (Springing) has negative moment respectively. The value of moments and axial and internal shear forces at critical points A and B calculated using computer software are tabulated as follows

TABLE 1

	MOMENT KN.M/M	AXIAL FORCE KN/M	SHEAR FORCE KN/M
JOINT A, CROWN	121.6	1039	51.3
JOINT B, SPRINGING	-88.1	1317	32

Tunnel lining Segment is considered as a ring when calculating internal forces. Bending moment distribution co-efficient, ζ =0.30 is used. Bending moment distribution can be worked out by equation,
Mj = (1- ζ). M. Hoop force caused by the weight of metro tunnel track slab is 7 kN/m and the Hoop force caused by the weight of trains 26 kN/m is as per given design data.

Thus Axial Force at Joint A
= 1039+ 1.4x (7+26) = 1085.20kN/m
Axial Force at Joint B = 1317 + 1.4(7+26) = 1363.20 kN/m.

Thus, design moment and internal forces at Joint A and Joint B are as tabulated below:

TABLE 2

Joint Details	Moment kN.m/m	Axial force kN/m	Shear force kN/m
Joint A, Crown	85.1	1085.2	51.3
Joint B Springing	-61.7	1363.2	32

5.2 Check of Radial Joint A (Crown) Ultimate Capacity

Joint A (Crown) can be simplified as tensile reinforcement. Given design data:
Concrete Compressive Strength,
f_{cu} = 50 N/mm^2
Width of section b = 1500mm, Height of section h = 280mm
Tensile Strength of Bolt f_y= 400 N/mm^2
Shear Strength of Bolt f_s =260 N/mm^2
Thus moment M = 85.1 x 1.5= 127.7 kN.m
Axial force N = 1085.2 x 1.5= 1627.8 kN
Axial shear force at Joint A =0
Area of Bolt (considering 2 bolts),
As= 2x3.14x 152 =1413 mm^2
According to BS 8110-3-1985(As per basic design formula)
$N_u = k_1 b.e - f_y.A_s$ eqn (1)
$M_u = N_u . e_c$
$= k_1 b.e. (h/2-k_2.e) - f_y.A_s(h/2-d)$ eqn (2)

Eccentricity e_0 =2.4 x 104(f_{cu}/γ_m) 0.5
= 2.4 x 104(50/1.5) 0.5 = 0 .0014.
$= (0.45 fcu / 0.0035).(0.0035 - e_o/3)$
$= (0.45 x 50/0.0035). (0.0035 - 0.0014/3)$
= 19.50 eqn (3)
$((2 - eo/0.0035).^2 + 2)/(4(3 - eo/0.0035))$
= 0.438 eqn(4)

Initial Eccentricity e_0 = M/N
= (127.7/1627.8) x 1000 =78.4mm
Additional Eccentricity e_a = maximum of (h/20, or 20) =20mm
Thus Eccentricity e = e_0 +e_a = 78.4 + 20
=98.40mm eqn (5)

Substituting Equations 3, 4 & 5 into equation 1 & 2 above
(19.5 x 1500 x e - (400/1.15) x1413) x 98.40
$= k_1 b.e\ (h/2-k_2.e) - f_y.A_s(h/2-d)$

= 19.50 x 1500 x e (140- 0.438. e) –
(400/1.15) x 1413 x (140-160) eqn (6)

Solving Equation 6 , we get the value of
e= 130mm.
Now substituting the value of e into equations 1 & 2 we get
$N_u = k_1 b.e - f_y.A_s$
= (19.5 x 1500 x 130 /1000 - (400/1.15)x 1413/1000 = 3311kN
Thus N_u (3311) >N (1627.8) kN. Hence OK
$M_u = N_u.e_c$ = (3311). 130/1000 =430.4kN.m which is > M =127.7 kN.m . Hence O.K.

Thus Ultimate Capacity of Radial Bolts at Joint A (Point of max. Positive Moment i.e. at Crown)) is > requirement Thus OK. Hence Radial Bolt at Joint A(Crown) is safe against Axial force and Moment .

5.3 Joint B(Springing) Bolts Check (at the point of Maximum negative moment)
Assuming Bolts do not bear tension,
Moment M= 61.7 x 1.5=92.6 kN.m
Axial force, N= 1363.2x 1.5= 2044.8 kN
According to BS 8110-3-1985 , as per Basic formula ,
$N_u = k_1 b.e + \sigma_s.A_s$ eqn (7)
$M_u = Nu.e_c = k_1 b.e\ (h/2-k_2.e) + \sigma_s\ f_y\ (h/2- d)$ eqn (8)
Initial eccentricity e_0 = M/N
= (61.7 x1000) /1363.2 = 45.3 mm
Additional eccentricity e_a = maximum of
(h/20, or 20) = 20mm
Eccentricity $e = e_0 + e_a$ = 45.3+20= 65.3mm
Thus 19.5 x 1500 x e. 65.3
= 19.5 x 1500 x e (140 -0.438.e) eqn (9)
From equation (9) we get e =170.5mm > 120 Thus bolts don't have tension. Hence O.K.
Substituting the value of e into equation 7 & 8 we get:
$N_u = k_1 b.e$ (No tension)
= (19.5 x 1500 x 170.5)/1000 = 4987.1kN > N=2044.8kN. Hence O.K.
$M_u = N_u.\ e_c$ = (4987.1 x 65.3)/1000 =326kN.m > M=92.6kN.m Hence O.K.

Thus Ultimate Capacity of Radial Bolts at Joint B which is point of max. Negative Moment (i.e. Springing) is > requirement Hence OK. Hence Radial Bolt at Joint B(Springing) is safe against axial force and moment .

5.4 Shear Stress

The maximum shear force per meter is
F= 97.5kN/m

The maximum shear force per segment is F_s= 97.5 x 1.5 =146.3 kN
The shear stress
$\sigma_s = F_s/A$=146300/1413=104 N/mm^2
$\sigma_s < f_s/\gamma_m$ = 208 N/mm^2 is < Bolts shear stress capacity, 260 N/sqmm Thus OK.

6 Bursting Check of Radial Bolts

Radial joints are checked against bursting Tensile Force in both directions.

6.1 Bursting Check of radial bolts in longitudinal direction
P_0 = 1627.8 kN.(refer Joint A details above)
Yp_0 =b/2=130/2 = 65mm.
Y_0= 280/2= 140 mm. Thus Yp_0/ Y_0 =0.46

TABLE 3
(According to BS 8110 Part I,Table 4.7)

Y_{p0}/ Y_0	0.2	0.3	0.4	0.5	0.6	0.7
F_{bst}/ P_0	0.23	0.23	0.20	0.17	0.14	0.11

From above table, F_{bst}/ P_0 = 0.182
Bursting force F_{bst} ,= 296.3 kN
Required area of Bursting reinforcement,
$A_{s,bst} = F_{bst}/(0.95f_y)$ = 624 mm^2
Provide 6 nos. 12 dia steel bars.
Area= 678mm^2
Provided reinforcement, area > required steel area. Hence OK.

6.1 Bursting check of Radial bolts in Radial direction

P_0= 2044.8 kN (refer Joint B details as above)
Yp_0 = b/2= (1500 – 200)/2 =650 mm
Y_0 = 1500/2 = 750 mm
Yp_0/ Y_0 =650/750 = 0.88
According to BS 8110 ,Part I , table 4.7
F_{bst}/ P_0 = 0.052
Bursting force F_{bst} ,= 106.3 kN
Required area of Bursting reinforcement
$A_{s,bst} = F_{bst}/(0.95f_y)$= 224 mm^2
Thus provide 2 nos. 12 dia steel bars.,
Area = 226 mm^2
Provided steel reinforcement, area > required steel area. Hence OK.

7 Conclusion

In this research paper ,the authors have mentioned detailed design loading as adopted for planning of Metro Tunnels by Delhi Metro Rail and it can be worked out either by considering direct loading method

or by considering soil/rock mass structure interaction method. Seismic analysis of underground tunnels has also become important in India in areas which are in high seismic zones.

Finally, in this paper, the authors have worked out the design criteria for the safe design checking of radial joints in tunnel segment as adopted in Delhi Metro Rail with detailed calculations.

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Peace and Security: Necessities for Sustaining National Transformation in Nigeria

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Abstract- Security is an enabler of national development. There can be no sustainable development without peace and security in any nation. Building peace and adequate security involves a wide range of efforts by diversed actors in government and civil society at the community, national international levels to address the root causes of violence and ensure that people have freedom from fear of humiliation, war and conflicts. This paper, therefore, x-rays peace and security as necessities for sustainable national transformation. It also discussed some concepts, challenges and came up with the way forward.

Index Terms- Peace, Security, Transformation

I. INTRODUCTION

Peace and Security have been acknowledged all over the world as basic conditions necessary for sustainable national transformation. The growing interaction of societies on a world wide scale demonstrates the overall need for peace and security. Adebayo and Rashid (2004) submitted that there is a consensus among scholars that there is a linkage between failure in governance, national transformation, sustainable development, insecurity and conflict. Nigeria is a country endowed with abundant human and mineral resources which when properly harnessed and equitably distributed would ensure sustainable national transformation.

Over the years, there has been unrest in the country starting with the persistent militancy in the Niger Delta, the cracks in our political democratic system and the failure of Nigerian leaders to meet with the people's needs, desires and hopes. Francis (2006 as cited in Ebrim, Mbaji and Iwuozor 2012 :2) opined that "high level of corruption among government or political office holders, violation of human rights, regional and sectorial injustice prevalent in the country have created room for aggressive tendencies, violence, conflicts, crime and general insecurity in the nation". The resultant effects of these have led to a downward trend of the economy and failure in sustainable national transformation agenda.

Madu and Udezo (2010: 3) stated it all in this comment that:

The feeling of estrangement of Nigerians in their home land is a source of worry to all patriotic Nigerians. If it is not the problem of Niger Delta, it is that of North- South dichotomy, or that of the minority group with the majority group or that of Uta Azu (back stabbing) of fellow Nigerians by their kits and kins or that of bastardization or scourge of democracy in the nation.

Currently, as this paper was being written, there was a report from the television media over a gang of bandits that assassinated one Mr. Uche Obuneke along Enugu Agidi Road in Njikoka Local Government Area of Anambra State. Mr. Obuneke was said to have come back from a business trip. The man died leaving five children behind at the mercy of his wife. All these acts of terrorism can never allow the nation to experience sustainable national transformation.

It is interesting to mention that Nigeria has been a member of African Unity Peace and Security Council (AUPSC) responsible for addressing conflicts in various parts of the world but unable to boost peace and stability in her jurisdiction. For instance, there has been rampant killing by a group called "Boko Haram" in the northern region of the country where lives and properties have been lost, political rivalries worked against and kidnapping, corruption, unemployment among others are at increase. How can there be sustainable national transformation in an atmosphere of such vices? This question creates a gap that has to be bridged. It is possible that if adequate peace and security strategies are employed, the issue of insecurity to sustainable national transformation in Nigeria would be reversed, hence, the need for this study.

II. CONCEPTUAL FRAMEWORK

Peace: Different scholars gave different interpretations and meanings to this concept, "peace". The interpretation and meanings vary depending on the situation and context within which it is used. Ahamefule (2013) defined peace as a situation in which there is no war between countries or groups; a situation in which you are not annoyed by noise or other people; a state when you are calm and have no worries. Francis (as cited in Ebrim, Mbaji and Iwuozor 2012: 3) conceptualized peace "as the absence of war, fear, conflict, anxiety, suffering and violence". In the words of Ibeanu (2006), peace can be defined as a situation where there is absence of violence or other disturbances within a state to ensure social, political and economic development. In the light of the above definitions, peace therefore, is the absence of fight or terror. It is the maintenance of orderliness and absence of threat to society.

Security: Security can be viewed as a defence against external and internal threat as well as the overall socio-economic well being of the society. Ahamefule equally defined security as safety from attack, harm or danger; a situation in which one feels confident and safe. In the same vein, United Nations (2013) understand security to mean far more than simply the absence of conflict and armed violence. Development, human rights and protection from environmental hazards are pre-conditions for security and lasting peace. Nigeria cannot boost of security where injustice, kidnapping, man's inhumanity to man, neglect

of the people's aspiration and high levels of unemployment are the order of the day.

Transformation: Cambridge Dictionary (2015) defined transformation as a complete change in the appearance of something or someone especially, so that that thing or person is improved. Also, Business Dictionary (2015) noted that in any organizational context, a process of profound and radical change that orients an organization takes it to an entirely different level of effectiveness. Unlike "turnaround" (which implies incremental progress on the same plane), transformation implies a basic change of character and little or no resemblance with the past configuration or structure. National transformation, therefore, implies fundamental change in the building block of a nation, change in the social, economic, infrastructural and political landscape of a nation (Dakuku, 2014).

III. RELEVANCE OF PEACE AND SECURITY

Peace and security is the key to sustainable national transformation. No nation boosts of development in the absence of peace and security. The relevance of peace and security entails development of stable economy, encouragement of unity as well as attraction of foreign investors. Development of stable economy has to do with assurance of economic growth. Attraction of foreign investors will bring about establishment of industries and consequently lead to job creations.

With peace and security, there is improvement in the quantity and quality of the nation's factors of production. Peace and security encourages the improvement of infrastructural base of the nation such as roads, electricity, water, school, hospital among others to ensure a change in the standard of living of the citizenry. Any nation with absence of unity as a result of violence and crime will not witness any appreciable national transformation. Malaysia would not have been where she is today without the willingness of a group of citizens who endangered their lives. Peace and security are the most important elements for a nation's success. It is the gate way to sustainable national transformation.

IV. CHALLENGES TO PEACE AND SECURITY IN NIGERIA

Despite the relevance of peace and security as basic instruments for sustainable national transformation in Nigeria, there are still many challenges confronting them. These challenges can be viewed in different dimensions ranging from social, educational, political and economic factors.

Social challenge: The social challenge relates to those activities that deal with fighting for power. It involves struggle for recognition and position. This struggle usually results to social conflicts. The social conflict according to Wikipedia (2012) is a social relationship where actions are oriented intentionally for carrying out the actor's will against the resistance of other parties. Social conflict occurs, when people, tribes, different societies agitate and cause opposition in social interaction, preventing rivals from accomplishing their goals (Ebirim, Mbaji & Iwuozor, 2012). This situation usually culminates in disruption of peace and security. This can also manifest in form of social vices resulting to assassinations, violence, riot and demonstrations. Social crises such as boundary disputes, cultism, criminality and violation of human rights pose social challenge to peace and security.

Educational Challenge: The educational challenge has to do with the problems bedeviling our education sector for which urgent attention is needed if we really desire sustainable national transformation. These problems according to Gbenedio (2012:2) are: curriculum that has no relationship with workplace and societal needs, embezzlement of funds meant for educational development purpose, employing unqualified personnel, misplacement of priorities, lack of research and development, lack of teacher motivation, inadequate facilities, incessant strike action, cultism among others. All these, and many more pose a challenge to education in Nigeria. Any nation that is intellectually bankrupt will definitely be socially, economically and politically bankrupt. Education as an agent of change is capable of transforming the nation. Any country yearning for meaningful progress must accord education a special place.

Despite the huge investment on education, our country has not fared well educationally. Entrepreneurship and information communication technology (ICT) are the trends that are imperative for transformation. The education so far given to Nigerians is largely theoretically based rather than practical and has created more problems than it has solved. Every year, our higher institutions of learning turn out graduates into the labour market without any entrepreneurial skills for self employment. These problems have faltered our educational system, invariably affecting national transformation.

Political Challenge: The political challenge relates to distribution of power and decision making. Successive governments in Nigeria have formulated a number of polices in the country over the years which pose threats to the peace and security of some citizens. For instance, the policy of Federal Character where Quota System and Catchment Areas are adopted in admissions into schools, appointments into offices and allocation of resources, does not promote merit, just and egalitarian society. Nigeria is vulnerable to insecurity and conflicts emanating from the nature and character of politics in many states of the federation. Instability of government, corruption and bad governance has eaten deep into the fabrics of our nation.

Nigeria is a country where elections are rigged to occupy political positions, political appointments are based on God-fatherism, and employments are based on sentiments. Madu and Udezo (2010) maintained that Nigeria has democratic system of government but seems to be struggling with issues of accountability and good governance. Revelation from Nigeria's anti-graft agencies is rife with so many economic and moral crimes of our political leaders at both the national and state levels. Many a time, series of reports have been given in some states of the country experiencing various crimes and violence involving groups that are illegally armed during elections to cause confusion. Youths are manipulated by political elites for self-fish purposes. The above scenario cannot promote peace in any nation.

Economic challenge: The economic challenge results from economic conflict which involves competing motives to attain scarce resources (Wikipedia Encyclopedia, 2013).Economic

conflicts arise where people, organizations or societies strive to control the means of production and direct their activities towards maximizing their gains (Ebirim, Mbaji & Iwuozor, 2012).The Niger Delta militancy arose due to the quest for resource control. Nnaman and Ayogu (2011) postulated that the Niger Delta region bears the bulk of the nation's oil wealth, yet it is faced with serious environmental hazards resulting from oil spillage, forcing the people to live in abject poverty. This has caused the youths of that region to take up arms hence, resulting to total confusion, anarchy and disorderliness in the nation. Unemployment among Nigeria youths has become a cankerworm in the country and a threat to Nigeria nation. In fact, it has many consequences on the youths and the society in general. Ocholi (2005) warned that if unemployment in Nigeria is not addressed on time, it will contribute to more social ills in the country. Unemployment brings about social unrest and national insecurity in the nation.

V. THE WAY FORWARD

Considering some of the challenges to peace and security in Nigeria as stated in this paper: social, educational, political and economic factors, the following can be a way forward towards promoting peace and security in the nation.

Anti-social conflict should be encouraged. Anti-social conflict in this paper refers to the struggle for understanding and tolerance rather than violence. This happens when people, tribes, different societies decide not to cause opposition in social interaction nor prevent their opponents from achieving their goals. Peaceful co-existence and harmony with one another might enhance sustainable national transformation. War and anarchy does no good to a nation.

Another is educational reform. Educational reform entails bringing sanity to our education sector so as to produce the right kind of human capital who will solve the problems facing the sector and catapult the nation in the right and desired direction. Just as Gbenedio (2012: 4) commented: "For Nigeria to attain national development and transformation, there must be a thorough revamping of the schools curricula, adequate and continuous training and retraining of teachers in relevant areas like entrepreneurship and ICT education. This assertion implies that Nigerian educational system should be tailored towards reorientation of the people's values and methodology to produce the right expertise for national transformation. When the citizens are self- employed, the rate of armed robbery and kidnapping might reduce and the nation will be a better place for the citizenry.

There should be a change in the political structure of the country. For democracy to be sustained in Nigeria, elections must be free and fair. There should be no imposition of interests and thus political parties must act as major instruments of constitutional democracy. Some government policies that do not promote just and egalitarian society should be abolished. In a situation where the application of government policies such as "Federal Character" that denies admissions, employments and appointments to merited candidates does not guarantee the safety and comforts of the citizens and hence a breach to peace and stability, a better policy should replace it.

There is need for economic reform. This has to do with equitable distribution of resources. When the resources are evenly distributed, there will be no anarchy. The government should avoid unjust revenue allocation formula. Every region must be treated equally without fear or favour. Moreso; industries should be established by the government especially in the rural communities to promote job creation, thereby reducing unemployment in the country. There is an adage that says: "A hungry man is an angry man". This will go a long way in maintaining peace and security in the nation. Hence, the end result will be sustainable national transformation.

VI. CONCLUSION

From the foregoing, it is evident that high level of crime and anti-social behaviour has been on the increase among developed, as well as developing nations like Nigeria. The resultant effect has led to a downward trend of the economy and failure in achieving sustainable national transformation. Peace and security are the basic instruments for a nation's success. Nigerians, must therefore, unite together and change their value system towards achieving national transformation. No meaningful progress can be attained in an atmosphere of disharmony and chaos. Hence, it is said that united we stand, divided we fall.

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Internals of Hadoop Application Framework and Distributed File System

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Abstract- Hadoop is an open-source framework to storing and processing of Big data in a distributed environment. Big data is collection of complex and large volume of structured and un-structured data. Hadoop stores data throughout clusters located in geographically different machines and distribute workload using parallel computing. MapReduce is software framework derived on Java, to analyze the large scale data. MapReduce uses Distributed Data processing model. HDFS is another component in Hadoop, storing large volume of data. Google File system supports immense amount of data stored into distributed data nodes, each node has redundant data storage maintained to avoid lost. This paper explains the HDFS, details of jobs node cluster environment, stack layered component on Hadoop framework, various Application development on Hadoop.

Index Terms- HBASE: Big Data Base, HDFS: Hadoop Distributed File System, JDBC: Java Data Base Connectivity, MapReduce, Hive, Pig, Sqoop, SQL: Structured Query Language.

I. INTRODUCTION

Big data can be classified into '3V': Variety, Velocity and Volume. It increases storage capacity of data, increasing adequate processing power. Data can be stored in volumes like Zettabyte/Petabytes, forms of data can be structured or unstructured, and data can be processed in Batch sequence process or streaming and parallel processing. Data inputs from several Sources like, Data generated from IOT connected service, Social media generated data from emails, tweets, photos, click stream by advertising, and appliance generated data from various sensors, logs and other information.

Data model is categorized as Structured, Semi-Structured and Un-Structured types stored in cluster system. Figure-1 explains Hadoop Stack structure information around big data components. Hadoop Core framework provides effective analysis on Data Models. MapReduce development based java programming, it access the Hadoop core framework and HDFS is distributed file system with file manipulation implementation. Both MapReduce and HDFS is low level component, directly access the Hadoop Core framework. Layer-2 component are access the Low level component and retrieve the results from Hadoop core component. PigLaltin, HiveQL and Hbase, Sqoop and other open source components are supports to communicate with Low level component. High level component has interpreters, convert to Low level component and to execute jobs on the cluster. High Level component is developer friendly framework, easy to analysis content in BigData cluster. PigLatin is developed based on Scripting language, HiveQL based on SQL Query Language.

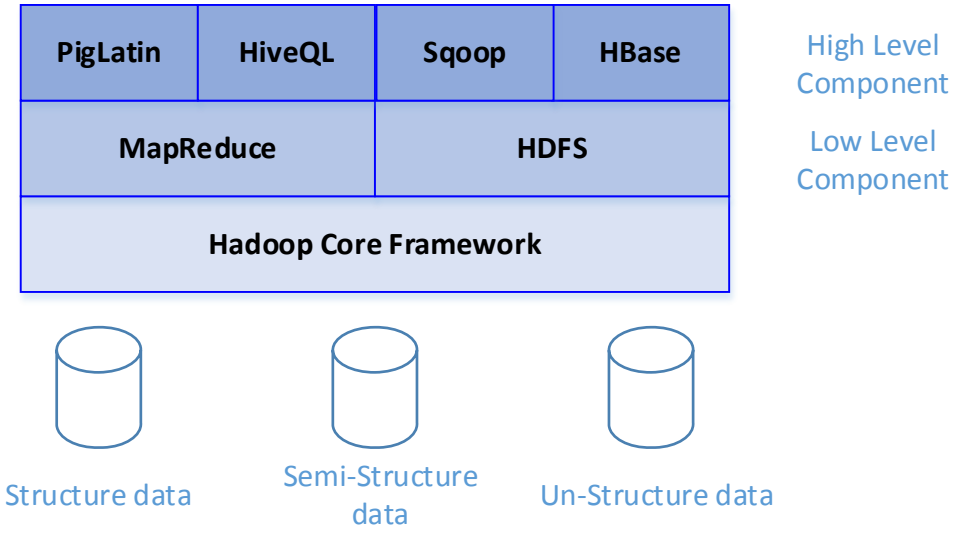

Figure-1: Hadoop Stack Framework

MapReduce component is developed on Java programming, It collects and analysis data on various domain like, Financial service for Banking, Heath care service for Medical system, Telecom domain, Energy domain, Travel and Logistics Domain. Data Analysis to Image processing, Intelligent Business tool development, Data Analytical tool, monitoring data streaming.

II. HDFS (HADOOP DISTRIBUTED FILE SYSTEM)

HDFS is derived from Google-File-System (GFS), completely developed on Java platform and runs over the Linux File system Ext3 and Ext4. Data spirited into blocks and stored in Cluster devices. Each block of data replicated and stored into three minimum distributed location. If any failure notification on the data, HDFS automatically load missing data from other cluster. Figure-2 illustrated Hadoop File system structure and node details.

HDFS data stored into two nodes

1) NameNode (NN) : Act as Master, Stores Metadata information
2) DataNode (DN): Act as Worker, Stores Actual Data block information.

Name Node stores Metadata information about actual data location of each data block, file name and file properties. Name Node content loaded into RAM, to access quickly. Size of Name Node is restricted by the File system because constrain in RAM memory. Data Node has actual vast data stored into blocks. Data needs to be stored into continuous blocks of node. Data are replicated across several distribute location and receive reports from each location. Name Node and Data Node are synchronized, Data Node send notification to Name Node. If fails, Name Node assumes that Data Node is lost. Name Node find the blocks of Data Node lost from its meta information, copy the data block from other nodes. Heartbeat communication between Name Node and Data Node is maintained. All Data Node connected in pipe-line architecture. New Data Node loaded from remote location, previous and Next Data Node linked to new Data Block. Secondary Name Node keeps update Meta data information and periodically compare with main Name Node information.

User level libraries are available to access the HDFS. Hadoop command line interface to remove/add directory Copy data to/from HDFS, Display content from HDFS, validate permission of HDFS information. Java API also provides framework to access the HDFS data structure. All the Jobs (Mapper, Reducer) runs on the Client machine and access the Data in File system using HDFS protocol.

Characteristic of HDFS

1. Write once, cannot be updated.
2. No Random write files allowed.
3. Random Reads with multiple times

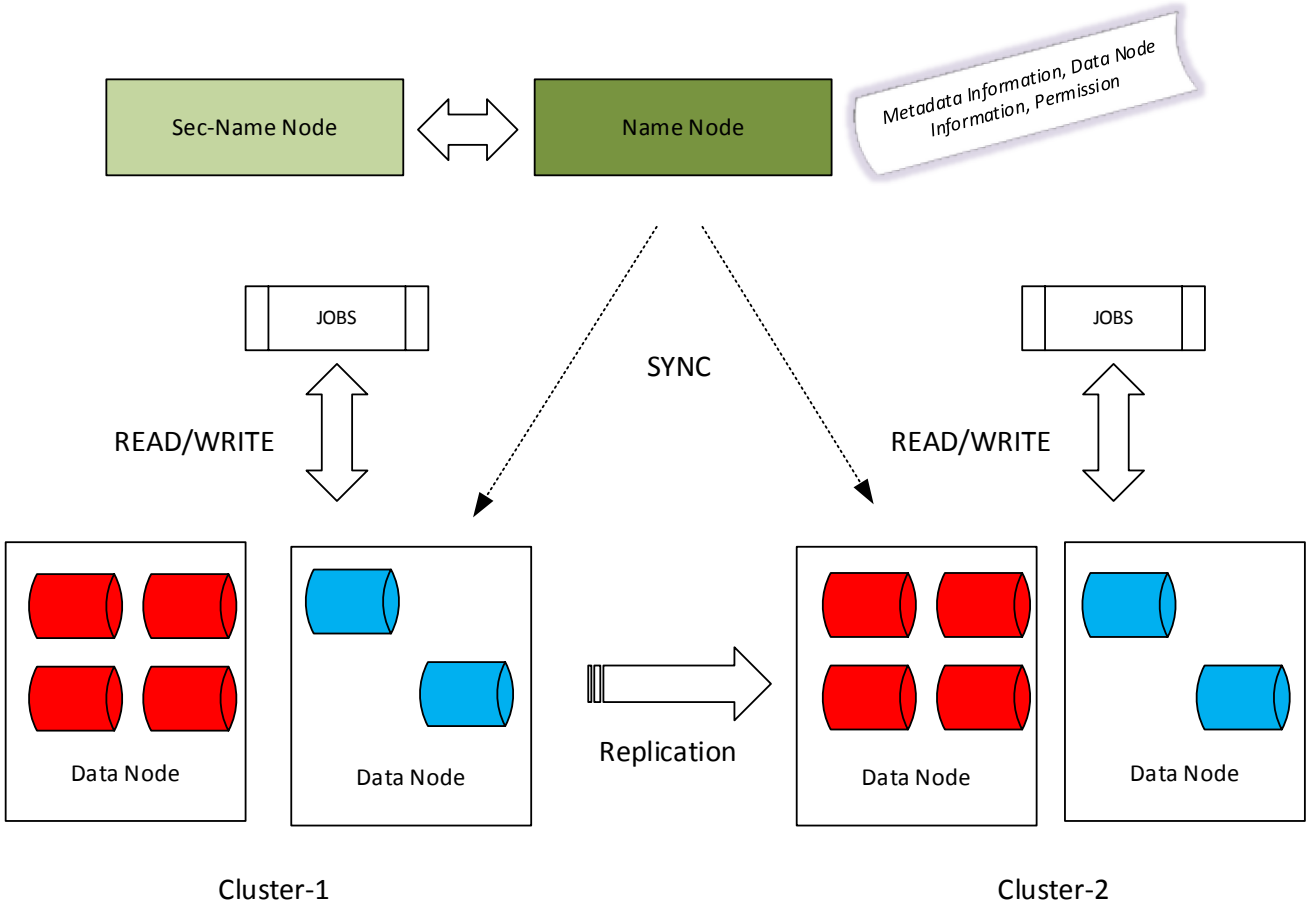

Figure-2: HDFS Architecture

III. HADOOP COMPONENTS

Hadoop is evolving framework in big data analysis, lots of component are available to access the data for different purpose. Some of the components can be analysis below.

A. Mapper and Reducer Architecture

MapReduce is java based software framework, to process large amount of data in Distributed cluster. MapReduce framework consist of single master JobTracker and one slave TaskTracker in each cluster. Master JobTracker schedule jobs, monitor all the jobs, if required reschedule jobs. Hadoop Job client is jar executable, it configures JobTracker and responsible for execute and configure slave TaskTracker application. Mapper task takes input key/value pair from HDFS. Mapper process the input data (key, value) convert to intermediate (key, value) records. Mapper reads input by specifying an InputFormat, currently system supports InputSplit and RecordReader formats. Text data processed by TextInputFormat and TextOutputFormat, each line of text data read and write to HDFS. Same way read and write in SequenceFile using SequenceFileInputFormat and SequenceFileOutputFormat functions.

The Reducer has a reduce method that transforms intermediate data (key, value) aggregates into smaller set of output (key, value) pairs. Reducer has 3 prime implementations are Shuffle, Sort and Reduce. The shuffle and sort framework runs simultaneously, it fetches mapper outputs and processed it. Reporter application use to generate status information and counter details write into file, which identify the live information about task and process. Blocks of M-R component explained in Figure-3.

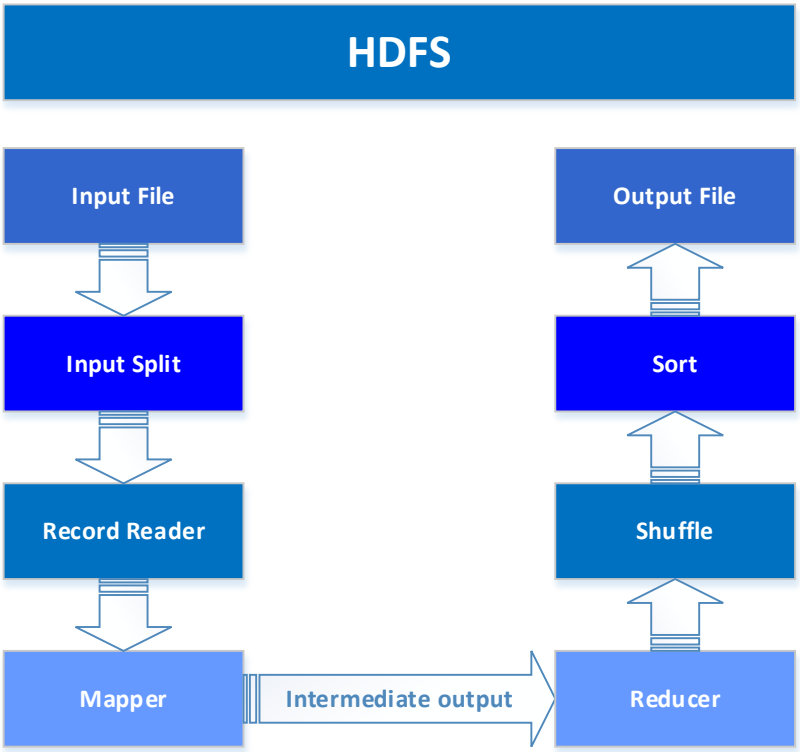

Figure-3: Mapper-Reducer Streaming data flow

B. HiveQL

HiveQL is SQL Based Query Application to supports MapReducejobs and executed across a Hadoop cluster. Hive allows SQL developers to write Hive Query Language (HQL) statements that are similar to standard SQL statements. Map reduce code is typically written in java and requires a developer with a good understanding of Java, Map reduce paradigms, Hadoop API's etc. But Hive is language based on SQL, Easy to learn, easy to use, immediately makes data on the cluster accessible to many more people and allow non-java programmers access to the dada in its Hadoop clusters.

Hive Implementation:

1) The Hive takes interpreter runs on a user's machine
2) Takes Hive queries and turns them into java Map reduce code
3) Submits the code to the cluster
4) Displays the result back to the cluster

C. PigLatin

Pig is a data flow language composed of series of statements (sequence of operations or transformations) with relatively simple syntax. Pig scripts are turned into Map Reduce jobs and executed on Hadoop cluster like HiveQL. The Pig interpreter runs on the client machine, it converts Pig Latin sequential script to standard Java Map reduce jobs, which are then submitted to the job tracker. Pig is originally created by Yahoo. No Modification requires on cluster, to install Pig. The PigLatin scripts translate into standard Java Map reduce jobs, which are then submitted as job tracker in client system.

Element of pig:

1) A single elements of data is an atom – Analogues to field
2) A collection of atoms is a tuple-Analogous to a row, or a partial row, in database terminology
3) A collection of tuple is a Bag-Sometimes known as a relation or result set

A Pig Latin script starts by loading one or more datasets into bags in RAM memory and creates new bags by modifying the content of loaded data structure.

D. Sqoop

Sqoop is (SQL-to-Hadoop) big data tool to extract structured data from RDBMS database and convert Hadoop supported format, also stored into HDFS data base. Sqoop supports command line interpretation to access RDBMS and HDFS database. Commands are executed in sequentially. Bulk import type import complete table/database from RDBMS to HDFS file system. Direct Input type import SQL database to Hive and HBase. Data Export type export HDFS file system to Relational Data base. Sqoop is a tool designed to transfer data between Hadoop and relational database servers. It is used to import data from relational databases like MySQL, Oracle to Hadoop HDFS and export from HDFS to RDBMS. Sqoop uses JDBC to connect with RDBMS and read/write the information. Based on the table's schema generates the necessary java classes to import sql data into the Hadoop Distributed File System (HDFS). Sqoop creates and launches a MapReduce job to read tables from the database and store to HDFS. Sqoop import tables into Hive for processing and export tabular data from HDFS to RDBMS. Communication blocks between HDFS and RDBMS using Sqoop is explained in Figure-4.

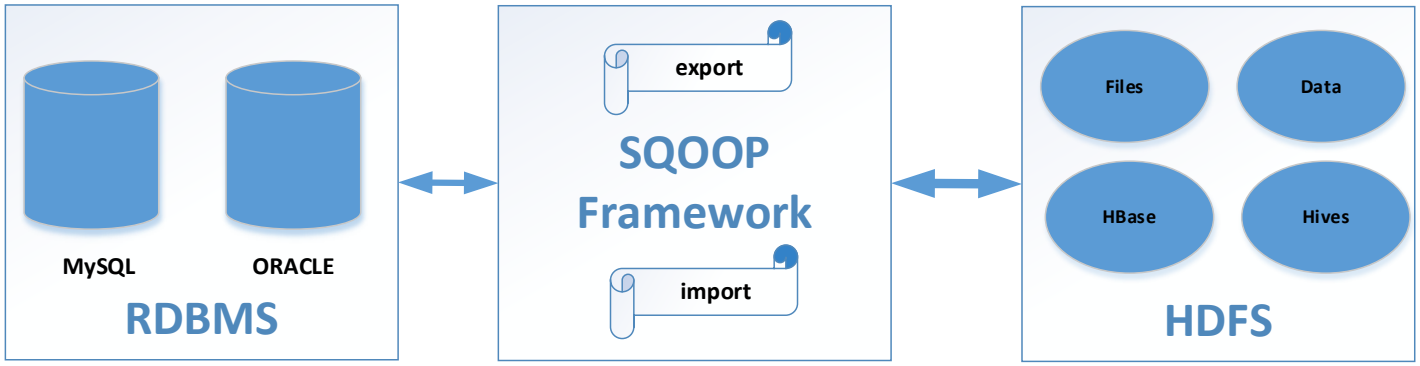

Figure-4: Sqoop Architecture

E. HBase

HDFS does not support random read/write to their file system, it need additional framework for access to sustenance it. HBase is a data model that is similar to Google's big table designed to provide quick random access to huge amounts of structured data. It leverages the fault tolerance provided by the Hadoop File System (HDFS).It is a part of the Hadoop ecosystem that provides random real-time read/write access to data in the Hadoop File System. Data can be store the data in HDFS either directly using Query Language or through HBase. Data consumer reads/accesses the data in HDFS randomly using HBase. HBase resides top of the Hadoop File System and provides read and write access to high level framework. Figure-5 describes the Hbase block between Random calls in user client and HDFS. Table-1 gives difference between Hbase and HDFS structure.

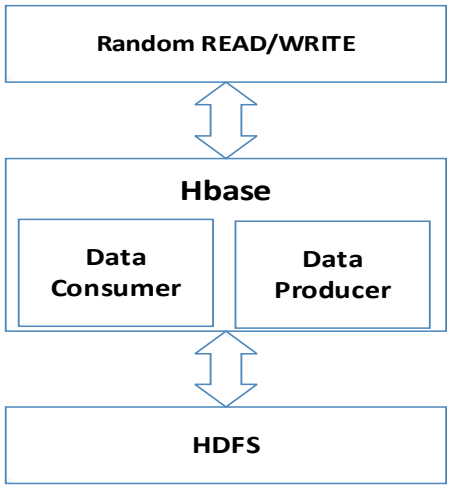

Figure-5: HBase Architecture

Table-1: Difference between HDFS and HBase

HDFS	HBASE

HDFS is a distributed file system suitable for storing large files.	HBase is a database built on top of the HDFS.
HDFS does not support fast individual record lookups.	HBase provides fast lookups for larger tables.
It provides high latency batch processing; no concept of batch processing.	It provides low latency access to single rows from billions of records (Random access).
It provides only sequential access of data.	HBase internally uses Hash tables and provides random access, and it stores the data in indexed HDFS files for faster lookups.

IV. Application Programing on Hadoop

Developing Hadoop Application by MapReduced using Java or Pig using PigLatin scripts or HiveQL using Query language. For all development we need Driver application to load target Analysis Application. Figure-6 explains sequence of data processing between Mapper and Reduce model, Input/output key/value pair details with examples. Mapper Application read data and produce Intermediate results, Reducer produces final results from intermediate output. Both Mapper and Reducer objects are loaded and controller by driver application. Source code driver, mapper, reducer are explained below tables.

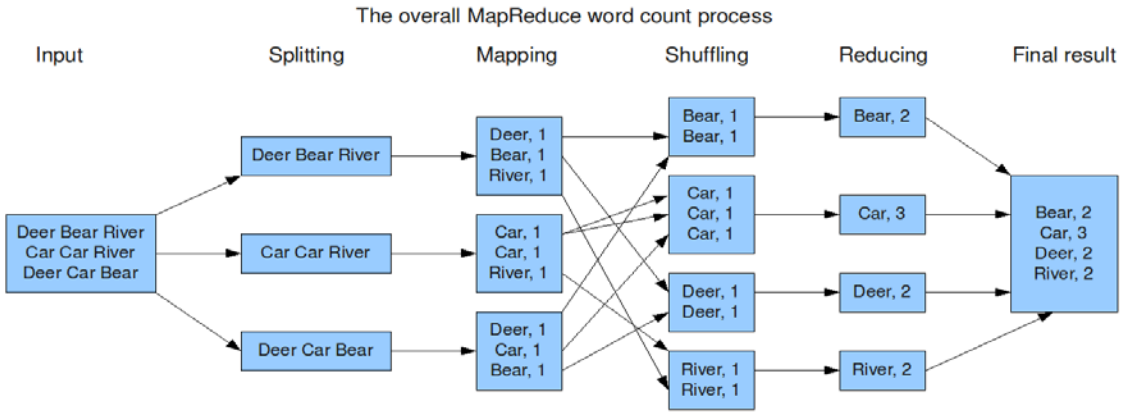

Figure-6: MapReduce Architecture

Driver Code loads Mapper and Reducer objects and run the jobs. Configure the File input and output formats and Path information's.

```
Job jobobj = new Job();
jobobj.setJobName("Word Count");

FileInputFormat.setInputPaths(jobobj , new Path(args[0]));
FileOutputFormat.setOutputPath(jobobj , new Path(args[1]));

jobobj.setMapperClass(Mapper.class);
jobobj.setReducerClass(Reducer.class);

jobobj.setMapOutputKeyClass(Text.class);
jobobj.setMapOutputValueClass(IntWritable.class);

JobClient.runJob(jobobj);
```

Mapper code reads content from File using BufferReader class, content of each word tokenized and write into intermediate context

```
public void mapper (LongWritable key, Text value, Context context) throws IOException, InterruptedException {

BufferedReader fis = new BufferedReader(new FileReader("InputFile.txt"));
while ((Line = fis.readLine()) != null) {
        StringTokenizer tokenizer = new StringTokenizer(Line);
```

```
            while (tokenizer.hasMoreTokens()) {
                        word.set(tokenizer.nextToken());
                        context.write(new Text(word), new IntWritable(1));
            }
      }
}
```

Reducer code reads intermediate output from Mapper object and collect the key with counter values. Final outputs write into context

```
public void reducer(Text key, Iterable<IntWritable> values, Context context) throws IOException, InterruptedException {

while (values.hasNext()) {
  sum += values.next().get();
}
context.write(key, new IntWritable(sum));
```

V. CONCLUSION

This paper explains the overview of Hadoop framework architecture with stacks of component. Hadoop is emerging technology in giant data analysis and big data storage planning with different structural format. Hadoop supports distributing technology to evade of data lost and system becomes stable. HDFS supports giant size of file stored in a place with replicated information in multiple geo graphical location. Hadoop core component and base component has some restriction in development like Java and not supporting of random access. The High level programming overcome to easy usage of Hadoop technology like Sqoop, HiveQL and Pig. Development point of view High level application runs top of the low level framework like Map-Reduce with efficient fashion.

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Medical Data Mining: Health Care Knowledge Discovery Framework Based On Clinical Big Data Analysis

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Abstract- "Big Data" is a new paradigm that is introduced in the field of computer science to abstract the size of data. It refers to huge quantities of data which need special processes according to business requirements. To get exact information and gain knowledge, professionals must apply intelligent tools, technologies and methodologies in the field's major areas. Yearly a lot of people lost their life because of medical mistakes. Diagnosing and treating patient's case is crucial matter to the medical team. Providers should deliver more accurate and personalized clinical data to improve the quality and efficiency of care. This paper discusses big data term in medical sector and how to analyze this clinical big datasets to discover knowledge to use it in clinical prediction. We discuss the deployment and the new trends with big data and explore two paradigms on building real data infrastructure for future studies and review some of on-line health care applications. Afterward, this paper propose framework which figure-out how to analyze big data and how to discover knowledge from the extracted information. Knowledge discovery and data mining are correlated terms; data mining is a step in knowledge acquisition processing journey, it is about applying data analysis and discovery algorithms, which should convey the widespread growth of data collection. As conclusion, big data analysis is expected to reveal the knowledge structure which guided the decisions making.

Index Terms- Big Data, Clinical data analysis, Data Mining, Data Warehouse, Healthcare knowledge.

I. INTRODUCTION

IT professionals in need of organizational data to assist stakeholders in doing informed decisions. These data comes through organizations' operational systems records and data warehouse [1]. Large amounts of data that come from business information systems known as big data. Big data is a common term in clinical area publications but in computer science means big datasets which distributed on many servers and require specific methodologies to process this data [2].

Health care industry has a big challenge on what to do about the collected and saved clinical data and how to analyze it according to specific perspective and different factors depends on health care foundations[3]. Medical or healthcare big data comes from electronic health records (EHRs) so health care organizations will help in mining information and reports from the EHRs using the proper tools, techniques and infrastructure. The collected data diverse between structured and unstructured data, it's important to mention that doctors' notes are a kind of unstructured data. In fact, big data term called on the application of specialized methodologies, technique and processes that mange a very large groups of datasets[3, 4].

In the past five years big data term is numerously mentioned on most clinical publications and reports. It refers to data that stored from clinical software packages. Big data is raw data, it's really big and will getting bigger day after day, and becomes complex more and more[5]. Therefore the processing of this big data is urgent and critical to get meaningful subjects[6]. Healthcare professionals are the people who put standards and identify the industries' needs based on million cases, which help on doing accurate decisions and managing the populations' health at management level.
Big data analytics main goal is to help stakeholders in concerned organizations to make informed and right decisions. As well as, big data applications looking for solving the problems of heterogeneity, time wasting, delay, privacy manner and high costs to maintain the processed data[3].

Medical studies need to process and analyze a large volume of data to handle it. So, the big challenge is how to turn the big data into knowledge or to help pharmaceutical companies to identify side effects of drugs or any process in direct contact with medical institutes to add more to the body of knowledge[7].
Knowledge in general is all about information, getting useful ones by understanding the patterns. In this paper when mention knowledge means how to implement and guide the electronic health records to improve health organizations outcomes according to clinical trends; using artificial methods to convert clinical data into statistical or logical information. These intelligent outcomes varies among diseases detection on early stages, monitoring patients who has a chronic disease such as diabetes or congestive heart failure, autism discovery and follow-up or may be it helps on addressing some parameters to improve people with autism disorder, registering

the behavior of group of candidates after taking a certain medication or undergoing treatment for a particular style or observe a side effects of specific medication. Also it helps people to figure out the best health plan for them [3, 6, 8].

II. DEPLOYMENT AND NEW TRENDS

A. BIG DATA

Big Data terminology referred to a large collection of datasets that is processed using traditional computer techniques and algorithms[2]. So big data related to data's size, speed and volume which need advanced computer science techniques and technologies to manage and analyze this data[9]. Big data can be categorized into six categories, as shown in Fig.1, according to the sources that it comes from such as web logs, call and medical records, surveillance of military purposes, video and photography archives[3].

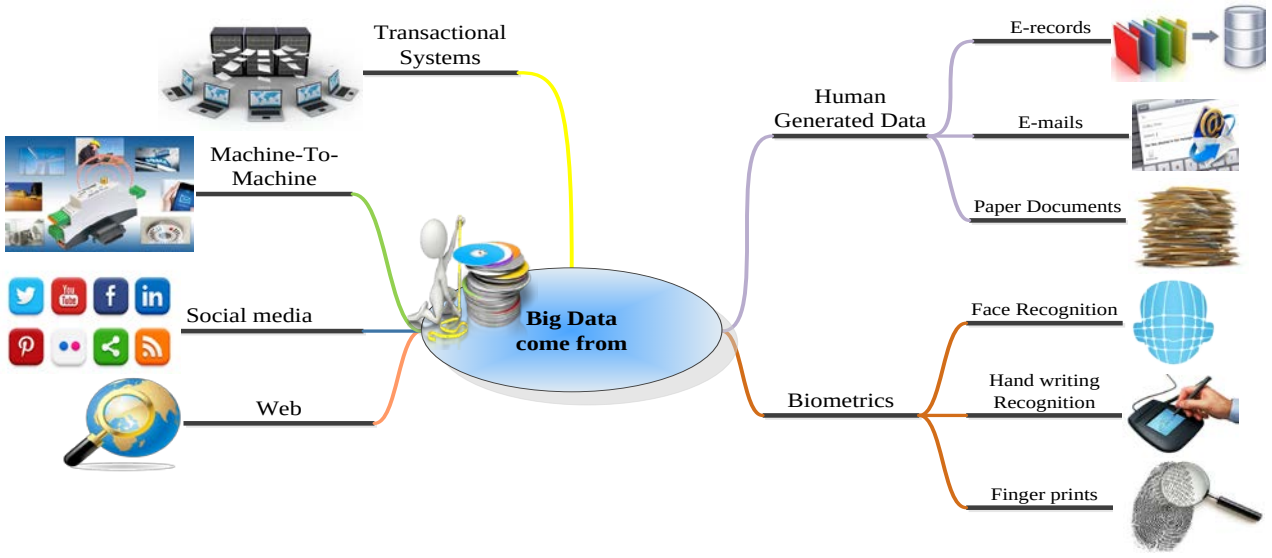

Figure 1: Big Data Resources

In other words, big data is everywhere and it growing exponentially at every moment. Big data in health care branch depends on real world sight to form an actual view to the digitized patients' records so big data in health care are adopted from real time electronic health records[10]. Experts claim that they drive their knowledge to combine, organize and analyze clinical big data to improve clinical care activities and outcomes in order to assist health care organizations, but they aware that this data is not organized in the right way and forms[4, 7]. Big data benefits in health care sector are abstracted in Fig. 2.

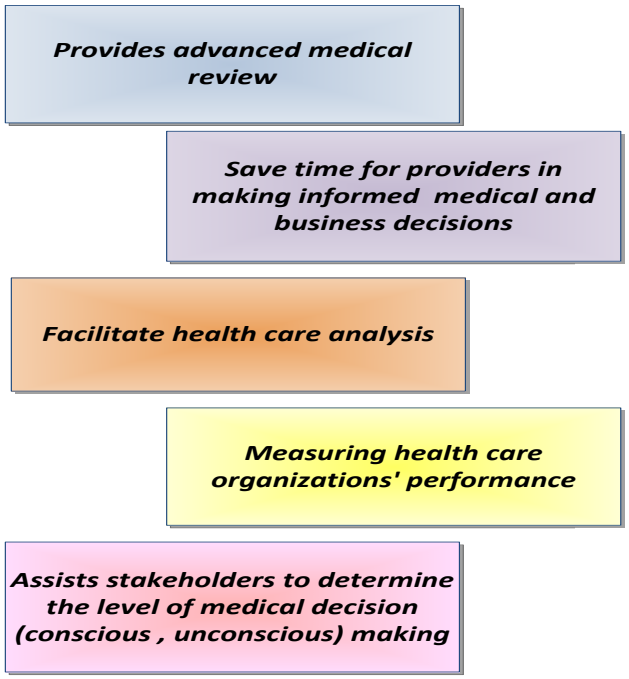

Figure 2: Big Data uses in healthcare

B. REAL WORLD HEALTH CARE STORIES ON BUILDING BIG DATA

In real world when says big data we speak about data that its size on terabyte or on petabytes (one petabyte= 1024 terabytes). It is worth mentioning that Facebook alone store about 100 petabyte of images, videos and other materials. Although there are three common patients online applications submitted by the biggest information technology companies in the world, but the world still needs more. Those three web sites are dossia.com which constructed by Intel, AT&T, Wal-Mart in December 2006. Second online health website is announced by Microsoft in October 2007 this website is HealthVault.com and the last one is Google Health which established in 2008[11].

According to International Data Corporation (IDC) Canada, prediction based on IT research associations big data is ranked as one of the top matters that the world's deal with in 2013. Since that the world get more interest and start focuses more on big data and apply it on different fields. Again big data comes from historical data, billing systems records, web blogs, medical records, image and video archives, military monitoring, voice materials and etc.

The first trend of Big data is by establishing an organized big data, for example what United Kingdom's National Health Service (NHS) done, is to build a paradigm of national research database that support researchers, doctors and technicians to get more understanding to the genetic causes to cancer. The construction of this national database planned to take around three to five years and the volunteers' information will be protected; this known as population health care management. The population health care management needs a modern IT tools, algorithms and techniques besides the availability of effective analytic methods to formalize the available EHRs.

The second new trend in big data categorization at real world applications is Medical history of a family is one of the important records that visual data analysis and health informatics starts dealing with; which is known as medical family tree[3, 12]. This history includes illnesses, symptoms, and allergies causes that family members share them based on their genetics and lifestyle. The mentioned factors are important keys to understand the medical conditions and disorders among relatives[6]. Professionals in health care sector through data mining techniques can notice patterns of their medical history to determine whether individuals or even future generation may be at risk of a particular indication or can detect the percentage value of a chronic disease may occur. Here the basic idea of big data analysis is to present the data in different forms which allows humans to use his mental inceptions and prove it on big datasets though visual data mining techniques, big data can be used to identify patients and populations at risk for various conditions. In this case, visual data clarification is very useful because we know little about the data and the clarification goal is vague.

C. HEALTH CARE BIG DATA APPLICATIONS

Recently, most of patients like to share their stories, experiences and knowledge through the networks, this obvious by observing social media, web blog or even in daily life. For future those materials should be utilized and directed on the right way[13]. This paper listed some of clinical platforms that used big data technology in one way or another, as shown below:

NextBio.com

NextBio.com is a big data technology consists of pharma and medical parts. NextBio has many packages of applications based on private and public experimental datasets. NextBio.com uses patients' genomic data to do medical decisions. These applications are developed to assist clinical and researches platforms. NextBio clinical platform enables experts to apply recent analysis techniques and methods to discover and translate clinical trials. On the other hand NextBio research platform provides tools to enhance pharma and medical parts by accessing and mining more than 10,000 clinical studies that help in analyze disease profiles, drug mechanisms discovery, optimize typical medical experiments and validate drug results.

Treato.com

Treato.com is an online health care blog that is generated by users. Treato.com portal consist of about 2-3 million of patients, advisers and caregiver around the world who share their knowledge, experiences and real stories about symptoms, medications and other conditions to provide real platform to patients and stakeholders that support decision making. Besides this blog has another section known as Treato IQ it is an intelligent platform from the users generated content; this platform helps stakeholders to get more understanding about the solutions and decisions about business targets. It's worth mentioning that treato.com manipulated by Hadoop.

Healthx.com

Healthx.com is a cloud-based health care IT services and health plan solutions which is looking for customer satisfaction and improving the business impacts, this is evident through its mission statement which is "Transforming healthcare through innovative digital engagement".

Short idea on Healthx: is an active member of Health Care Administrators Association (HCAA) and Self-Insurance Institute of America (SIIA). Healthx cover more than 200 million of American people diverse between health plans in private and general sectors to careers. Also Healthx provides a library of resources such as whitepapers, articles, case studies, infographics and practices.

Vitals.com

From its mission statement can understood its goal which is "find the best medical care with millions of doctor reviews". In other words, Vitals.com searches over millions of doctors around the world according to the branch of medicine they are belong to and access the reviews and find the best care according to different solutions. Those solutions stating consumers, healthcare plans, insurance plans, providers and advisements.

III. KNOWLEDGE DISCOVERY FRAMEWORK BASED ON BIG DATA ANALYSIS

Recently the usage of information technology in health care sector plays an important role to improve experts' decisions [5]. Delivering information through raw big medical data is a considerable challenge and a complicated process. Health care organizations with different denominations are looking for constructing big data platform to improve their performance and to enhance patients' safety, but it still a wish. Building big data analysis infrastructure will eliminate and reduce the manual processes and this will impact on costs, time and accuracy [1, 3, 7].

Big data analysis process to deploy knowledge will go through five stages to reach the goal. This paper presents a framework represented in Fig. 3, which generally explains how to lead raw data to discover knowledge. First step is data collection from EHRs on its private and public forms the next process is to create Clinical Datasets (CDSs) from the collected data. Clinical datasets is a warehouse that builds for the purpose of analysis, mining and reporting. Clean CDSs and extract the important data is the next step, Cleansing the raw big data its important stage by using data cleaning algorithms; in other words detect and remove errors or delete duplication or whatever process to improve the quality of data and to avoid processing time consuming. Clinical data warehouse (CDW) is a repository that is collected from multiple clinical software packages and it used to link, analyze, report and search within stored medical information. CDW aimed to provide health investigator by obtaining data from enormous clinical systems. Those Clinical Systems used in health and health related organizations.

Then this data have to be categorized according to stakeholder's perspectives, this process called information retrieval or data mining level. To get information cleansed big data can be categorized into statistical information or analytical information or tactical information or any different category that aid senior managers and decision maker to do exact decisions. The analysis procedures needs a health plans with a comprehensive view from patients, doctors, physicians, pharmacists, technicians and other intended people.

To implement big data analysis and knowledge deployment there are many techniques to produce predictive outcomes. The predictive model needs to be evaluated and validated, and then monitor the results after that the model can be deployed. From the IT expert perspective the data mining stage is more in data technologies and algorithms so it should to answer many questions and address many important factors. On the other hand from stakeholders' perspective they have to identify the business problems and differentiate data and business understandings. Knowledge discovery from the categorized information help experts on prediction, managing and guiding the extracted information.

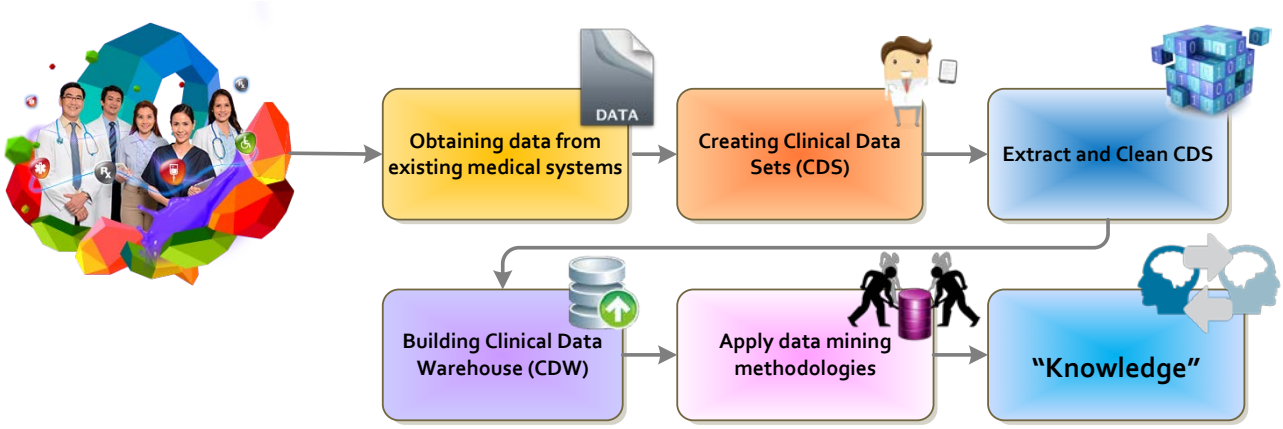

Figure 3: knowledge discovery through Clinical Big data analysis proposed framework

IV. CONCLUSION AND FUTURE WORKS

Lack of patients' records is the most important challenge that experts and researchers suffer from, which almost motivates healthcare organizations to build patients portals to help stakeholders in their business. Those portals are web-based health care information systems. Healthcare online systems could help to improve the communication between doctors and patients on the other hand to improve the quality of care which may lead to reduce medical errors and costs. In order to get better reviews patients in interest with share, save, manage, and retrieve their medical data, such as their medical history, medications, allergies, x-rays and test results. Accordingly building these online big repositories give them an opportunity to interact with doctors, physicians and pharmacists, but IT experts should take in mind patents' privacy and polices risk.

To be concluded that big data is about real time data. Healthcare management follow three main and important stages the first stage is data collection: this data may come from EHRs, hospitals or clinical billing systems, lab and imaging systems or any data attached with patients. The second stage is about cleaning and extracting useful data this more in data warehouse technology and the third is management and knowledge stage is data analysis using data mining techniques. From data scientists perspective in big data analysis target is to retain and to analyze more and more data with increasing the analysis speed, besides publishing accurate outcomes with low cost. Last to say that "Big Data" analysis in healthcare will provide more and more to the body of knowledge.

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The Legacy of Kuriakose Elias Chavara as a Social Reformer

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Abstract- The dignity of man, who is endowed with both body and soul, was the basis for all social activities and humanitarian services of Kuriakose Elias Chavara. He gave prime importance to the dignity of a human being from his faith that all are created in the image and likeness of God. The foundation of empowerment of dalits and minorities are education and employment. Chavara was keen to initiate a movement which ensure public education, and thus open possibilities for decent employment. The establishment of a Charity home at the small village of Kainakari in the state of Kerala in India distinctively emphasize the concern of Chavara towards the sick and suffering in society where the uncharitable practices are predominant because of the caste- system and its numerous norms. Chavara's success in all his many undertakings was undoubtedly originated from his spiritual vision. It led him to be an innovator of many socio-pastoral, cultural, educational and social reforms. While he most assiduously lived the life of a Religious, dedicated to the love and service of God, the same divine love in him inspired him to devote himself, as much as he could, to the love and service of men. It is a long and most praiseworthy record, his varied enterprises and activities for the religious, social, cultural and educational advancement of his fellow men.

Index Terms- Chavara, dignity, integral outlook, social reformer

I. INTRODUCTION

Kuriakose Elias Chavara (1805-1871), a renowned social reformer, was a native from the land of Kerala in India. The Catholic Church raised him to the status of a saint on 23rd November 2014 in milieu of his heroic spiritual life and innovative humanitarian services for the uplift of his fellow men. Being a spiritual leader, the major orientation of his life and activities was for the empowerment of people. He firmly believed in the right to maintain the dignity of each and every individual and the upholding of the same became the major priority of his services. The social situations of Kerala during his life time were deplorable due to the existence of a caste- oriented and socially unequal society. People belonging to the higher castes enjoyed many privileges while the lower castes were neglected and oppressed. Government jobs and general education were denied to people of the lower castes. They were not allowed even to walk along public roads. Untouchability and such evil customs were predominant and accepted practices in the society. The government itself set up norms and instructions to set limit for the untouchables to walk along public paths and market places. Dalit women were not allowed to cover their breast, especially in front of higher caste people whom they compelled to call '*Thampuran*' (Lord). The dalits lived on the property of the landlords of higher castes and worked for them as bonded laborers. They would be forced to work, but wages would not be paid. As they were forced to bow to their wishes of their masters, they had no self-respect. Even when abused and raped, their women folk could not raise their voice in protest. Education was the right of a small minority. It is against this backdrop of unjust rules and discrimination that the heroic efforts of Chavara becomes important and relevant.

Chavara worked hard to raise the status of his fellow beings and provide them better chances to progress through innovative initiatives and opening opportunities for everyone to flourish and progress. The words and deeds of Chavara proclaim his great vision for the uplift of the people in the society. Today Kerala is holding the highest literacy rate in India and people are enjoying equal social status and the fruits of development. Chavara dreamed for such a society and become a pioneer to start a movement which is primarily based on his own Syrian Christian community and reached out to every one of the society especially to the lower castes and poor.

A. Objectives of the study

To describe the unique contributions of Kuriakose Elias Chavara as a social reformer in the nineteenth century and to identify the radical steps taken by him for the social reformation.

B. Methodology

It is a descriptive study based on the primary and secondary sources on Kuriakose Elias Chavara. The writings of Chavara compiled and published in four volumes – *Complete Works of Chavara* (CWC), which includes his chronicles, literary works, spiritual writings and letters holds a major role in this study. Besides that various studies based on his life and contributions, books and articles related to the topic were used as secondary sources for this study.

The subsequent section of this paper deals with the integral outlook of Chavara for the uplift of a downtrodden society, radical steps taken by him for making a difference and to promote development in all realms and the impact of such actions of him in the later society.

II. INTEGRAL OUTLOOK

Chavara had an integral outlook regarding the worth of all human beings and gave prime importance to the dignity of man from his belief that all human beings are created in the image and likeness of God. The dignity of man, who is endowed with both body and soul, was the basis for all social activities and

humanitarian services of Chavara. (Panthplackal, 2004) With this ideology he looked at the intellectual, corporal, social and religious values of the person beyond the limits of caste, color and creed. As a socio-cultural and educational visionary his vision embraced most of the important fields in the society. Chavara was a lover of humankind and firmly believed in the providential love of the Father and in the strength of the fraternity of his fellow human beings. He took a keen interest in uplifting the underprivileged classes, the orphans and the poor. He stood as the champion for the cause of women, the downtrodden, the sick, poor and *dalits (Maria, 2014)*. He represented the first glimmerings of the rise of social consciousness in Kerala before the advent of Sreenarayana Guru or Ayyankali. He was also a predecessor of the Gandhian ideology that service to God is through service of humanity (Felix, 2004).

The integral outlook possessed by Chavara which guided him to take relevant measures to ensure social reforms in his time can be read from his sense of duty to help others, the awareness of him about the equal value of all human beings, his strong conviction that learning dignify individuals as well as women deserves a lofty status. He was firmly aware of the need of doing justice in a society which is nourishing the practices of untouchability and unseeability. His vision for the people of the society emerged from his ideology that spirituality and humanitarian services should go hand in hand. He set a new trend where social welfare programs become part of spiritually dedicated life. The following sections explains these aspects of his integral outlook exclusively.

A. Duty to Help Others

Chavara had a strong conviction that his life is not for himself, but for others. His more long life than his ancestors was a clear base for this belief of him. The words written by St. Chavara, in one of the letters to his nephew Fr. Joseph Chavara represents this fact. He wrote: God the almighty granted more time to me than to my predecessors. This was granted to me not so much for me I know, as for the benefit of others (CWC, Vol. IV, V/14, 1982). With this conviction he tried his best to make this long existence as a reward and profit to the society. It gave wings to his actions and gave color and enthusiasm to his visions. This other oriented life of Chavara is the main attribute of him which led to find out new ways and means to the transformation of society.

The compassionate heart of Chavara was always aware of his duty to help others as his fellow humans and he reaffirmed this verity by his selfless service to the lowly and the lost (Ramachandran, 1987). In the latitude of the initiation of the institution of the confraternity of St. Joseph for happy death (1843), he had incorporated in clear terms a programme for visiting and assisting the sick besides helping the poor, for whom he wished to provide clothes, food, care and hospitality. He wanted charity to continue even after death by means of the suffrages for the dead.

The uplift of the poor, the destitute, and the low caste were Chavara's dear causes. He wanted to inculcate in destitute men and women a healthy awareness of self-worth. Also he wanted them to understand that they were not ostracized from society, but rather, were entitled to be enriched both financially and intellectually. They had to develop self-confidence, sound spirituality and morality (Moozhoor, 1993). Chavara's love for his brethren was expressed not only through spiritual helps but also through material help, especially to the poor, the destitute and the outcastes. He used to say: the day in which you do not do some help to others will not be counted in the days of your life. This he practiced in his life and asked others to do the same. (Kanjiramattathil, 1986).

B. Equal Value of All Human Beings

All human beings partake an equal elementary moral status. They have the same fundamental rights, and the like interests of each person should count equal in designs that regulate social policy. Neither hypothetical racial variances, nor skin color, sex, sexual orientation, ethnicity, intelligence, nor any other differences among humans negate their fundamental equal worth and dignity. These cants are effectively universally admitted. Chavara bequeathed these policy which holds an equal status to all human beings. The strenuous efforts he has undertaken for the *Harijan* people remains as an untainted proof of this fact. The schools initiated by him were open to members of all communities who sought admission, including *Harijans*.

The society of his time stood for the gradation in social status and stood rigidly to hold the tradition of social inequality. As a reformer and promoter of human dignity he gradually made changes in this pattern of the society through the widely accepted educational reforms and print media. His concerns and efforts for the dalits were indeed a revolutionary act at that time. Christian missions always worked among the *Adivasis*, the aboriginal and among the *Harijans* in a practical implementation of the Christian ethic of service. Few people have exemplified this dimension of Indian Christianity as memorably as father Chavara (Venkataraman, 1986).

C. Learning Dignify Individuals

Chavara was keenly aware that the progress of a community greatly depended on the growth from within and assistance from outside. For achieving the former he launched a process of education at various levels, such as theological education and formation of the clergy, education of the children through schools attached to all parishes. For helping the latter he started the medium of press- apostolate, to accomplish which he had to work very hard. His awakened social conscience would stop nothing short of communicating enlightenment and comprehension to others.

For Chavara teaching and learning is a sacred process which leads to enlightening. He invoked his fellow priests and parents to be aware of this. He said: just as without eye one cannot see the material things in the world, so also without knowledge it will be impossible for us to see and understand the reality of world and the eternity of God. As those who have no eye are called blind, so as too those who have no learning are to be called 'intellectually blind.' Hence it is the responsibility of

priests to teach the faithful and of parents to teach their children (CWC, Vol. IV, IX/2, 1982). As part of his educational, social and cultural reforms, Chavara promoted the starting of schools attached to churches, and provided the depressed and backward sections of the society with the opportunity of studying together with the upper class children, by giving them economic aid such as clothes, books, and noon meals. With this same zeal and vision, he started the publication of prayer books and Christian literature with the help of a wooden printing press, designed in plantain marrow. He gave schools an importance almost equal to that of churches.

D. Women Deserves a Lofty Status

The progress and development of a society largely depend on the status of its women and it was Chavara, the first one among the Christians of India who realized the need of empowering women for the social uplift of the families and for the dedicated service of the Church. It is in this context that Chavara's vision on women becomes novel, revolutionary and far ahead of his times (Panthaplackal, 2004). For him, a religious community for women, was first of all, for self-sanctification, then education for value formation, and thirdly to empower the women for social action. Empowering the women folk in society to renew and strengthen the Church and society was a revolutionary vision of Chavara far ahead of his time.

In the particular social set up of Kerala, women too had a very mere position in society at that time. One of the principal aims of Chavara in founding a religious congregation for women was to uplift the social status of women. The members of the congregation were to give education and training to girls so that future mothers would be enlightened to instruct and guide their children. Chavara's vision on women is lofty. There are those who see him as the pioneer of women's emancipation, as the leader of the women's uplift movement (Kadankavil, 2004). He was an ecclesial visionary who realized the need of empowering women for the social development of the families and for the committed service of the Church. His intention behind the ardent desire to establish a convent for women was nothing but to bring women into the main stream of the society and thus to enable them to be leaders not only in the spiritual sphere but also in the social and cultural arena. This step was a far-reaching decision considering the social situation of his time (Maria, 2014).

E. Spirituality Encompasses Humanism

Chavara has been undoubtedly one of the great spiritual *gurus* that Kerala has ever seen. He was a spiritual man and at the same time he was not devoid of anything human. He knew that God's glory was man's glory too. Therefore he was interested in all human spheres. To be in the state of yoga is what the Christian tradition of spirituality basically means by being prayerful or a contemplative. Hence the advice is 'to be engaged in activities while remaining a contemplative', or be a 'contemplative in action', a *karma-yogi*. This is the ideal that Chavara, true to his rootedness in the Christian and Carmelite traditions of spirituality, realized in his own person (Kochumuttam, 2004). His spiritual vision led him to be an innovator of many socio-pastoral, cultural, educational and social reforms. While he most conscientiously lived the life of a Religious, dedicated to the love and service of God, the same divine love in him inspired him to devote himself, as much as he could, to the love and service of men. It is a long and most praiseworthy record, his varied enterprises and activities for the religious, social, cultural and educational advancement of his fellow men.

As a man of contemplation he conversed with God as an intimate friend, seeking his presence in the deepest realm of his heart. At the same time he was an altruist – a man for others. Thus he proved that divinity and humanness are two sides of the same coin (Maria, 2014). He believed that the faith he professed should be shared with the less fortunate of his fellowmen, and that the right knowledge of the fatherhood of God and brotherhood of man would be the first step towards developing a self confidence in the poor people. This would eventually lead to lifting them up socially also (Chacko, 1959).

F. Need of Doing Justice

Chavara was always a promoter of justice. Felix (2004) reports that in the family code which he gave to the Parishners of Kainakari, he was laid several rules to safeguard the claims of the poor and the needy, for example: "do not allow beggars to leave your house empty- handed; do not fail to give as much as you can, by way of charity; never withhold just wages to the labors or make undue delay in paying them, because that is an offence that cries out to god for justice; do not insult the poor, neither vex them, because if God sees them weeping, He will surely wreak vengeance on you…" (CWC Vol. IV, IX/2, 1982).

In Chavara's time, the dalits were compelled to work. They were not given just wages. This was considered their obligation. Father Chavara objected to this system. He insisted that just wages should be provided. His view that God is with the poor, is similar to *dharidranarayan* concept of Swami Vivekananda. Father Chavara also proclaimed the glory of not possessing anything (Menon, 2005).

II. RADICAL STEPS

The steps taken by Chavara for social development mainly comprised in three areas. Educational reforms, literary contributions and charity works.

A. Educational reforms

Kerala was a protuberant domain on the educational record of the country from ancient times. Historians noted that with the upsurge of the temple to a place of importance in the social and cultural life of the people, educational establishments received distinct consideration as they molded a vital part of the temple complex itself. The practice of running educational institutions as part of the Hindu temple complex was a legacy of Buddhism and Jainism. They served in a way the needs of theological education as far as the Hindus were concerned. The Muslims also had their 'Madrasas' and Arabic colleges and the former attached to the mosques were used to give a course of religious instruction. There were village schools also which functioned for the general education of the non-Brahmins. Fr. Chavara did his primary education in such a village school.

By the beginning of the19th century the state government of Travancore began to take more interest in the field of education in line with the Protestant missionaries. And both Hindus and Protestants profited much out of this. But the educational condition of the Catholics was abysmal. Chavara realized that the community would even remain subjugated if they did not move with the times and so he decided that the religious congregation should concentrate on educational work. So in 1846 the monastery at Mannanam started a new institution of Sanskrit studies where the seminarians, and students from any caste or religion sat together and studied. As a Catholic institution, it was the first of its kind in the world.

Later in the year 1864, while he was the Vicar General of the Syrians, he took a very bold step, for which the country at large should be grateful to him. He issued a mandate, calling upon all parish churches under his jurisdiction to raise schools attached to each of them. For the poor students he arranged the provision to supply study materials, clothes and mid-day meals, which even the government schools were not providing at that time. If today the people of Kerala are literate to a high degree, it is largely because of the farsighted policy of Fr. Chavara in the establishment of a school for each parish (Panthaplackal, 2004). He was a brilliant scholar in literature well versed in seven languages viz. Malayalam, Tamil, Sanskrit, Latin, Italian, Portuguese and Syriac. Chavara was a great educationist. Till his time, the Church in Malabar had not advanced much in the field of education. It was natural that proficient as he was in several languages he became a powerful influence in the cause of education.

B. Literary enlightening

In 1846 Saint Chavara took essential steps in opening a printing press for the Church in Kerala. At that time there were only two printing presses in Kerala, one owned by Protestant missionaries and another run by the state government. First he approached the Protestant missionaries to get technical help to start a printing press. However, they refused to help. Hence, he somehow got permission to see the press operated by the government at Thiruvananthapuram, took mental note of its details, made a mini sample press with his own hands and asked a carpenter to make a full size press according to his model. The Carpenter was successful in implementing the plan of Saint Chavara. Thus the dream of Saint Chavara to begin a press for Catholics was realized. It was from this press that the first Malayalam daily newspaper, Deepika (Torch-bearer), came out in 1887. He was also the first Indian to start a printing press in the private ownership. This served to publish several books of devotion, prayers, and catholic doctrine. These served to propagate catholic news and literature among the people at large. This has also helped to create many young literary men and women among the Catholics in Kerala.

Amidst his diverse and manifold activities, he found time and leisure to write a few books, both in prose and in verse like *Atmanuthamam* (The lamentations of a repentant Soul- a poem), *Maranaveettil Paduvanulla Pana* (A poem to sing in the bereaved house), *Anasthaciayude Rakthasakshyam* (The martyrdom of Anastacia), historical notes as *Nalagamangal* (Chronicles), *Dhyana Sallapangal* (Colloquies in meditation) and 10 Eclogues (Shepherd Plays) on the birth of Christ. He took initiative in codifying the liturgical books like canonical prayers for priests and prepared the liturgical rubrics, liturgical calendar and office for the dead etc. His counsels to the Christian families given in the form of the "Testament of a Loving Father" is universally applicable and are relevant to this day. As an instruction manual for families its hundred thousands of copies in more than 30 editions were circulated to the Christian families of Kerala.

C. Charity Home

Chavara was very much compassionate towards the poor and marginalized people of the society. In the history of the life of the Church in Kerala, before the time of Chavara, there was no charitable institute as such, where the aged persons or orphans were cared for and protected; there was no pious association to help the dying in a spiritual way. The home for the sick and aged which Fr. Chavara started in 1869 at Kainakari was the first of its kind in Kerala. This was an institution to give refuge to the sick and destitute who had no one to look after them, and to prepare the dying to face a happy death. This was being run by the members of a lay charitable organization 'Confraternity of St. Joseph for happy death'. This was the beginning of the organized humanitarian work of the Kerala Church (Mundaden, 2008). In order to give food and clothing to the poor, Fr. Chavara had also bought few acres of land for financial support near the Mannanam Monastery.

IV. FINDINGS AND CONCLUSION

This study discloses the following facts regarding the role of St. Chavara as a social reformer in the society of Kerala.

1. His integral outlook towards society prompted him to evoke the awareness in the people to become aware of the duty to help others, accept the equal value of all, the importance of learning, the lofty status of women in the society and the need of doing justice. He also proved that spirituality encompasses humanism and the humanitarian services he had done being a sage give emphasis to this fact.
2. The radical steps taken by him in the educational, literary and charity realms trigger the development in the society especially among the Syrian Catholics.

On the basis of these findings it can justly concluded that St. Chavara was a social reformer who gave significant contributions to awaken the social cognizance of Kerala and become a trend setter to trigger its further progress. From his life, influences, and literary works one can conjecture that the social change he wished to create was one that upheld human dignity that approved human worth and hold everyone in equal respect and deference.

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Effect of Short Duration High Intensity and Long Duration Low Intensity Progressive Aerobic Exercise on Selected Health Related Fitness Components and Hematological Parameters on Male Students of Haramaya University

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Abstract- This study was conducted to compare the effect of short duration high intensity and long duration low intensity progressive aerobic exercise on selected health related fitness components and hematological parameters on male students of Haramaya University. Subjects were randomly assigned to short duration high intensity and long duration low intensity groups. Both experimental groups participated in aerobic exercise 3 days/week for 12 weeks. The variables selected for the study were: cardiovascular endurance, muscular endurance, flexibility, body composition, WBC, RBC, hemoglobin and platelets. Throughout the training program, tests were taken at pre training, during training, post training. The results obtained in this study indicated that there were significant improvement in selected variables in both groups except BMI, hemoglobin and platelets under long duration low intensity group in which they showed insignificance ($p < 0.05$). According to this study when both groups compared, the short duration high intensity training program was significantly better than long duration low intensity training program in improving cardiovascular endurance, muscular endurance, flexibility, body composition, white blood cell, red blood cell, platelets and hemoglobin.

Index Terms- Aerobic exercise, health related fitness components, hematological parameters.

I. INTRODUCTION

Exercises are generally grouped into three types depending on the overall effect they have on the human body: aerobic exercises, flexibility exercises, and anaerobic exercises. Aerobic exercise has the aim of improving the body's consumption of oxygen. Aerobic refers to our body's use of oxygen in its metabolic process (energy-generating process). Most aerobic exercises are done at moderate levels of intensity for longer periods, compared to other categories of exercise (Birch *et al*., 2005).

Recently physiological and hematological changes due to different physical activities have received much attention from many corners of the society. Since some exercise sessions have higher intensity, especially at in-season tournaments, the circulatory system and hematological variables may undergo changes that in the long run considerably influencing performance and the result of the competition (Fereshteh *et al*., 2012).

Moreover exercise training causes the body to adapt and improve performance over time. One area of ongoing interest is the adaptations that take place in physical fitness and the production of blood as a response to exercise (AJH, 2011).

Today the biggest problem in the world specifically in our country is lack of physical performance. Most studies indicated that this impairment can be partially prevented by aerobic exercise. Aerobic exercise can be an important component of improving physical fitness and therefore is commonly included in comprehensive fitness maintenance program. Whilst it remains controversial which mode and intensity of exercise yields the most beneficial adaptations and is the most effective for improving performance and reduces metabolic syndrome, some research indicates that short duration, high intensity exercise reaps many benefits than continuous low-moderate exercise and the other says vice versa (Rognmo *et al., 2004).*

The general objective of this research study was to compare the effects of short duration high intensity and long duration low intensity of progressive aerobic exercise on selected health related fitness components and hematological parameters on male students of Haramaya University. The specific objectives were to compare the effect of short duration high intensity and long duration low intensity progressive aerobic exercise on cardiovascular endurance, muscular endurance, flexibility and body composition and to find out the relative changes between short duration high intensity and long duration low intensity progressive aerobic exercise on selected hematological parameters.

II. MATERIALS AND METHODS

The Study Design

The design for the study was experimental and the layout for this study was as the following table;

Table 1. The study design layout

Total sample		
Group	Group-1 (SDHI)	Group-2 (LDLI)
Treatment	Aerobic exercise	Aerobic exercise
Frequency	3days/week	3days/week
Duration /session	45 minutes	90 minutes
Intensity	High (75-85 %HR_{max})	low (40-50%HR_{max})
Time of training	Afternoon (4:30-5:15Pm).	Afternoon (4:30-6:00Pm).

In order to determine the heart rate of the students during exercise the karvonen method formula was used.

First maximal heart rate (HRmax) of the individual was calculated as follows;

HRmax = 220-age of the individual

Then, THR = ((HR_{max} − HR_{rest}) × % intensity) + HR_{rest} (Oscan *et al.*,2011).

Sample Size and Sampling Technique

Simple random sampling was used up on the parameters set by the researcher based on prepared aerobic exercise readiness questionnaire (PARQ). The experimental groups were divided in to two i.e. short duration high intensity and long duration low intensity group. Both groups contain 10 male students.

Methods of Data Analysis

The data collected through fitness tests and laboratory tests were analyzed, interpreted and tabulated into meaningful idea using manually and software to compare the selected health related fitness components and hematological parameters changes observed in both groups. In this study it was carried out by the Descriptive Statistical Analysis Coded and analyzed in SPSS version 16.0 software. Calculating measures of central tendency like mean and calculating measures of dispersion like standard deviation, T-test, were used in this research.

Exercise Training Protocol

Selected subjects relatively within a range of equal number of age and BMI were assigned randomly into two groups; the first group was assigned in SDHI aerobic exercise and the other group was assigned in LDLI progressive aerobic exercise. The exercise training program was consists of aerobic exercise such as treadmill running, fitness walking, jumping rope, badminton, endurance, push up, step up, cycling, aerobic dance, running and etc. for both groups. But the intensity and duration of the exercise was different. (75-85% of maximum heart rate & 45 minutes for SDHI and 40-50% maximum heart rate & 1:30 hour for LDLI aerobic exercise group).

The weekly exercise program was conducted on Monday, Wednesday, and Friday at afternoon (5:00pm-5:45pm) for SDHI group and Tuesday, Thursday, and Saturday afternoon (4:30pm-6:00pm) for LDLI aerobic exercise group.

III. RESULTS AND DISCUSSIONS

3.1. Anthropometric Test Results and Discussion

Table 2. Mean Body weight (kg), Body height (m) and Body mass index (BMI kg/m2) for male beginner athletes of Haramaya University under short duration high intensity (SDHI) and long duration low intensity (LDLI) experimental groups.

	SDHI			LDLI		
	PT	DT	PoT	PT	DT	PoT
BW	62.8 ± 3.22	63.5 ± 3.37	64.75±3.26	62.85±2.88	63.35±2.88	63.35±2.86
BH	1.77±0.07	1.77±0.07	1.77±0.07	1.75±0.05	1.75±0.05	1.75±0.05
BMI	20.01±1.14	20.25±1.33	20.67±1.56	20.37±1.31	20.54±1.29	20.55±1.35

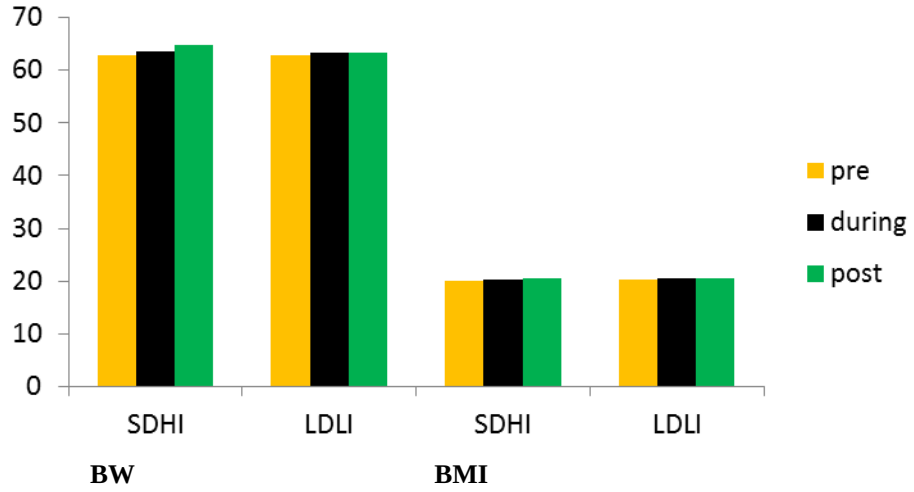
Values are mean ± SD, SDHI= short duration high intensity, LDLI= long duration low intensity, PT= pre training test, DT= during training test, PoT= post training test, BW= body weight, BH= body height, BMI= body mass index.

Table two showed that the body weight and body mass index changed both in SDHI and LDLI experimental groups. The mean difference showed that there was an improvement in body weight in both groups even though the improvement shown in LDLI was insignificant. This was due to progressive aerobic exercise they were participated in. The SDHI improved body weight by 1.95 and the LDLI improved by 0.5 mean values. Therefore, according to this data there is a greater change in the SDHI than LDLI group.

The mean value of body mass index (BMI) was increased from pre training test to post training test in both groups and more significant change was distinguished in the SDHI group. The mean value of SDHI group before training was 20.01 and improved to 20.67 after the training program while the LDLI was

20.37 before training and increased to 20.55 after the training program. After the training program, the SDHI was exhibited an improvement of 0.66 mean values however, the LDLI was improved by 0.18 of mean values. This result indicates that the SDHI training program was better than the LDLI training program.

Figure 1. Comparison of mean Body weight (kg), Body height (m) and BMI (kg/m^2) at PT, DT and PoT for male beginner athletes' of Haramaya University under SDHI and LDLI experimental groups.



SDHI= short duration high intensity LDLI= long duration low intensity, BW= body weight BMI= body mass index

3.2. Performance Variables Test Results and Discussion.

Table 2. Mean values of Step test (bpm) Push up and Sit & reach (cm) for 20 male beginner athletes of Haramaya University students under SDHI and LDLI experimental groups.

	SDHI			LDLI		
	PT	DT	PoT	PT	DT	PoT
ST	42.49 ± 2.88	46.14 ± 2.47	47.15 ± 2.94	43.45 ± 3.08	44.97 ±3.38	46.14 ± 2.83
PU	4.60 ± 4.27	14.40 ± 5.66	17.40 ± 6.51	8.40 ± 3.97	11.60 ± 3.30	15.00 ± 4.64
SR	1.25 ± 1.11	4.40 ± 2.28	7.35 ± 1.78	1.05 ± 1.14	4.05 ± 1.18	5.75 ± 1.16

Note: SDHI = Short Duration High Intensity, LDLI = Long Duration Low Intensity, ST=step test, PU= push up, SR= sit & reach, PT = Pre Training, DT = During Training, Pot = Post Training and All Values are Mean ± SD.

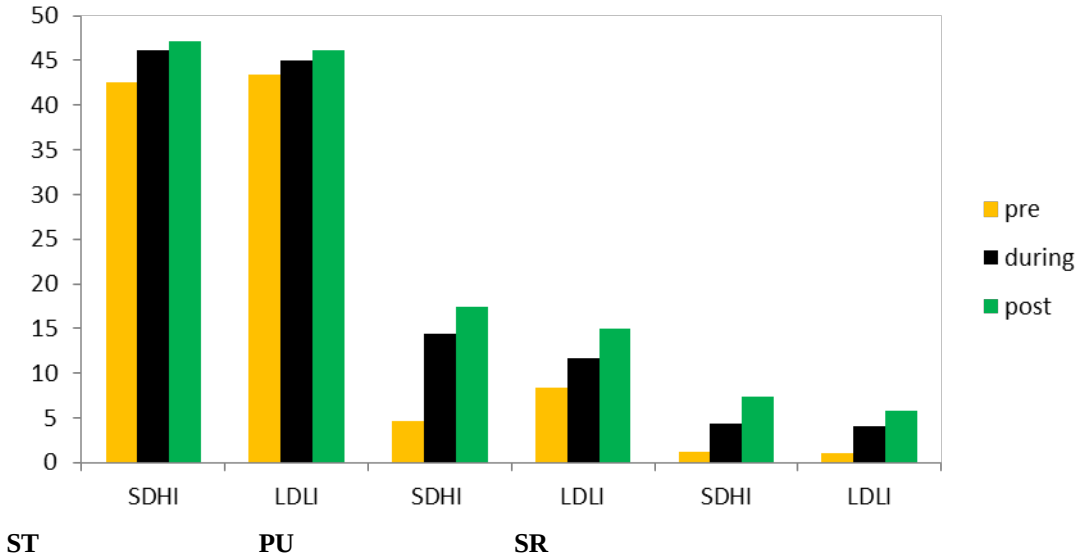
The above table shows that ST changed in both experimental groups; i.e short duration high intensity and long duration low intensity. However, when we see the mean difference between the two groups, it indicated that in SDHI it was improved by 4.66 and in LDLI by 2.69. The greater improvement in the SDHI implies that short duration high intensity aerobic exercise improved cardiovascular endurance of male beginner athletes than LDLI program. This is due to the intensity of exercise, at high intensity exercise, the number of capillaries in trained skeletal muscle, thereby allowing a greater capacity for blood flow in the active muscle.

In the above push up results, the mean difference indicates that there was an improvement in both experimental groups. This is due to progressive aerobic exercise both groups were engaged in. As indicated in the above table the mean value of push up for SDHI before training was 4.60 and this result was improved to 17.40 after training program while the result of LDLI was 8.40 before training and improved to 15.00 after training. When we come to compare which exercise program had brought significant change, the mean difference of SDHI and LDLI groups were 12.8 and 6.60 respectively. Therefore, the difference in between the mean was much more in case of SDHI than the LDLI group.

There was a significant mean difference in the sit and reach tests between the SDHI and LDLI groups (table 3). Compared to LDLI group, SDHI had a better mean increment in sit and reach test during the study. As indicated in table 3, the mean value of sit and reach for SDHI was 1.25 before training and 7.35 after training and the mean value of LDLI was 1.05 before training and 5.75 after training. Then, at the end of the study period, the mean of SDHI group was increased by 6.1 however the mean of LDLI was increased by 4.7. In both experimental groups the results indicates that both SDHI and LDLI improved sit and

reach performance but, there is a greater improvement in SDHI than LDLI training program.

Figure 1. Comparison of Step test, Push up and Sit & reach at PT, DT and PoT for male beginner athletes of Haramaya University under SDHI and LDLI experimental groups.



SDHI=short duration high intensity, LDLI= long duration low intensity, ST=step test, PU= push up, SR= sit and reach.

3.3. Hematological Test Results and Discussion.

Table 3. Mean values of white blood cell (µl), red blood cell (µl), hemoglobin (g/dl) and platelets (µl) for 20 male beginner athletes of Haramaya University under SDHI and LDLI experimental groups.

	SDHI			LDLI		
	PT	DT	PoT	PT	DT	PoT
WBC	5.86±1.44	6.24±1.49	6.69±1.38	6.63±1.70	6.70±1.99	6.89±1.77
RBC	4.51±0.29	4.88±0.14	5.34±0.13	4.59±0.34	4.73±0.32	4.84±0.29
HB	15.37±0.93	15.72±0.82	16.4±0.65	16.05±0.77	16.18±0.75	16.2±0.97
PLT	263.3±55.4	277.7±51.6	308.8±51.7	297±55.4	304.4±55.8	312.9±57.4

Values are mean ± SD, SDHI= short duration high intensity, LDLI= long duration low intensity, PT= pre training test, DT= during training test, PoT= post training test, WBC= white blood cell, RBC= red blood cell, HB= hemoglobin, PLT= platelets.

Table 4 indicates that the mean value of white blood cell (WBC) of the selected subjects were increased in the test after progressive aerobic exercise than the test before engaging in training in both short duration high intensity and long duration low intensity. The mean value of WBC for SDHI group before training was 5.86 $x10^3$µl and 6.69 $x10^3$µl after training. Here, the SDHI improved by 0.83 mean values, while the mean value of WBC for LDLI was 6.63 $x10^3$µl and 6.89 $x10^3$µl before and after training respectively. Therefore, the mean difference value of 0.26 improvements was shown in LDLI. Based on the mean difference value, the greater improvement and significant change was shown in SDHI than LDLI group. The more stress leukocyte, accompanies the exercise, the more the leukocyte increases. Especially in intense exercises, this increase is more obvious.

As indicated in table 4 the mean value of RBC distribution of SDHI group of the subjects before training was 4.51 $x10^6$µl and after they engaged in progressive aerobic exercise, the mean value of RBC of this group was increased to 5.34 $x10^6$µl. At the end of the study period, totally the mean value of RBC of this group was improved by 0.83. Statically highly significant mean difference have been observed in SDHI group. The mean value of RBC for LDLI group before training was 4.59 $x10^6$µl and this mean value of RBC was increased to 4.84 $x10^6$µl after progressive aerobic training. The mean difference value of RBC for LDLI group was improved by 0.25. When we compare which training program was better, the SDHI group has shown a greater improvement than LDLI group.

In Hemoglobin (HB) test, the mean value of both short duration high intensity and long duration low intensity group was increased. The mean difference showed that there was a better improvement in the SDHI group. The mean value of SDHI was increased from 15.37 g/dl to 16.40 g/dl and showed an improvement of 1.03 g/dl. On the other hand, the LDLI group

was increased from 16.05 g/dl to 16.20 g/dl. The mean difference for this group was improved by 0.15 g/dl even though the result was insignificant. It might be possible to conclude that the short duration high intensity of progressive aerobic exercise has positive effects on the amount of hemoglobin.

The mean value of platelet count was increased both in SDHI and LDLI. The reason was the progressive aerobic exercise program they were engaged in. The SDHI group had increased from 263.3 x 10^3µl to 308.8 x 10^3µl. The mean difference of platelets count for SDHI was improved by 45.5µl. On the other hand, the mean value of platelets count for LDLI increased from 297 x 10^3µl to 312.9 x 10^3µl. The mean difference of 15.9µl was recorded in the LDLI group. However, when we compare both groups; the SDHI group brought a significant improvement in the amount of platelets than the LDLI group.

Figure 2. Comparison of WBC and RBC of PT, DT and PoT values for male beginner athletes of Haramaya University under SDHI and LDLI experimental group

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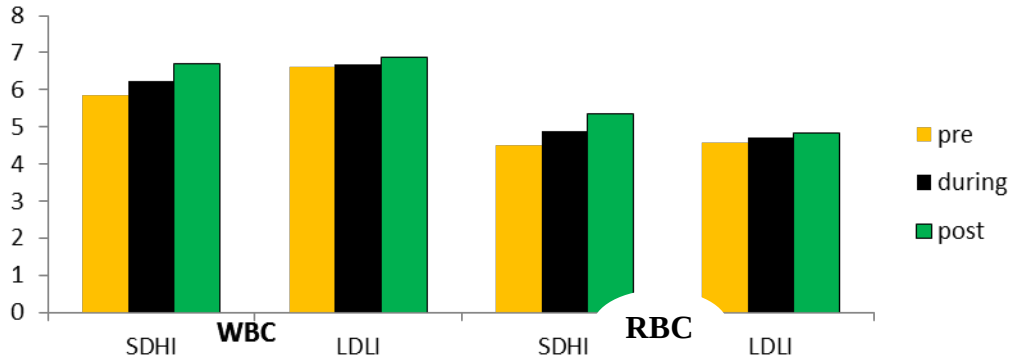
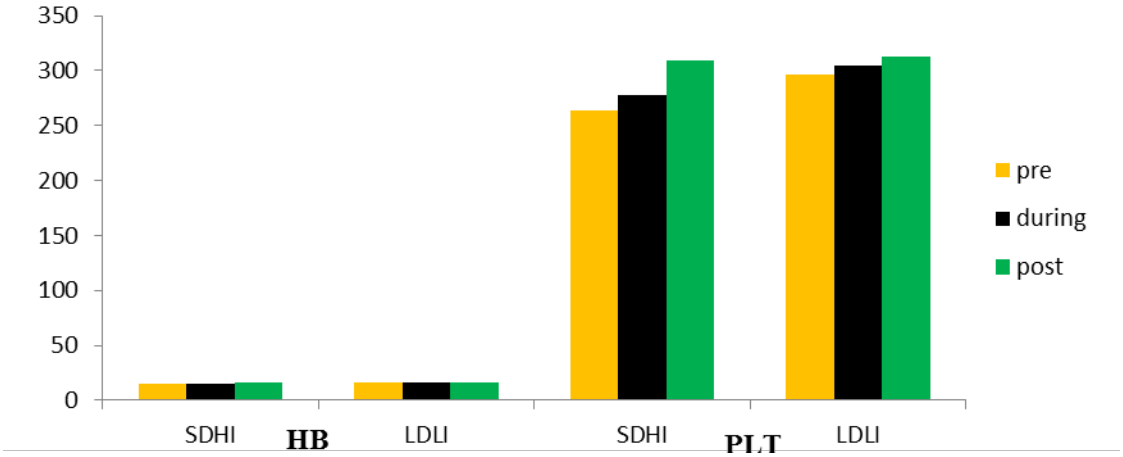


SDHI= short duration high intensity, LDLI= long duration low intensity, WBC= white blood cell RBC= red blood cell.

Figure 3. Comparison of Hemoglobin (HB) and Platelets (PLT) of PT, DT and PoT of male beginner athletes of Haramaya University under SDHI and LDLI experimental groups.



SDHI= short duration high intensity, LDLI= long duration low intensity, HB= hemoglobin, PLT= platelets.

IV. CONCLUSIONS

With the possible limitation of the study, the following conclusions were made.

- Short duration high intensity training program was found to be better than long duration low intensity training program in improving cardiovascular endurance of the participants.
- Short duration high intensity training program was improved muscular endurance more than long duration low intensity training program of the study participants.
- Both short duration high intensity and long duration low intensity training program improved flexibility and body composition of the study participants.
- Short duration high intensity training program was better than long duration low intensity training program in improving the number of white blood cells, red blood cells, platelets and the amount of hemoglobin.

- Both, short duration high intensity and long duration low intensity progressive aerobic exercise programs had shown significant change ($p \leq 0.05$) in improving the selected variables of health related fitness components and hematological parameters except BMI, hemoglobin and platelets under LDLI in which they showed insignificant.

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Effect of Physical Activities in Lowering Blood Pressure in Hypertensive Patients: The Case of Haramaya University Main Campus Employee, Ethiopia

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Abstract- Background: A variety of lifestyle modifications including weight loss in the overweight and regular aerobic physical activities have been shown in clinical trials to lower blood pressure in hypertensive patients. This study aims to investigate the effect of physical activities in lowering blood pressure in hypertensive patients subjected to consecutive physical activities training sessions. **Method:** A sample of 12 female hypertensive patients diagnosed with hypertension for more than one year were purposively selected from those hypertensive patients visited the primary care center for their regular follow up. A laboratory experiment was conducted in April, 2012 at Haramaya University Health Center. Patients whose systolic blood pressure reading < 180 mmHg, and diastolic blood pressure reading < 110 mmHg and heart rate reading <100 b/m were included in the study. Hematological and biochemical tests and systolic and diastolic blood pressure reading was employed for data collection. Data analysis was made using SPSS Version 15.0. **Result:** Physical activities training induced significant net weighted reductions in blood pressure readings by 17.00/11.08 mmHg (P<.0001), and resting heart rate by 15.58 b/m (P<.0001), and RBC count by 2.6 ml/cm^3 (P<.0001), body weight and BMI by 9.5 kg and 3.65 (P<.0001), respectively. In addition, training induced significant net weighted reductions in uric acid by 2.9 mg/dl (P<.0001), sodium by 30.67 mmol/l (P<.0001), potassium by 3.92 mmol/l (P<.0001), creatine by 0.57 mg/dl (P<.0001) and triglyceride by 71.98 mg/dl (P<.0001). Furthermore, physical activities training induced significant net weighted increment of hemoglobin by 3.43 g/d (P<.0001), WBC by 2.16 ml/cm^3 (P<.0057), platelet by 113.92 ml/cm^3 (P<.0001) and albumin by 0.38 g/l (P>0.05).

Conclusion: This study revealed that training from 3 – 5 times per week with an average of 4 times per week during 20 – 60 minutes per session with a mean session length of 40 minutes at intensity of 40% – 60% with a mean of 50% of net maximal oxygen uptake (VO_2max) physical activities training performance is recommended to lower blood pressure in hypertensive patients.

Index Terms- Blood pressure, aerobic physical activity, VO2max.

I. Introduction

Hypertension remains a major public health challenge in both economically developing and developed countries (1). Worldwide prevalence estimates for hypertension may be as much as 1 billion individuals, and approximately 7.1 million deaths per year may be attributable to hypertension (2). It is the most widely recognized risk factor for cardiovascular disease (CVD), cerebrovascular disease and end-stage renal disease. The importance of treating this "silent killer" lies in its associated risk to cardiovascular disease, which is one of the cause of death in both economically developing and developed countries as well as other maladies including renal disease, stroke, heart failure, and peripheral artery disease (3).

Many studies have reported a significant relationship between hypertension and risk factors such as age, body mass index, smoking and physical inactivity (4). Physical inactivity may be responsible for various chronic disease conditions including hypertension. Hypertension therapy and medications are available that can control blood pressure with minimal side effects. Yet inadequate blood pressure control remains too common, contributing to excess cardiovascular morbidity and mortality. Prevention of hypertension by lifestyle modifications may be one of the ways to decrease the cardiovascular disease (CVD) population risk attributed to hypertension (5). A variety of lifestyle modifications such as weight loss in the overweight, increased physical activity, eating a diet with increased fresh fruits and vegetables and reduced saturated fat content, and reduction of dietary sodium intake plays a great role in lowering blood pressure in hypertensive patients (6). A prospective study from Finland in 2005 showed that overweight and obese subjects were associated with an increased risk of hypertension and the protective effect of physical activity was consistent in both overweight and normal weight subjects (7). There is no longer any question concerning the role of aerobic physical activity in controlling or lowering blood pressure in hypertensive patients (8). Health workers agree that regular aerobic physical activity is an important aspect of a healthy living beyond high blood pressure concerns. It makes the heart and blood vessels more flexible and efficient and prevents possible onset of high blood pressure for people who currently are not hypertensive. Thus, the flexibility of blood vessels and efficiency of the heart are at the center of blood pressure control, management and treatment (8). As pertains to which physical activity in particular, it is true that

not all types of physical activities are beneficial to lower blood pressure. Hypertensive patients need to focus on particular activities that benefit the heart and blood vessels. However, aerobic physical activities are what are recommended for hypertensive patients (9)**.** At the present time, most hypertensive patients are laden with overweight because of physical inactivity. Having overweight body particularly causes strain on an individual's heart which has the net effect of raising blood pressure. It therefore, follows that losing weight will lower blood pressure for people who are already hypertensive and prevents possible onset of high blood pressure for people who currently are not hypertensive (10)**.** The main aim of this study was to determine the effect of physical activities in lowering blood pressure in hypertensive patients subjected to consecutive physical activities training sessions.

II. METHODS

A laboratory experiment was conducted in April, 2012 at Haramaya University Health Center to investigate the effect of physical activities in lowering blood pressure in hypertensive patients subjected to consecutive aerobic physical activities training sessions. A sample of 12 female hypertensive patients were selected using purposive technique from those hypertensive patients visited the primary care center for their regular follow up. A laboratory experiment for hematological and biochemical tests and systolic and diastolic blood pressure and heart rate reading was employed for data collection. The physical activities mode for the treatment of hypertension was cardiovascular mode, for duration length of 20 - 60 minutes, frequency of 3 - 5 days per week, at intensity of 40 - 60% of net maximal oxygen uptake physical activity performance (VO_2max). Data analysis was made using SPSS Version 15.0. Ethical clearance was approved by Haramaya University Ethical Board. Client consent was taken and confidentiality was maintained.

III. OPERATIONAL DEFINITION

- **Blood pressure**: refers to the force exerted on the wall of the blood vessels by the blood as a result of contraction of the heart (systole) or relaxation of the heart (diastole).
- **Aerobic physical activity**: an activity performed by using oxygen.
- **VO_2max**: the largest amount of oxygen an individual use during physical activities.

IV. RESULT

A total of 12 female hypertensive patient of Haramaya University were participated. The response rate was 100%. Age of the study samples ranges from 45 to 60 years. All of the study samples were married 12 (100%). Physical activities training induced significant net weighted reductions in blood pressure readings by 17.00/11.08 mmHg (P<.0001), and resting heart rate by 15.58 b/m (P<.0001).

The results of the current study revealed that, participation of regular aerobic physical activities training resulted in weighted net decrease of body weight by 9.5 kg and body mass index (BMI) by 3.65 which had a major contribution in lowering blood pressure in hypertensive patients. Similarly, systolic, diastolic and heart rate readings resulted in average net reduction by 17.00 mmHg, 11.08 mmHg, and 16.58 b/m, respectively.

Furthermore, the results obtained clearly indicated that participation of moderate to high intensity (40% - 60% of net maximal oxygen uptake physical activity performance (VO_2max) with a mean of 50% VO_2max, frequency ranged from 3 – 5 times per week with an average of 4 times per week and duration per session varied from 20 – 60 minutes with a mean session length of 40 minutes) of regular aerobic physical activity training resulted in weighted net reduction of red blood cells (RBC) by 2.6 ml/cm^3, uric acid by 2.9 mg/dl, sodium by 30.67 mmol/l, potassium by 3.92mmol/l, Creatine by 0.57 mg/dl, triglyceride by 71.98 mg/dl, and weighted net increment of white blood cells (WBC) by 2.16 ml/cm^3, platelet by 113.92 ml/cm^3 and hemoglobin by 3.43 g/d and no significance difference (P>0.05) was observed on the level of albumin. The patient's hemoglobin count was significantly increased by 3.43 g/d (25.13%) within population normative range (12 - 17.4 g/d) throughout the whole study period. The patient's platelet count was significantly increased by 113.92 ml/cm^3 (44.97%) within population normative (150 - 400 ml/cm^3) throughout the whole study period.

Table 1. Mean effect of physical activities on changes of weight and BMI of hypertensive patients, HU, Eastern Ethiopia, 2012.

Parameters	Experiments			F Value	Pr > F
	Before	Between	After		
Weight (kg)	78.00	72.6 7	68.50	146.30	<.0001
Height (m)	1.61	1.61	1.61	6.09	<.0001
BMI	30.31	28.24	26.65	480.12	<.0001

HU = Haramaya University

Table 2. Mean effect of physical activities on changes of HB, RBC, WBC and platelets of hypertensive patients, HU, Eastern Ethiopia, 2012.

1. Parameters	2. Experiments			3. F Value	4. Pr > F
5.	6. Before	7. Between	8. After	9.	10.
11. HB (g/d)	12. 13.65	13. 15.89	14. 17.08	15. 1.90	16. 0.0963
17. RBC (ml/cm^3)	18. 7.07	19. 5.19	20. 4.47	21. 2.05	22. 0.0728
23. WBC (ml/cm^3)	24. 5.76	25. 7.27	26. 7.92	27. 2.08	28. 0.0686
29. Plt (ml/cm^3)	30. 253.33	31. 307.83	32. 367.25	33. 1.35	34. 0.2640

HU = Haramaya University

Table 3. Mean effect of physical activities on changes of blood pressure and heart rate readings of hypertensive patients, HU, Eastern Ethiopia, 2012.

Parameters	Experiments			F Value	Pr > F
	Before	Between	After		
SBP (mmHg)	161.67	153.33	144.67	100.41	<.0001
DBP (mmHg)	93.83	89.17	82.75	19.97	<.0001
HR (b/m)	91.00	81.58	74.42	5.43	0.0004

HU = Haramaya University

Table 4. Mean effect of physical activities on biochemical changes of hypertensive patients, HU, Eastern Ethiopia, 2012.

Parameters	Experiments			F Value	Pr > F
	Before	Between	After		
Uric acid (mg/dl)	6.28	4.83	3.38	10.31	<.0001
Albumin (g/l)	39.58	38.56	39.96	1.73	0.1320
Sodium (mmol/l)	166.76	149.78	136.09	6.23	0.0001
Potassium (mmol/l)	7.88	5.65	3.96	4.35	0.0016
Creatine (mg/dl)	1.80	1.42	1.23	7.81	<.0001
Triglyceride (mg/dl)	182.92	147.13	110.94	8.20	<.0001

HU = Haramaya University

V. DISCUSSION

The results of this study tend to indicate that regular aerobic physical activities training session significantly reduced the resting heart rate by 16.58 b/m ($P<0.05$) of the patients which is in agreement with research findings reported by Chobanian, et al.**,** 2009 as 15 - 20 b/m (12).

Systolic blood pressure reading was significantly lowered by 17.00 mmHg (11.75%) and diastolic blood pressure by 11.08 mmHg (13.39%) ($P<0.05$) for hypertensive patients throughout the whole physical activities training sessions which is in agreement with research findings reported by Padilla**,** et al, 2005) as 12/10 mmHg blood pressure readings (13) and Hagberg, *et al.*, 2000 as 5 - 25 mmHg for systolic and 3 - 25 mmHg for diastolic blood pressure with the average reduction for hypertensive patients to be 11 mmHg for systolic and 8 mmHg for diastolic blood pressure (8).

The patient's body mass index decreased by 3.65 (13.73%) throughout the whole study period and the patient's BMI changed from obese to overweight which is in agreement with research findings by Marengo, et al., 2004 (7) reported that systole and diastole reductions could be observed following weight and BMI loss, dietary modification and improvement of cardiovascular endurance, flexibility of joints, strength and efficiency of the heart and increased aerobic physical activities training. The patient's white blood cell (WBC) count was significantly increased by 2.16 ml/cm^3 (37.5%) within population normative (4 - 10 ml/cm^3) throughout aerobic physical activities training sessions which is in agreement with research findings by Seneczko, 2008 (15) reported as regular aerobic physical activities training program enhances an increase of white blood cell count that plays a major role in immune function of hypertensive patients. The patient's hemoglobin count significantly increased by 3.43 g/d (25.13%) within population

normative range (12 - 17.4 g/d) throughout the whole study period which is in agreement with research findings by Dickinson, *et al.*, 2006 (14) reported as regular aerobic physical activity enhances the amount of hemoglobin count by 1.89 g/d for hypertensive patients.

VI. CONCLUSION

The results of the current study revealed that, participation of regular aerobic physical activities training resulted in weighted net decrease of body weight by 9.5 kg and body mass index (BMI) by 3.65 which had a major contribution in lowering blood pressure in hypertensive patients. Similarly, systolic, diastolic and heart rate readings were resulted in weighted net reduction by 17.00 mmHg, 11.08 mmHg, and 16.58 b/m, respectively.

Furthermore, the results obtained clearly indicated that participation of moderate to high intensity (40% - 60% of net maximal oxygen uptake physical activity performance (VO_2max) with a mean of 50% VO_2max, frequency ranged from 3 – 5 times per week with an average of 4 times per week and duration per session varied from 20 – 60 minutes with a mean session length of 40 minutes) of regular aerobic physical activity training resulted in weighted net reduction of RBC by 2.6 ml/cm^3, uric acid by 2.9 mg/dl, sodium by 30.67 mmol/l, potassium by 3.92mmol/l, Creatine by 0.57 mg/dl, triglyceride by 71.98 mg/dl, and weighted net increment of WBC by 2.16 ml/cm^3, platelet by 113.92 ml/cm^3 and hemoglobin by 3.43 g/d and no significance difference (P>0.05) was observed on the level of albumin.

To conclude, the present study revealed that training from 3 – 5 times per week with an average of 4 times per week during 20 – 60 minutes per session with a mean session length of 40 minutes at intensity of 40% – 60% with a mean of 50% of net maximal oxygen uptake (VO_2max) physical activities training performance is recommended to lower blood pressure in hypertensive patients.

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Skewness Corrected Control Charts for Random Queue Length

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Abstract- Classical Shewhart kind control charts are based on normality assumption and ignore the skewness of the plotted statistic in the construction of control charts. Generally the skewness is large enough to be overlooked and in such situation the traditional chart is improper to give satisfactory performance. In this paper, we present a comparative study and present best control chart based on skewness and kurtosis for random queue length for M/M/1 queueing model evaluated on the basis of performance measure false alarm rate.

Index Terms- Control limits, false alarm rate, Haim Shore method, kurtosis correction method, (M/M/1): $(\infty/FCFS)$ queueing system, Shewhart method, skewness correction method, skewness and kurtosis correction method

1. INTRODUCTION

Queueing system has the following types of system responses of interest:

(i) Some measure of waiting time that a customer might be forced to bear that is the time a customer spends in the queue and the total time a customer spends in the system (queue plus service).

(ii) The number of customers in the queue and the total number of customers in the system.

(iii) A measure of facility utilization.

As most queueing systems have stochastic elements, these measures are often random variables and their probability distributions or their average values are desired. Depending on the type of system under study, one may be of more interest than the other. The problem is to find out the values of appropriate measures for a given system, which quantifies the phenomenon of waiting in queues that is the average number of customers in queue, average waiting time in queue/system and average facility utilization. Thus average queue length and average waiting time are the main observable characteristics of any queueing system. In this paper, control charts are proposed for the monitoring of random queue length of (M/M/1): $(\infty/FCFS)$ queueing systems. A service system in which customers arrive at random to avail service is known as queueing system and if a server is busy then the customer has to wait, resulting in a queue. The customer waiting in queue is served when a server becomes available according to first come, first serve queue discipline. The characterizing feature of a single server queue is that both the inter-arrival time and the service times are exponentially distributed with parameters λ and μ respectively. Further there is no limit to queue size. Let random variable (r.v.) N denote the number of customers in the system (either served or waiting). In this paper control charts are constructed for N by various methods which can serve as follows:

1. To monitor the stability of the queueing system in terms of N where an out of control signal signify change in any of the parameter that determine N say traffic intensity or in arrival or service rate of the system or rise in variance.
2. The upper control limit of N can be taken as upper patience limit of a customer in queue which can be used further in studying one of the important performance measures of queueing system.

3. In case these control limits are informed beforehand to customers, then abandonment of service by customer because of impatience reduces. Performance of any queueing system is judged to be satisfactory if a customer has to wait for minimum period of time within his/her patience limit in the system to get service, in concise queue length should be small.

All of the cases discussed above rely heavily on the goodness of the control chart limits [8]. Mean, standard deviation, skewness and kurtosis are used in calculating the control limits. It is also assumed that the control charts relate to individual observations. Through numerical analysis of the performance measure, control charts obtained by different methods are compared to find the best performing control chart.

2. Literature Review

Control charts are one of the powerful tools of statistical process control, widely accepted and applied in industry. Basically used to improve productivity, prevent defects and unnecessary process adjustments, also provides information in diagnosis and process capability. Control chart effectiveness is based on control limits to detect whether a process is in control. The traditional charts are based on the assumption that the distribution of the quality characteristic is normal or approximately normal [2]. However, in many situations this normality assumption of process population is not valid when the process distribution is found to be skewed.

If the underlying process distribution is skewed, then methods with which false alarm rates can be controlled to the desired level for an arbitrary skewed distribution are required. A great deal of literature developed various methods to deal with skewness of process distribution. Chan and Cui [2] took the degree of skewness of the underlying process distribution and proposed skewness correction (SC) method for constructing control charts for skewed distribution. Kurtosis correction method was developed to set up control charts for the symmetric and leptokurtic distribution [8]. A skewness and kurtosis correction (SKC) method was proposed to derive control charts with no assumption of the underlying process distribution, that takes into account the degree of skewness and kurtosis of the process distribution and provides the control limits using three standard deviation and adding the known function of skewness and kurtosis [9].Control charts for attributes data were developed, where the monitoring statistic may have a skewed distribution and implemented for the study of queue length of M/M/s system [7].This paper uses control charts developed through heuristic methods with no assumptions on the process distribution for obtaining upper control limit for characteristic i.e. number of customers in the queueing system. Performance of control charts are judged on the basis of false alarm rate.

3. Probability distribution of the system size N

(M/M/1): (∞/FCFS) is taken for study as it models a large number of queueing problems has Poisson input, exponential service time, single server with first come, first serve queue discipline and infinite capacity. In the construction of control chart for N, characteristics of distribution of r.v. N is needed.

Let r.v. N be the number of customers in the system (both waiting and in service) in steady state. The steady state probability distribution of r.v. N is given by, $p_n = P[N = n] = \rho^n(1-\rho), n = 0,1,2,\ldots,$ where $\rho < 1$ (1)

and $\rho = \frac{\lambda}{\mu}$ is the traffic intensity or utilization rate for single server queue, λ is the mean arrival rate and μ is the mean service rate.The r.v. N follows geometric distribution with parameter $(1-\rho)$. The distribution of the r.v. N depends on two parameters λ and μ only through their ratio. The model clearly suggests that, if control is possible, the parameters should be adjusted to make ρ approach 1, in order to achieve full utilization of the server.

3.1. Distributional properties of random variable N

The distributional properties of r.v. N namely mean, variance, skewness and kurtosis are displayed in the table given below.

Table I: Distributional properties of random variable N

E(N)	V(N)	γ_1	γ_2
$\frac{\rho}{1-\rho}$	$\frac{\rho}{(1-\rho)^2}$	$\frac{1+\rho}{\sqrt{\rho}}$	$(\frac{1}{\rho}+\rho)+4$

From the above table, it can be noted that various characteristics of N depends on traffic intensity ρ.

4. Numerical analysis of characteristics of distribution of r.v N

To study the effect of traffic intensity on the distributional properties of random variable N, a set of increasing values of ρ are selected mean, variance, skewness and kurtosis are computed and displayed in Table II. From this table, it is noted that as the values of traffic intensity (ρ) increases, the mean and variance increases rapidly. But for large values of ρ, the rate of increment in variance as compared to mean is larger, as such the expected value of N does not appear to have much relevance for large values of ρ. Although these quantities can be made arbitrarily large for sufficiently large ρ (<1), the system may therefore take long time to reach steady state equilibrium. It is observed that skewness, and kurtosis of the distribution of r.v. N decreases with increasing values of traffic intensity.

Table II: Mean, Variance, Skewness, and Kurtosis of r.v. N

ρ	E(N)	V(N)	γ_1	γ_2
0.1	0.11111	0.123	3.47851	14.1
0.2	0.25	0.313	2.68328	9.2
0.3	0.42857	0.612	2.37346	7.633333
0.4	0.66667	1.11	2.21359	6.9
0.5	1	2	2.12132	6.5
0.6	1.5	3.75	2.06559	6.266667
0.65	1.85714	5.31	2.04657	6.188462
0.7	2.33333	7.78	2.03189	6.128571
0.75	3	12	2.02073	6.083333
0.8	4	20	2.01246	6.05
0.85	5.66667	37.8	2.00661	6.026471
0.9	9	90	2.00278	6.011111
0.91	10.1111	112	2.00222	6.008901
0.92	11.5	144	2.00174	6.006957
0.93	13.2857	190	2.00132	6.005269
0.94	15.6667	261	2.00096	6.00383
0.95	19	380	2.00066	6.002632
0.96	24	600	2.00042	6.001667
0.97	32.3333	1080	2.00023	6.000928
0.98	49	2450	2.0001	6.000408
0.99	99	9900	2.00003	6.000101
0.991	110.111	12200	2.00002	6.000082
0.992	124	15500	2.00002	6.000065
0.993	141.857	20300	2.00001	6.000049
0.994	165.667	27600	2.00001	6.000036

0.995	199	39800	2.00001	6.000025
0.996	249	62300	2	6.000016
0.997	332.333	111000	2	6.000009
0.998	499	250000	2	6.000004
0.999	999	999000	2	6.000001

5. Construction of control charts for random variable N

Knowing the characteristics of the probability distribution of r.v. N control charts are constructed for N using different methods. These charts will be referred as C-charts. As the probability function of a geometric distribution is a monotonously decreasing function in n and since control limits for queueing system are to be computed, it would be meaningless to define lower control limit (LCL) for this distribution, however, obtaining upper control limit i.e. UCL would obviously make sense. Since, it will help in monitoring improbable high values of N (the monitoring statistic) and further help in controlling abandonment due to impatience. Hence, in all control charts defined for N, only UCL, α_u and ARL would be computed. The criteria used for out of control condition will be whenever a point falls outside the UCL, the system is said to be out of control. In other words, customers are running out of patience and might abandon the system. And hence investigation and corrective action are required to be taken to find and eliminate the causes responsible for this behaviour [6].

5.1. Control chart C_1: Shewhart method

The conventional Shewhart type control charts are used to determine whether a process is in a state of statistical control to bring out-of-control process into in-control and to monitor the process to confirm that it stays in control [5]. The limits are constructed by assuming that the underlying distribution is normal or approximately normal. Here, control chart can be used for on-line system surveillance and to improve the system.

Control limits for $\mathbf{C_1}$-chart for r.v. N when parameters are known [6]:

$$\left.\begin{aligned} UCL &= E(N) + L * \sqrt{V(N)} \\ CL &= E(N) \\ LCL &= E(N) - L * \sqrt{V(N)} \end{aligned}\right\} \quad (2)$$

where E(N) and V(N) are displayed in Table I and L(=3) is the "distance" of the upper control limit from the centre line, expressed in standard deviation units.

Control limits are used in determination of a performance measure of queueing system, hence a need for better performing charts.

5.2. Control chart C_2 : Skewness correction (SC) method

Skewness correction method corrects the Shewhart chart according to the degree of skewness of the distribution of r.v. N. It provides asymmetric control limits using ±3 standard deviations plus the same known function of the degree of skewness estimated from subgroups, and with no assumptions on the distribution.

The skewness correction C_2 chart is based on the following control limits, when parameters are known [2]:

$$\left.\begin{aligned} UCL &= E(N) + (3 + c_4^*)\sqrt{V(N)} \\ CL &= E(N) \\ LCL &= E(N) + (-3 + c_4^*)\sqrt{V(N)} \end{aligned}\right\} \quad (3)$$

where c_4^* denote skewness correction and is given by $c_4^* = \frac{\frac{4}{3}\gamma_1}{1+0.2\gamma_1^2}$ and E(N) , V(N) and $\gamma_1(N)$ are displayed in Table I. When $\gamma_1 = 0$, the SC chart reduces to the Shewhart chart. However, if the distribution is positively skewed, then the distance of the UCL from the CL is larger than that of the LCL from the CL. If the distribution is negatively skewed, then the distances are reversed, but the bandwidth of the control chart is always six.

5.3. Control chart C_3: Haim Shore method

Sometimes the skewness is too large to be ignored and may be crucial to the proper functioning. Ignoring skewness affects the performance of the control chart and results in raised Type I risk. These findings have instigated in the development of various control charts that takes into consideration the non-normality of the monitoring statistic. Control charts for attributes data were developed, where the monitoring statistic may have a skewed distribution and implemented it for the study of queue length of M/M/s system[7]. Unlike the traditional chart which uses only standard normal quantiles, the control chart for attributes may use logistic quantiles. Since this may help for monitoring statistic with exceptionally high skewness and high kurtosis.

The control limits for N, obtained by Haim Shore method which involves the first three moments of the r.v. N are:

$For\ \gamma_1(N) \geq 0.5$

$$UCL = E(N) + 3.642\sqrt{V(N)} + 0.9146\sqrt{V(N)}\,\gamma_1 - \frac{1}{2}$$

$$= \frac{\rho}{1-\rho} + 3.642\frac{\sqrt{\rho}}{1-\rho} + 0.9146\frac{1+\rho}{1-\rho} - \frac{1}{2} \quad (4)$$

$$CL = E(N) = \frac{\rho}{1-\rho} \quad (5)$$

$$LCL = E(N) - 3.642\sqrt{V(N)} + (1.40)(0.9146)\sqrt{V(N)}\,\gamma_1 + \frac{1}{2}$$

$$= \frac{\rho}{1-\rho} - 3.642\frac{\sqrt{\rho}}{1-\rho} + (1.40)(0.9146)\frac{1+\rho}{1-\rho} + \frac{1}{2} \quad (6)$$

where E(N),V(N) and γ_1 are displayed in Table I. It is observed that skewness depends only on the traffic intensity and from Table II the skewness of the distribution of N decreases as ρ increases. Also, the minimum value of skewness is nearly 2 which are observed for high values of ρ. Therefore control limits given by expressions (4), (5) and (6) are used, as the distribution of N is highly skewed and for high values of skewness the probability limits, based on normal quantiles, may not be appropriate due to the long tails associated with highly skewed distributions or distributions that do not converge to the normal. Hence, control limits based on the logistic quantile are used which are proved to be more efficient, as it has longer tails relative to normal variable.

5.4. Control chart C_4 : Kurtosis correction (KC) method

Tadikamalla and Popescu [8] developed a KC method to construct control chart when the process distribution is symmetrical, but is leptokurtic, it has the advantage of providing better control limits and are easier to use and make no assumption on the functional form of underlying distribution. This method shifts the control limits to both sides by the same amount which is function of kurtosis, which is estimated by sample kurtosis. It is observed that the use of the α-quantile of the normal distribution is not appropriate, if the process distribution is skewed.

The control limits based on KC method for C_4 control chart if the process distribution and parameters are known for r.v. N [8],

$$\left.\begin{aligned} UCL &= E(N) + (3 + \frac{\gamma_2(N)}{1+0.33\gamma_2}) * \sqrt{V(N)} \\ CL &= E(N) \\ LCL &= E(N) - (3 + \frac{\gamma_2(N)}{1+0.33\gamma_2(N)}) * \sqrt{V(N)} \end{aligned}\right\}$$

(7)

where E(N),V(N) and γ_2 are displayed in Table I. When kurtosis of underlying distribution is zero, the control chart reduces to Shewhart chart.

5.5. Control chart C_5 : Skewness and kurtosis correction (SKC) method

Wang (2009)[9] developed a SKC method to construct control chart with no assumptions on the process distribution, both the degree of skewness and kurtosis of the process distribution is taken into account. It provides the control limits using 3 standard deviation with addition of the known function of skewness and kurtosis. If kurtosis of the process distribution is zero then SKC method reduces to SC method and to Shewhart if both skewness and kurtosis of the distribution are found to be zero.

The control limits based on SKC method if the process distribution and parameters are known for r.v. N ,

$$\left.\begin{aligned} UCL &= E(N) + (3 + \frac{\frac{4}{3}\gamma_1}{1+0.2\gamma_1^2} + \frac{\frac{3}{4}\gamma_2}{1+3|\gamma_2|}) * \sqrt{V(N)} \\ CL &= E(N) \\ LCL &= E(N) - (3 + \frac{\frac{4}{3}\gamma_1}{1+0.2\gamma_1^2} + \frac{\frac{3}{4}\gamma_2}{1+3|\gamma_2|}) * \sqrt{V(N)} \end{aligned}\right\} \quad (8)$$

where E(N),V(N), γ_1 and γ_2 are as displayed in Table I.

6. Performance measures

In this section performance measures of control chart are studied.

6.1. False alarm rate for control chart

Let α_u denote the probability of type I error generated in the upper tail of the control chart. The Type-I error rate is defined as the probability of signalling an out of control even though the process is actually in-control. It is defined as, $\alpha_u = P[N > UCL] = \rho^{UCL}$ where UCL is as obtained for control charts based on different methods. This implies that the probability of exceeding some limit on the number of customers in the system is a geometrically decreasing function of that number and decays very rapidly.

6.2. Average run length

Let ARL_{Ci}, i=1,…,5 denote the average run length of control chart C_i. ARL is the average number of points that must be plotted before a point indicates an out of control condition. If the system observations are uncorrelated, then for any control chart; the average run length is given by [6],

$$ARL_{C_i} = \frac{1}{\alpha_u} \text{ , i=1,…,5 where } \alpha_u \text{ is the false alarm rate .} \quad (9)$$

7. Performance comparison of different control charts

The control limits of control chart based on different methods depend on traffic intensity ρ. To study the effect of ρ on control limits and performance measures, same set of increasing values of ρ are selected and CL, UCL,FAR and ARL were computed and comparisons were carried out.

In Tables III and IV, FAR and corresponding ARL obtained by using different control charts are displayed respectively. From these tables, it is observed that as ρ increases FAR (α_u) decreases consequently ARL increases for the control charts based on different methods.

i. When ρ=0.1 and 0.2 , $\gamma_1 = 3.48$ and 2.68 and $\gamma_2 = 14.1$ and 9.2 respectively, it is observed that,

$$\alpha_{C_4} < \alpha_{C_3} < \alpha_{C_5} < \alpha_{C_2} < \alpha_{C_1}.$$

Consequently,

$$ARL_{C_4} > ARL_3 > ARL_{C_5} > ARL_{C_2} > ARL_{C_1}.$$

As UCL of control chart based on KC method is found to be highest of all methods, so corresponding FAR is lowest and consequently ARL is highest. Whereas, UCL obtained by Shewhart method is lowest, so FAR is found to be highest and resultantly ARL is lowest of all the methods. The argument is as the underlying distribution is highly skewed and leptokurtic, the FAR is large as skewness is high and also because of the discrepancy between the variability pattern of the asymmetric distribution and the normality assumed in constructing the control chart.

ii. For $\rho \geq 0.3, \gamma_1 = 2.37$ to 2 and $\gamma_2 = 7.63$ to 6,it is observed that,

$$\alpha_{C_3} < \alpha_{C_4} < \alpha_{C_5} < \alpha_{C_2} < \alpha_{C_1}.$$

Consequently,

$$ARL_{C_3} > ARL_4 > ARL_{C_5} > ARL_{C_2} > ARL_{C_1}.$$

FAR obtained from control chart based on Haim Shore method is lowest consequently the ARL is highest of all methods and lowest for Shewhart method. Hence control chart based on Haim Shore method is best of all, second best is control chart based on KC method and third best under this situation is control chart based on SKC method.

iii. From Table II, it is observed that for skewness around 2, traffic intensity is nearer to 1.From figure 2 it is observed that as skewness decreases FAR decreases whereas ARL increases(observe figure 4) .On the other hand from figure 1 as traffic intensity(ρ) increases FAR decreases whereas ARL increases(observe figure 3). On the basis of FAR, control charts C_3, C_4 and C_5 show comparable performance.

Table III: Comparison of False Alarm Rate of control charts based on various methods

ρ	γ_1	$(\alpha_u)_{C_1}$	$(\alpha_u)_{C_2}$	$(\alpha_u)_{C_3}$	$(\alpha_u)_{C_4}$	$(\alpha_u)_{C_5}$
0.1	3.47851	0.06836	0.02282	0.009803	0.00909	0.018728
0.2	2.68328	0.04498	0.01203	0.006205	0.00579	0.00968
0.3	2.37346	0.03536	0.0087	0.004562	0.00458	0.006945
0.4	2.21359	0.02994	0.0071	0.003604	0.00392	0.005636
0.5	2.12132	0.02641	0.00614	0.002972	0.00348	0.004862
0.6	2.06559	0.0239	0.0055	0.002523	0.00317	0.004345
0.65	2.04657	0.02289	0.00525	0.002344	0.00304	0.004145
0.7	2.03189	0.02201	0.00503	0.002187	0.00293	0.003973
0.75	2.02073	0.02122	0.00484	0.002049	0.00283	0.003822
0.8	2.01246	0.02052	0.00467	0.001926	0.00274	0.00369
0.85	2.00661	0.01989	0.00453	0.001816	0.00265	0.003572
0.9	2.00278	0.01932	0.00439	0.001718	0.00258	0.003466
0.91	2.00222	0.01921	0.00437	0.001699	0.00256	0.003447
0.92	2.00174	0.0191	0.00434	0.001681	0.00255	0.003427

0.93	2.00132	0.019	0.00432	0.001663	0.00254	0.003408
0.94	2.00096	0.01889	0.0043	0.001646	0.00252	0.00339
0.95	2.00066	0.01879	0.00427	0.001628	0.00251	0.003371
0.96	2.00042	0.0187	0.00425	0.001612	0.0025	0.003353
0.97	2.00023	0.0186	0.00423	0.001595	0.00248	0.003336
0.98	2.0001	0.0185	0.00421	0.001579	0.00247	0.003319
0.99	2.00003	0.01841	0.00418	0.001563	0.00246	0.003302
0.991	2.00002	0.0184	0.00418	0.001561	0.00246	0.0033
0.992	2.00002	0.01839	0.00418	0.00156	0.00246	0.003298
0.993	2.00001	0.01838	0.00418	0.001558	0.00245	0.003297
0.994	2.00001	0.01837	0.00418	0.001557	0.00245	0.003295
0.995	2.00001	0.01836	0.00417	0.001555	0.00245	0.003293
0.996	2	0.01835	0.00417	0.001554	0.00245	0.003292
0.997	2	0.01834	0.00417	0.001552	0.00245	0.00329
0.998	2	0.01833	0.00417	0.00155	0.00245	0.003289
0.999	2	0.01833	0.00417	0.001549	0.00245	0.003287

Table IV: Comparison of Average Run Length (ARL) of control charts based on various methods

ρ	ARL_{C_1}	ARL_{C_2}	ARL_{C_3}	ARL_{C_4}	ARL_{C_5}
0.1	14.6286	43.8232	102.006	110.051	53.3969
0.2	22.2306	83.1528	161.152	172.8334	103.311
0.3	28.2805	114.895	219.201	218.2565	143.981
0.4	33.3957	140.916	277.49	255.2174	177.417
0.5	37.861	162.907	336.477	287.1177	205.673
0.6	41.8406	181.975	396.363	315.5815	230.139
0.65	43.6828	190.646	426.676	328.8233	241.246
0.7	45.4403	198.833	457.246	341.5136	251.72
0.75	47.1213	206.588	488.078	353.714	261.628
0.8	48.7331	213.955	519.175	365.4752	271.027
0.85	50.2817	220.97	550.541	376.8394	279.965
0.9	51.7724	227.666	582.176	387.8421	288.483
0.91	52.064	228.97	588.535	390.0021	290.139
0.92	52.3535	230.261	594.906	392.149	291.781
0.93	52.641	231.542	601.287	394.2831	293.407
0.94	52.9264	232.811	607.679	396.4046	295.019
0.95	53.2099	234.069	614.082	398.5138	296.616
0.96	53.4913	235.317	620.495	400.6107	298.199
0.97	53.7709	236.554	626.92	402.6957	299.768
0.98	54.0485	237.78	633.355	404.7689	301.324
0.99	54.3242	238.996	639.802	406.8304	302.866
0.991	54.3517	239.117	640.447	407.0359	303.019

0.992	54.3792	239.238	641.092	407.2413	303.172
0.993	54.4066	239.359	641.738	407.4466	303.326
0.994	54.434	239.48	642.383	407.6518	303.479
0.995	54.4614	239.601	643.029	407.8568	303.632
0.996	54.4888	239.721	643.675	408.0618	303.784
0.997	54.5162	239.842	644.321	408.2666	303.937
0.998	54.5435	239.962	644.967	408.4713	304.09
0.999	54.5708	240.082	645.613	408.676	304.242

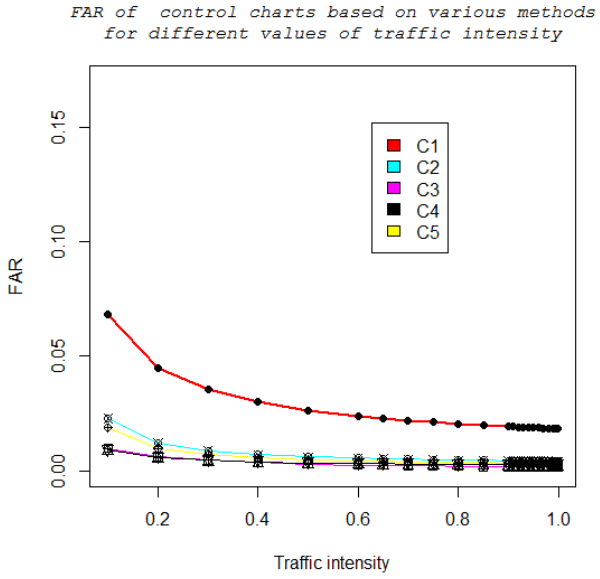

Figure 1

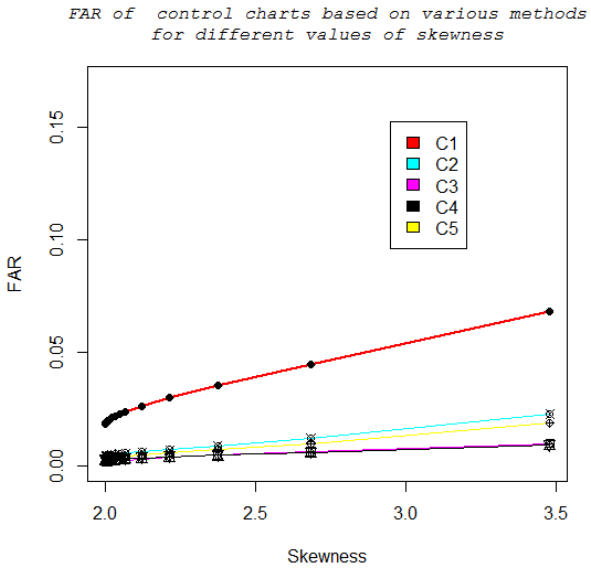

Figure 2

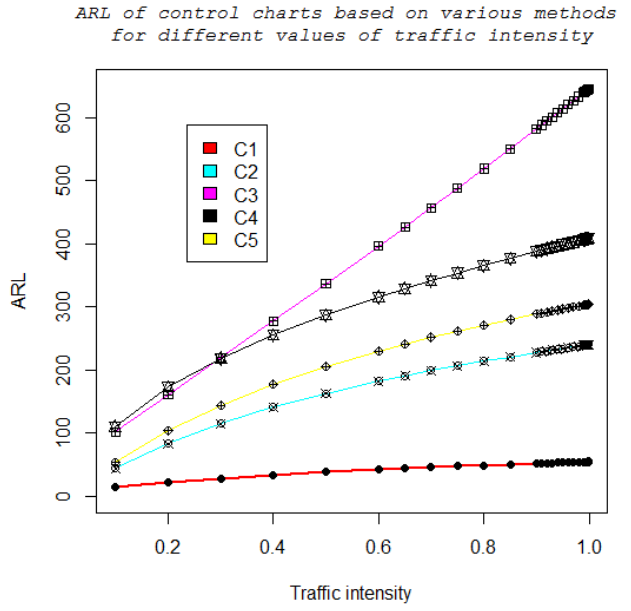

Figure 3

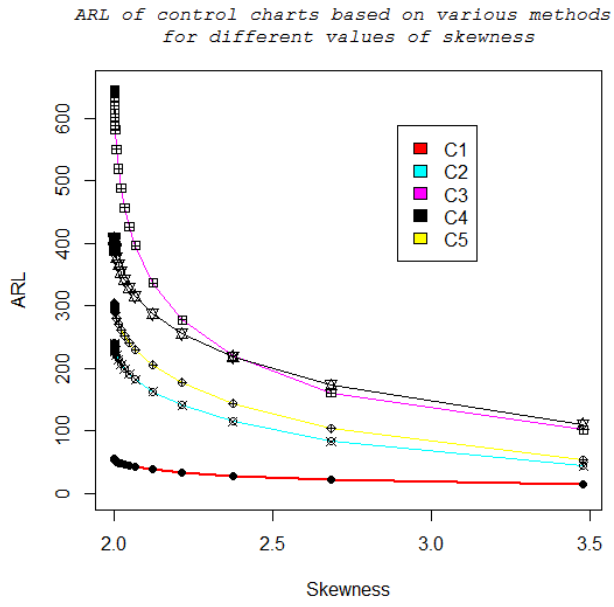

Figure 4

8. Conclusion

The paper proposes performance wise for ρ=0.1 and 0.2 use of control chart C4 based on KC method, since it outperforms rest methods. Further for ρ>0.3 the use of control chart C3 based on Haim Shore method for obtaining UCL for random queue length (N). Since C3 out performs charts based on all other methods as it considers in its construction of control limits skewness of underlying distribution of r.v. N. This control chart can be suggested for intimating system management for taking precautionary measure. Hence control chart C3 is recommended for skewed population and KC method C4 as next best of all charts. For a process in control, the ARL is preferred to be large because an observation plotting outside the control limits represents a false alarm. R software was used in computation.

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"A Comparative Evaluation of Palatal Adaptation in Denture Bases Processed With Compression Molding and Injection Molding In Two Different Palatal Configuration"-An In Vitro Study

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Abstract- The success and draw backs of the compression molding are well studied and reported but there is no enough studies or reports on injection molding. This study is on a comparison and evaluation of palatal adaptation of two different denture bases fabricated in two different palatal forms namely Shallow palate and Deep palate were used. Orientation notches (OrN) were made in the Master Model and were duplicated. 20 Shallow and 20 Deep palate cast were made. Denture bases were processed by Compression molding and Injection molding technique. The casts were trimmed in the PPS area and midline and the palatal adaptation was evaluated using vision measuring system. The results revealed that the mean palatal adaptation of injection molding denture bases was statistically significant when compared to compression molding denture bases in both the shallow palate and deep palate ($p \leq 0.05$). But there was no statistical difference within the injection molding and compression molding denture bases in both palates ($p \geq 0.05$). The Injection molding denture bases had better palatal adaptation. The material of choice and the technique of processing plays a major role than the shape of the vault in deciding the palatal adaptation of the denture.

Index Terms- Compression Molding, Injection Molding, Orientation Notches, Posterior Palatal Seal, Midline

I. INTRODUCTION

The success of the removable complete denture depends upon its retention, stability, and support. The retention of the complete denture is directly related to the adaptation of the base to the supporting oral tissues and is maximised when there is more intimate adaptation with the oral tissues. PMMA based acrylic resin have been used popularly for the denture bases.

In a clinical situation, decreased gap between the denture base and the tissue surface contributes to improved denture retention. Previous studies reported that variations in measurements from less than 0.25 to 0.27 mm in the fit of the record bases to the master cast would appear to have little clinical significance in the serviceability of dentures, because tissue displacement of only 0.25mm would be required to allow almost complete seating of a maxillary denture on the oral tissues[4].

Palatal adaptation of the denture is influenced by the material, the processing technique and the anatomic morphology of the vault also plays a role.

Two recognised changes are unavoidable in PMMA based acrylic resin which is Shrinkage and expansion[2]. However, newer denture materials and processing techniques are being introduced to reduce the shrinkage and expansion[3]. Volumetric shrinkage occurs during polymerisation process is due to the differences in densities of the monomer and the polymer, this results in a lifting of the denture base away from the posterior palate area after the polymerisation of PMMA.The conventional processing technique causes polymerization shrinkage, thermal contraction during flask cooling, and strain accompanying stress release during de-flasking may cause diminished adaptation of the denture to the tissues[4].

Assessment of the complete adaptation of the denture, along the posterior border is insignificant; adaptation of the denture base should be quantified or assessed along the antero-posterior region and the midline. The shallow palatal vault displays interface gap openings over a wider area at the posterior border of the denture extending from ridge to ridge. The V

shaped palatal forms usually seen in the deep vault have openings only in the midline.

The aim of the study was to compare the palatal adaptation of two different denture bases fabricated by compression molding and injection molding in two different palatal forms namely shallow and deep vault along the Midline, Posterior Palatal Area and the Entire arch.

I. Materials and Methods:

The impression of the stone cast was made with irreversible hydrocolloid material (Zelgan Plus, DENTSPLY) and it was poured with base plate wax (Hindustan Modelling Wax, Hindustan Dental Products).

The waxed cast was processed with Heat cure acrylic resin- Pink (Acrylin-H, Asian Acrylates) according to the manufacturers recommendations. Two master casts made of PMMA acrylic resin, one with the Shallow vault and the other with Deep vault were obtained (Fig 1 & Fig 2).

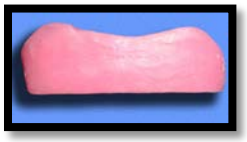

Fig 1 Master model – Shallow palate

Fig2 Master Model – Deep palate

'V' shaped orientation grooves were made on the Master Model for both the Shallow palate cast and Deep palate cast. The Orientation Notches (OrN) were marked on 5 specific points namely in the Left Vestibule (LV), Left Ridge (LR), middle of the Posterior Palatal Seal (MPPS), Right Ridge(RR), Right Vestibule (RV) with a indelgible marker along the posterior palatal seal area. Three specific points namely Labial Frenum (LF), Anterior Ridge (AR) and in Mid Palatine Raphe (MPR) were marked along the midline. The Orientation notches of 2 mm were drilled using a stable surveyor with a handpiece (Fig 3).

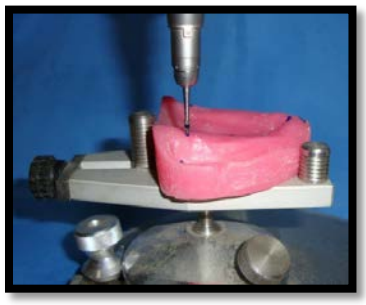

Fig 3 Drilling OrN in the cast

II.A Fabrication of special tray:

A single base plate wax (Hindustan Modelling Wax, Hindustan Dental Products) was adapted all around the master model as a single wax spacer[5]. The wax in the area of the retaining grooves was removed to maintain the orientation of the cast after the fabrication of the special tray. After the making of the spacer, the self-cure resin (Pyrax Rapid Repair, PyraxPolymers) was mixed and well adapted over the cast along with the spacer with uniform thickness.

Five pillars were made on the tray to orient the cast parallel to the floor. The parallelism was achieved by placing tray along with the pillars and the cast in the hydraulic pressure machine before the resin in the pillars was completely polymerised. Pressure was applied until the cast was parallel to the floor. The whole assembly was maintained until the pillars were completely polymerised (Fig 4).

Fig 4 special tray with Pillars

II.B Impression Procedure:

The spacer was completely removed and one relief hole was given in the centre of the palate which was greater than 1.0 mm[5]. After the spacer was removed, tray adhesive (Ivoclar Vivadent) was applied and then impression material was loaded uniformly on to the special tray (Aquasil Ultra Monophase Fast Set, Smart Wetting® Impression Material) and then the cast was placed within the tray and taken to the hydraulic bench press where a pressure of 5 KgF[6] (72 psi) was applied and the pressure was maintained until the material was completely set (Fig 5). When the pressure was applied , the excess material flowed through the relief hole and the borders of the tray.

Fig 5. 72 psi pressure for impression making

II. C Pouring the cast:

20 casts were fabricated for both the shallow vault and deep vault palatal forms using dental stone (Gyproc, Prevest Dentpro Limted).

II.D Grouping

They were subdivided into two Sub Groups namely A and B for both the group of 10 casts each for fabrication of denture bases by Compression Molding and Injection Molding. (Table 1)

Group 1: Shallow Palate (S)	Group 2: Deep Palate (D)
Total Cast : 20	Total Cast : 20

Sub Group A (SC)	Sub Group B (SI)	Sub Group A (DC)	Sub Group B (DI)
10 cast : Compression molding (C)	10 cast: Injection molding (I)	10 cast : Compression molding (C)	10 cast: Injection molding (I)

Table 1: Grouping the casts

II.E Wax Up For Denture Base Fabrication:

A single shellac base plate (Rolex base plate, Ashoo Sons Company) was well adapted. The base plate was well fused to the cast with a thin roll of wax around the borders of the cast completely. The base was carefully removed and checked for its thickness with a Vernier calliper (Baker SD 10 Vernier Calliper). The thickness was evenly maintained within 3 mm (Fig 6) for all the 40 casts .

Fig 6 Thickness is measured with caliper

II. FProcessing

II.F.1Compression Molding:

The denture bases were processed by Compression molding Technique using Heat cure denture base resin (Lucitone, DENTSPLY) in a thermal acryliser unit (Acryliser C-73, Confident Dental Equipments) . A bench press pressure of 3000 psi (Fig 7) was applied during the trial closure overnight.

Fig 7 Bench curing at 3000 psi in Bench press

The curing temperature of 74^0celsius was maintained for 2 hour and 100^0celsius was maintained for 1 hour[1].

II.F.2 Injection Molding:

The denture bases were processed using Hydraulic Bench Press and a pressure of 6 Pa (Fig 8) was maintained. The Heat cure resin (SR-IVOCAP, IVOCLAR VIVADENT) was injected through an injector at a constant pressure of 6 Pa. during the whole process. The curing temperature was maintained at 98 degree Celsius for 35 minutes.

Fig 8 Curing under constant pressure (6 pa)

II.G. Making of the matrix:

After the dentures were retrieved from the flask, the flash was trimmed off. The cast was covered with a cellaphon sheet and then held with the cast with the help of a rubber band and yellow type II dental stone (Gyproc, PrevestDentpro Limited) was poured to form a matrix over the denture base (Fig 9). Matrix helped in preventing the dislodgement of the denture base from the cast during the trimming and measurement[6].

Fig 9 Matrix in cross section

II.H. Trimming the Cast:

After the matrix was set, the cast was trimmed of up to the OrN in the cast were visible along the posterior palatal seal area (Fig 10 & 11). The readings were taken along the PPS area for palatal opening, after which the cast were trimmed along the sides to see the OrN along the midline (Fig 12 & 13) to study for the palatal opening.

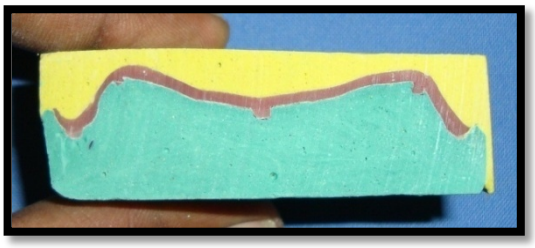

Fig 10 Trimming of cast to see OrN in Shallow palate

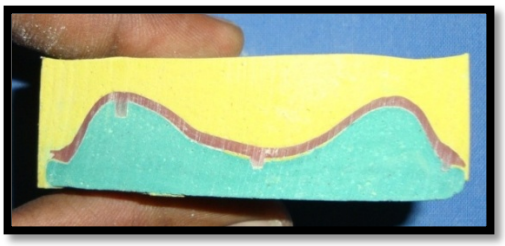

Fig 11 Trimming of cast to see OrN in Deep palate

Fig 12 OrN along the Midline for Shallow palate

Fig 13 OrN along the midline for Deep palate

II.I Data Collection:

Vision Measuring System (VMS) were used for recording the width of palatal opening. The VMS had an optical scanner which measured at 5x optical zoom. The readings were processed with the help of software (Msu25D Vision Measuring Software, 3 axis, Version 75.0 k) and produced on the computer screen (Fig 14 & 15).

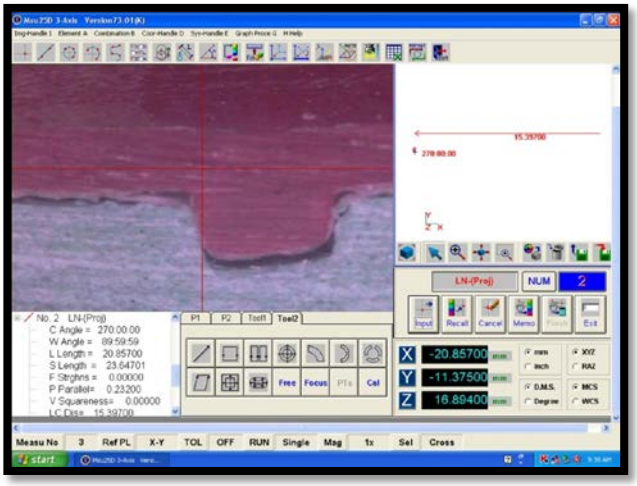

Fig 14 Processed image on the Screen for Compression molding denture base

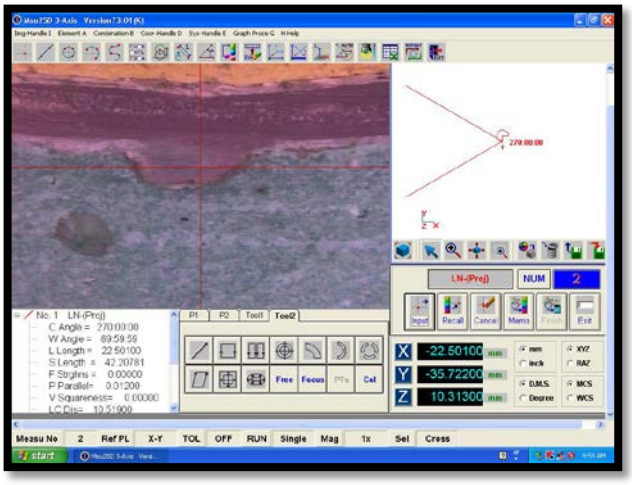

Fig 15 Processed image on the screen for Injection molding denture base

The results were subjected to statistical analysis with Independent Students't' test. Significance value (p) was found out using the Test of Significance.

III. RESULTS:

The results were tabulated in different tables for the PPS area, midline area and combined PPS and midline.

Between the groups of compression molding and injection molding in shallow and deep palate:

Along the posterior palatal seal:

(i) The mean palatal adaptation in shallow palate between compression molding and injection molding showed a high statistical significance. (Tables II).

(ii) The mean palatal adaptation in deep palate between compression molding and injection molding showed a high statistical significance. (Tables III).

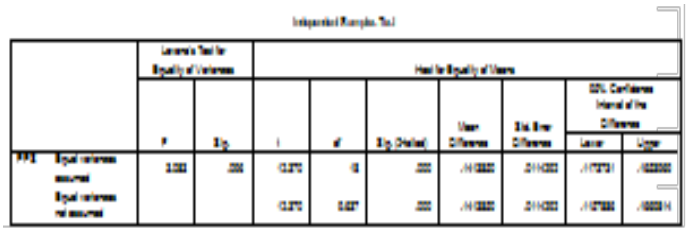

Table II: Test of significance for palatal adaptation along the PPS in shallow palate for compression molding and injection molding denture bases.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									99% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PPS	Equal variances assumed	13.054	.002	15.388	18	.000	.1848200	.0120108	.1559863	.2100537
	Equal variances not assumed			15.388	9.833	.000	.1848200	.0120108	.1579998	.2116402

Table III: Test of significance for palatal adaptation along the PPS in deep palate for compression molding and injection molding denture bases

Along the midline:

(i) The mean palatal adaptation in shallow palate between compression molding and injection molding showed a high statistical significance. (Tables IV).

(ii) The mean palatal adaptation in deep palate between compression molding and injection molding showed a high statistical significance. (Tables V).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MID	Equal variances assumed	3.030	.099	12.927	18	.000	.1335500	.0103316	.1118542	.1552658
	Equal variances not assumed			12.927	9.581	.000	.1335500	.0103316	.1104026	.1567174

Table IV: Test of significance for palatal adaptation along the MIDLINE in shallow palate for compression molding and injection molding denture bases

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MID	Equal variances assumed	9.298	.007	15.018	18	.000	.1785625	.01188789	.1535 6072	.2035 1178
	Equal variances not assumed			15.018	10.719	.000	.1785625	.01188789	.1522 8715	.2047 8535

Table V: Test of significance for palatal adaptation along the MIDLINE in deep palate for compression molding and injection molding denture bases

Entire arch:

(i) The mean palatal adaptation in shallow palate between compression molding and injection molding showed a high statistical significance. (Tables VI).

(ii) The mean palatal adaptation in deep palate between compression molding and injection molding showed a high statistical significance. (Tables VII).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95%Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SC - SI	Equal variances assumed	9.645	.006	8.917	18	.000	.1523500	.0170881	.1164774	.1882726
	Equal variances not assumed			8.917	9.228	.000	.1523500	.0170881	.1138362	.1908638

Table VI: Test of significance for mean palatal adaptation in shallow palate for compression molding and injection molding denture bases throughout the arch

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DC - DI	Equal variances assumed	13.994	.001	15.681	18	.000	.18065875	.01152068	********	********
	Equal variances not assumed			15.681	9.615	.000	.18065875	.01152068	********	********

Table VII: Test of significance for mean palatal adaptation in deep palate for compression molding and injection molding denture bases throughout the arch

Results within the groups:

(i) The mean palatal adaptation between shallow and deep palate throughout the arch in compression molding showed no statistical significance. (Tables VIII).

(ii) The mean palatal adaptation between shallow and deep palate throughout the arch in impression molding showed no statistical significance. (Tables IX).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95%Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SC - DC	Equal variances assumed	.702	.413	-1.591	18	.129	-.0324500	.0204346	-.075382	.0104209
	Equal variances not assumed			-1.591	15.686	.132	-.0324500	.0204346	-.075820	.0109001

Table VIII: Test of significance for a compression molding denture base in shallow and deep palate

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SI - DI	Equal variances assumed	.000	.999	-1.478	18	.157	-.0041912	.0028362	-.0101499	.0017674
	Equal variances not assumed			-1.478	17.852	.157	-.0041912	.0028362	-.0101535	.0017710

Table IX: Test of significance for an injection molding denture base in shallow and deep palate

IV. DISCUSSION

The current study compared the palatal adaptation between shallow and deep. Earlier studies suggested a statistical difference in palatal adaptation in dentures between the shallow palate and deep palate where the adaptation for the deep palate is significantly more than the shallow palate[7].

The results of one study showed that palatal adaptation along the posterior palatal seal and midline was of high statistical difference. The mean palatal adaptation for Injection molding denture base was statistically higher, when compared to the compression molding denture base[8]. Two main reasons were the Pressure and in Injection molding technique the resin was pushed through the flask continuously for the complete polymerization cycle.

In Compression molding technique after the material was packed in the flask, the flask was placed under the bench press overnight at 3000 psi. After the flask was retrieved from the bench press, transferred to the clamp, where the amount of pressure built up within the flask in the clamp was unknown. But in Injection molding the material slowly pushed in to the flask at constant pressure (6 Pa) until the polymerization was completed. Difference in this pressure increased the palatal adaptation between the two denture bases.

In Compression molding technique the material was packed within the flask and then the pressure was applied hence when there is polymerization shrinkage there was no excess unpolymerised material to compensate for the shrinkage. In Injection molding technique first the flask was held at a pressure and later the material was injected slowly into the flask at a constant pressure until the polymerization was completed. This slow injection of material at a constant pressure helped to compensate for the shrinkage of the material which has already happened.

The results of this study differed to results of previous studies[9, 10, 11, and 12].

Turck reported that there was no statistical difference in adaptation between compression molding, microwave and light activated techniques[13].

Previous studies have reported that there was difference in adaptation in a compression molding denture in shallow palate and deep palate, in which the adaptation was better in deep palate compared to the shallow palate. The palatal adaptation between the compression molding and injection molding dentures in a shallow palate and deep palate along the PPS and midline, the results observed to be higher with no statistical difference. The adaptation of a compression molding denture was better in shallow palate than the deep palate but was not statistically significant. There was no difference in adaptation between the injection molding denture bases in shallow and deep palate because of the continuous application of pressure.

In compression molding, in deep palate when pressure was applied, the excess pressure tends to escape along when pressure was stopped, whereas in shallow palate since there was no deep undercut (steep palate) the pressure tends to escape all throughout the palate.

Comparing the adaptation of the denture bases in shallow and deep palate between the compression molding and injection molding the results were highly statistically significant. However there was no statistical significant difference in adaptation in shallow or deep palates in both compression and injection molding technique.

McCartney reported that additional distortion of the denture base and associated effects on the occlusion stabilize within 24 hours after removal of the denture from the master cast. Beyond this time there will be further distortion caused by water sorption and continued stress release, but it is of a statistically insignificant magnitude and does not warrant delay in delivery of the denture[14].

This difference in adaptation is not attributed to the material composition between these two materials used in different fabrication technique[15]. O'toole studied whether the processing technique of acrylic resins affected their dimensional stability. Several curing methods were suggested to improve the quality of acrylic resin restoration. The methods include (1) bench curing (2) curing under a Coat of petroleum jelly, (3) curing in a monomer atmosphere and (4) curing under pressure in air and/ or under water[16]. But he found out that there was no difference after using all these methods.

Gap formation between the denture base and cast are generally attributed to polymerization shrinkage of the resin material and a tendency of cooling shrinkage toward the central area of the denture base, as well as to subsequent distortion caused by confinement of the surface topography of the alveolar ridge. Hence the greatest gap was always seen in the centre of the PPS area or the Vestibule area[17].These findings are also predictable with the results reported by Consani et al[18], who compared the posterior border gap of the denture base-cast sets sectioned transversally at each area of the canine, molar and posterior ends.

Latta in his study has reported that there was shrinkage in compression molding dentures before and after polymerization[19]. Lee in his study examined the adaptation accuracy of acrylic denture base processed using fluid-resin (PERform), injection-moldings (SRIvocap, Success, Mak Press), and two compression-molding techniques. The PERform and Mak Press produced significantly smaller maximum palatal gap dimensions than the other groups ($p<0.05$)[20].

CONCLUSION:

Injection molding is better compared to compression molding and the following conclusion can be derived.

1. In both the Palatal forms the Palatal adaptation of the Injection molding denture bases is much better compared to the Conventional Compression molding denture bases.
2. Individually both Injection molding and Compression molding performs in the same way in both the Shallow palate and Deep palate.
3. The Material of choice and the technique of fabrication play a bigger role than the shape of the vault in deciding the palatal adaptation of the denture.

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A study on relationship between intelligence and motor fitness between school level cricketers and footballers

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Abstract- Human being is an interaction of body and mind which is known as psycho-physical unity. The better co-ordination between two, the better would be the performance. Intelligence is integral part of human nature. We do distinguish individual in our everyday life. Movement is the major part of motor fitness. In the field of sports, the performance of a particular motor task / skill requires a top level of intelligence depending upon the complexity of the skill or task.

The purpose of the study was to observe the relationship between intelligence and motor fitness of school level cricketers and footballers. For this purpose one hundred (100) cricketers and one hundred (100) footballers were taken as subject. The Motor fitness components and Psychological Trait Intelligence were selected as the criterion measures for this study. The Psychological trait intelligence was measured by Dr. G. C. Ahuja's, 'Group Test of Intelligence' questionnaire and the Motor fitness components were measured by "AAHPERD Youth Fitness Test". For this purpose Pearson correlation was used. It was observed that players possessed better motor fitness qualities, has higher level of intelligence level. Footballers group was better in both intelligence and motor fitness than cricketers group. Therefore, it may be concluded that better the motor fitness, there should be a fair chance of exhibiting of intelligence level also high.

Index Terms- Intelligence, motor fitness, school level cricket players, school level football players

I. Introduction

Human being is made-up with body and mind and this interaction is known as Psycho-physical Unity. The better the co-ordination between two, the better would be the performance. The response capabilities of the individual are dependent upon his innate neuro-motor make-up, his physical structure and his typical of activation, as well as his inclination to move at a given moment in a given task.

In this world, and individual's life is a continuous flow of activity. Every moment he or she is doing something. His every activity is the result of the joint effort of his body and mind. The activity may be throwing, kicking, running, jumping etc. Mechanism of combined working of mind and body is known as neuro-muscular system, which conducts and controls all human behaviour. It is the base and the function of the whole body is dependent on it. As activity originates in the mind and is done and expressed by some bodily organs. In other words, mental processes like thinking, feeling, expression etc, start with bodily activity[1].

According to R. B. Cattel as referred by Gupta (1989), intelligence is hereditary in nature. We are finding that both intelligence and movement are hereditary qualities of human being, so there is a relation between them.

In a broad and general sense, it can be expressed that physical fitness deals with the physical side of the body and intelligence deals with mental side of the body. We know that the human organism is a complete entity, the total whole.

We do not think with the brain alone. A person thinks with the function of gland, the tone of muscles, and the digestive process in addition to the brain. So, mental activity is a manifestation of whole organism, e.g. pain in stomach (organ of the body) shows feelings of uneasiness that leads to the mental disturbance.

Accordingly body and mind are intimately related i.e., there may exist a relation between motor fitness and intelligence.

Now-a-days, physical education has the aim to develop physical fitness, motor fitness as well as mental, intellectual, social and emotional development. In the field of sports, the performance of a particular motor task requires a top level of intelligence depending upon the complexity of the skill or task. This type of performance is the result of intelligence on the part of the athlete concerned.

With this back drop, the investigator tries to investigate the intelligence of the athletes and has taken up this study for investigation to find out the relationship between athletic performance in terms of motor fitness and intelligence.

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1 S.C. Gupta "Psychology Applied to General Education and Physical Education.", Pragati Prakashan, Meerut, 1989, pp 25-27

II. Materials and Methods

Subjects:

Total Two hundred (200) school level players consists of One hundred (100) cricketers and rest of them footballers were taken as subjects for this study. The subjects were taken from Burdwan District, West Bengal.

Psychological State:

Psychological states of the subjects were measured by Dr. G. C. Ahuja's "Group Test of Intelligence" questionnaire. The questions are as follows:

Sl. No.	Sub-Test	Number Items	Time Limit
1	Following Directions	9	4 Minutes
2	Classification	20	"
3	Analogy	20	"
4	Arithmetic Reasoning	6	"
5	Vocabulary	40	"
6	Comprehension	8	"
7	Series	12	"
8	Best Answers	20	"
TOTAL		135	32 Minutes

1 mark was given for each question. Motor fitness was measured by "AAHPER Youth Fitness Test'. There have six test items i) Pull up for boys and flexed arm hang for girls, ii) Bent knee sit up, iii) 4×10 yard shuttle run, iv) Standing board jump, v) 50 yard dash, vi) 1½ mile run.

Data Analysis:

The collected data were analyzed by using SPSS version. The Pearson's Correlation method was used to calculate the relationship between intelligence and motor fitness.

Results and Discussions:

Table -1 showed the results of the correlation between intelligence and total motor fitness scores of Footballers group were presented in a tabular form.

Table-1: **Results of correlation between Intelligence and motor fitness of football players.**

	Total Fitness (Footballer)	Total Intelligence (Footballer)
Total Fitness (Footballer)		
Pearson correlations	1.000	0.886**
Sig. (2 tailed)	-	0.000
N	100	100
Total Intelligence (Footballer)		
Pearson correlations	0.886**	1.000
Sig. (2 tailed)	0.000	-
N	100	100

**** Correlation is significant at the 0.01 level (2 tailed)**

Table-1 showed that there was a positive correlation between intelligence and motor fitness of football players.

Table -2 showed the results of the correlation between intelligence and total motor fitness scores of Cricketers group were presented in a tabular form.

Table 2: Results of correlation between intelligence and motor fitness of cricket players

	Total Fitness (Footballer)	Total Intelligence (Footballer)
Total Fitness (Cricketer)		
Pearson correlations	1.000	0.897**
Sig. (2 tailed)	-	0.000
N	100	100
Total Intelligence (Cricketer)		
Pearson correlations	0.897**	1.000
Sig. (2 tailed)	0.000	-
N	100	100

**** Correlation is significant at the 0.01 level (2 tailed)**

Table- 2 showed that there was also a positive correlation between intelligence and motor fitness of cricket players.

It may be concluded that both the groups (***Footballers and Cricketers***) selected for this study were alike within the level of intelligence in relation to total motor fitness scores.

The investigator also tried to focus some light on the motor fitness components of both the groups and estimate the difference, if any, for better understanding about their fitness status. In this connection, the investigator represented the results in tabular form as in ***Table-3***.

Table- 3: Comparison of Mean in motor fitness components between the two groups.

Parameters	Footballer	Cricketer
Pull-up	54.25	54.4
Sit-up	25.35	23.2
40 yard dash S.R.	57.2	69.25
Standing broad jump	72.65	49.60
50 yard dash	77.3	62.3
1.5 mile run	78.55	73

Table-3 showed that the footballers group was better in Sit-ups, 40 yard Dash S.R. , Standing Broad jump than their counterpart and the cricketers group was better in Pull-ups, 50 yard Dash and 1.5 Mile run than the footballers group.

The investigator also tried to enlighten the difference between the two groups in relation to motor fitness components

through graphical representation. ***Figure-1*** showed the graphical outcome of the group difference on component specific.

Figure-1: Graphical representation of the fitness components between the two groups.

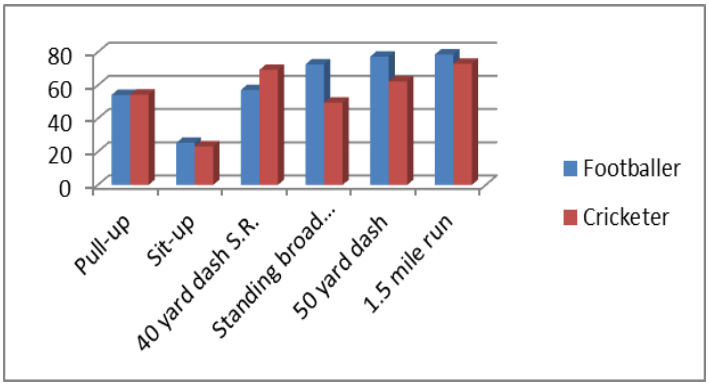


Figure-1 also showed that the both groups were identical in pull-ups and the footballers group was better in bent knee sit-up, standing board jump, 50 yard dash and 1.5 mile run but the cricketers group was better in 40 yard dash shuttle run.

The investigator also intended to estimate the difference of total fitness scores between the two groups and also presented in ***Table-4.***

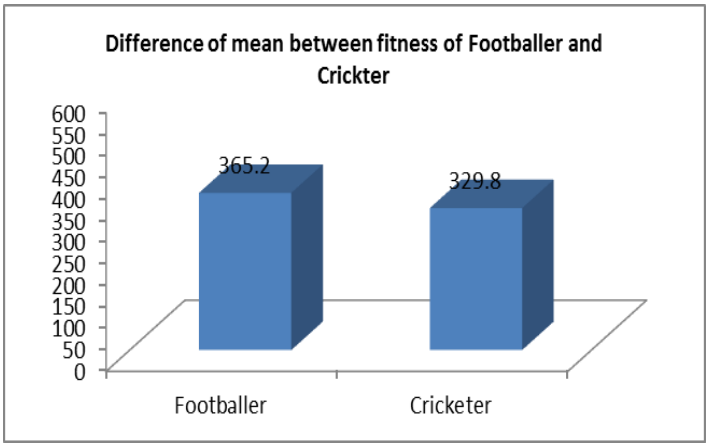
Table 4: Comparison of Mean values of total fitness and total intelligence between two groups.

	Footballer	**Cricketer**
Total fitnes	365.2	329.8
Total Intelligence	92.3	90.7

Table-4 showed that the Footballers group was relatively better in both the fitness and psychological parameters than the cricketers group.

This result also represented in graphical form and mentioned in Figure-2.

Figure-2 showed the difference of Mean values in fitness and psychological parameters between two groups.



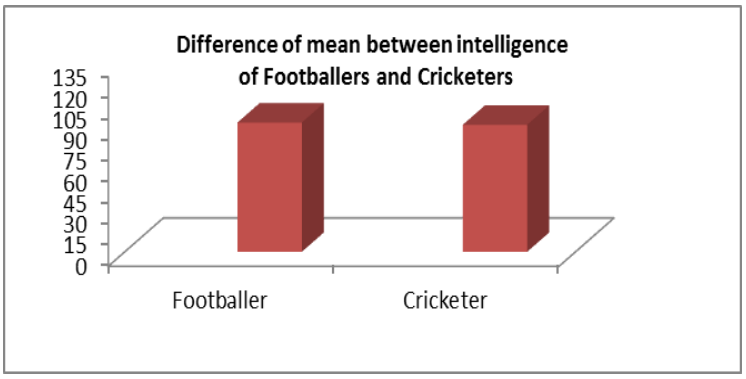


Figure-2 showed that both in total motor fitness scores and in total intelligence scores footballers were better than the cricketers.

In the present study, there was a positive relationship between intelligence and motor fitness for both the groups. So, it may be concluded that better the motor fitness better the chance of expressing high level of intelligence or vice-a versa.

III. Conclusion

In spite of the limitations, on the basis of the findings of this study the following specific conclusion was drawn:-

Performers showed better motor fitness has the fair chance of expressing higher level of intelligence and vice-a versa.

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Adiponectin as a Biomarker of Type 2 Diabetes Mellitus

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Abstract- Adiponectin is an adipocyte-derived peptide that acts as a hormone with anti-inflammatory and insulin-sensitizing properties. Lower serum levels of adiponectin have been consistently associated with increased risk of type 2 diabetes in numerous prospective studies of diverse nationalities. However, few studies among Filipinos were documented. The objective of this study is to identify if adiponectin could serve as a biomarker of type 2 diabetes mellitus among Filipino respondents by determining the association of its levels with the presence of impaired fasting blood glucose, type 2 diabetes mellitus, insulin resistance and other anthropometric parameters. This study, conducted in University of Santo Tomas Hospital-Out Patient Department, compared the levels of adiponectin in normal, pre-diabetic and diabetic groups, with each having 28 randomly selected samples and equivalent gender ratio. Blood samples were analyzed for fasting blood glucose (FBS), insulin and adiponectin. Homeostatic model assessment of insulin resistance (HOMA-IR) was also computed. Adiponectin and insulin levels were determined using enzyme-linked immunosorbent assay (ELISA). Adiponectin was significantly decreased ($p<0.001$) in diabetic (23.6 ± 10.5 ug/ml) and pre-diabetic (67.6 ± 10.6 ug/ml) groups compared to the normal group (143.9 ± 11.6 ug/ml). It was also found to have a significant inverse correlation with FBS ($rxy.z= -.370$, $p= 0.001$), and HOMA-IR ($rxy.z= -.326$, $p= 0.003$) in all of the subjects. Serum adiponectin was also significantly decreased in insulin-resistant (HOMA-IR > 3) compared to insulin-sensitive (HOMA-IR < 3) subjects (57.1 ± 11.2 ug/ml vs. 95.1 ± 9.9 ug/ml; $p= 0.014$). The researchers conclude that lower adiponectin level is associated with insulin resistance and development of type 2 diabetes mellitus.

Keywords: adiponectin, HOMA-IR, insulin resistance, type 2 diabetes mellitus

I. Introduction

The burden of diabetes mellitus is dramatically increasing worldwide affecting approximately 382 million people, 80% of whom live in low- and middle-income countries where four out of five people are said to have diabetes. Cases of all the types of diabetes are increasing. Of note are Type 2 diabetes mellitus cases wherein the number of people affected is expected to increase by 55% by the year 2035 [1]. This type of diabetes is characterized by a combination of impaired insulin secretion from pancreatic beta cells and insulin resistance of the peripheral target tissues and is most often associated with older age, obesity, family history of diabetes, previous history of gestational diabetes, physical inactivity, and certain ethnicities [2]. Identifying individuals with high risk of Type 2 diabetes at an early reversible stage is critical for controlling its epidemic trend [3].

Adiponectin, an adipocyte-derived peptide that is exclusively and abundantly expressed in adipose tissue, acts as a hormone with anti- inflammatory and insulin-sensitizing properties [4]. Higher adiponectin levels are consistently associated with lower risk of Type 2 diabetes in prospective studies of diverse populations. Future studies that evaluate whether adiponectin is a useful predictor of Type 2 diabetes in addition to established risk factors using statistical techniques appropriate for prognostic analysis are encouraged [5]. Several cross-sectional studies have already been conducted, most of which documented that lower plasma levels of adiponectin in human subjects can be related with obesity [6], insulin resistance [7], and Type 2 diabetes [8].

In addition, several epidemiological researches in African-Americans, Pima-Indians [9], Asian Indians [10], Japanese-Americans [11], Japanese [12], Chinese [3] and Korean [13] population support the protective role of adiponectin against diabetes but few studies are documented in Filipino subjects. The first population-based investigation on Filipinos in determining the association of adiponectin levels with the presence of diabetes mellitus and impaired fasting glucose conducted by Paz-Pacheco et al. (2009) [14] recommends further studies to be performed, including investigations of the correlation of adiponectin with the degree of insulin resistance, on Filipino subjects.

This study evaluated whether adiponectin could serve as a biomarker of Type 2 diabetes mellitus among Filipino respondents. Furthermore, this study: (1) compared serum adiponectin levels of normal subjects with serum adiponectin levels of pre-diabetic and diagnosed Type 2 diabetic individuals, (2) identified if lower serum adiponectin levels is associated with the presence of Type 2 diabetes mellitus, and (3) determined the association of adiponectin with fasting blood glucose, insulin resistance, and other anthropometric parameters.

II. Methods

A cross-sectional study design was used to compare the levels of serum adiponectin in normal, pre-diabetic, and Type 2 diabetic individuals. Its association with insulin resistance and other anthropometric parameters was also identified.

2.1 Research Setting

The study was conducted at the University of Santo Tomas Hospital Out-Patient Department (OPD) Diabetic Clinic supervised by Dr. Bien J. Matawaran and Dr. Erick Mendoza where the diabetic and pre-diabetic patients were screened.

2.2 Population and Sample

Subjects that were included were normal, pre-diabetic, and Type 2 diabetic Filipino males and non-pregnant females ages 30 years old and above who are willing to participate and give their consent. Subjects excluded were individuals with diseases or conditions, including Type 1 diabetes mellitus, congestive heart failure, established renal disease requiring hemodialysis, history of endocrine disorders such as thyroid diseases, severe psychological disorders, physical disabilities, cancer, cardiovascular disease, Alzheimer's disease, tuberculosis, AIDS, and other communicable diseases [14]. The presence or absence of the aforementioned conditions for disqualification was identified through the patient's history interview and questionnaire, and was verified through the supervising physicians in the USTH-OPD Diabetic Clinic.

All respondents who passed the inclusion criteria were included in the study. Subjects were categorized according to American Diabetes Association (ADA) classification of diabetes [15] into 3 groups: normal, pre-diabetic and Type 2 diabetic groups. Individuals having fasting blood glucose level of < 100mg/dl (< 5.6 mM) were grouped to the normal/control group. Subjects having fasting blood glucose level of 100 to 125 mg/dL (5.6 mM to 6.9 mM) and/or having a history of impaired fasting glucose/ glucose tolerance for the past three months were grouped into pre-diabetic group. Individuals with a clinical diagnosis of Type 2 diabetes and/or having ≥ 126 mg/dL (>7.0 mmol/L) were grouped into Type 2 diabetic group. All individuals were randomly selected.

Twenty-eight patients were used in each group to achieve 84.8% power of the statistical test at two-sided 5% level of significance. This calculation is based on the report of Snehalatha et al. (2003) [10] that the mean serum adiponectin of non-diabetic Indian patients and Type 2 diabetic patients are 16.7 (SD = 7.6) and 11.3 µg/mL, respectively. OpenEpi was used in the computation of this sample size. A population of 28 per group (total n=84) from the total screened pool was obtained through random numbers to increase the power of the test (28 normal, 28 pre-diabetic and 28 diabetic subjects).

2.3. Ethical Considerations

Permission was requested from the ethics committee of the University of Santo Tomas Hospital Institutional Review Board and authorized physicians to conduct a study among normal, prediabetic and type 2 diabetic patients. The study was supervised by Dr. Bien J. Matawaran, FPSCP, DPSEM and Dr. Erick Mendoza. Diabetic and pre-diabetic patients were screened in the USTH Out-Patient Department Clinic. The participants were informed of the detailed objectives of the study and were reassured of the confidentiality of data upon signing the informed consent.

2.4. Data and Specimen Collection

Subjects were recruited and screened through a questionnaire which covered the demographic, anthropometric, and clinical parameters, including family and personal medical history.

Blood sample (5.0 ml) of each subject was drawn by venipuncture after an 8- to 10-hour fast. Serum was separated from whole blood within 30 minutes and the samples were tested for fasting blood glucose, adiponectin levels, and insulin levels. Fasting blood sugar was measured using Hitachi 902 Chemistry Analyzer. Serum adiponectin and fasting insulin were measured using Enzyme-Linked Immunosorbent Assay (ELISA) kits from Abcam U.K. product code ab99968 and Monobind Inc. Lake Forest, CA 92630, USA product code: 2425-300, respectively. HumaReader HS Human (Biocare ELISA reader) was used to obtain the absorbance of each sample.

2.5 Statistical Analysis

The clinical characteristics and demographic data of the respondents such as age, body mass index (BMI), systolic and diastolic blood pressure, waist-hip ratio, fasting blood sugar (FBS), adiponectin, insulin, and homeostatic model assessment for insulin resistance (HOMA-IR) were summarized using mean ± standard error of mean (SEM).

Analysis of variance (ANOVA) was used to compare the means of the summarized clinical characteristics and demographic data of the three groups (normal, pre-diabetic and diabetic). Analysis of covariance (ANCOVA) adjusted for age and body mass index (BMI) was used to compare the means of insulin, HOMA-IR, and adiponectin. Partial correlation adjusted for age and BMI was calculated to determine the correlation between adiponectin and other variables. HOMA-IR was calculated using the equation: [fasting serum insulin (uIU/ml) x fasting plasma glucose (mmol/L])/22.5 [16]. P-values of less than 0.05 were considered significant. All statistical tests were performed using SPSS 17.0.

III. RESULTS AND DISCUSSION

The table below shows the summarized demographic and clinical characteristics of the recruited normal, pre-diabetic, and diabetic groups.

Table 1. Demographic and Clinical Characteristics of Study Groups

Parameters	Normal	Pre-diabetic	Diabetic	p-value	*Post-hoc*
Age (years)	47.7 ± 2.5	59.1 ± 2.0	57.9 ± 1.9	<0.001	N<(D=P)
BMI	22.0 ± 0.5	24.6 ± 0.6	24.8 ± 0.8	0.004	N<(D=P)
W/R	0.86 ± 0.01	0.89 ± 0.01	0.89 ± 0.01	0.085	-
Systolic (mmHg)	124.3 ± 2.2	124.8 ± 1.3	125.7 ± 2.4	0.899	-
Diastolic (mmHg)	80.5 ± 1.8	83.0 ± 1.1	83.2 ± 1.4	0.343	-
FBS (mmol/L)	4.4 ± 0.1	5.8 ± 0.1	10.5 ± 0.9	<0.001	(N=P)<D

Legend: BMI, Body Mass Index; W/R, Waist-Hip Ratio; FBS, Fasting Blood Sugar; N, Normal; D, Diabetic; P, Pre-diabetic

Each group was composed of 28 respondents with equal gender ratio (14 males and 14 females). The age of pre-diabetic [(Mean ± SEM) 59.1 ± 2.0] and diabetic (57.9 ± 1.9) respondents were significantly higher ($p<0.001$) than the normal group (47.7 ± 2.5) based on the *Post-hoc* analysis [(P=D)>N], however, there is no significant difference between the age of pre-diabetic and diabetic groups. The BMI of the pre-diabetic (24.6 ± 0.6) and diabetic (24.8 ± 0.8) groups were significantly higher ($p=0.004$)

compared to the normal group (22.0 ± 0.5) based on the *Post-hoc* analysis [(P=D)>N], however, there is no significant difference between the BMI of pre-diabetic and diabetic groups. The FBS of the diabetic group (10.5 ± 0.9 mmol/L) was significantly higher (p<0.001) compared to the normal (4.4 ± 0.1 mmol/L) and pre-diabetic (5.8 ± 0.1 mmol/L) groups based on the *Post hoc* analysis [D>(N=P)], however, there is no significant difference between the FBS of normal and pre-diabetic groups. The systolic and diastolic blood pressure, and waist-hip-ratio did not significantly differ statistically among the subject groups.

Table 2. Analysis of Covariance (Age and BMI Adjusted) of Insulin, HOMA-IR and Adiponectin Among the Study Groups

Parameters	Normal	Pre-diabetic	Diabetic	p-value	Post Hoc
Insulin (mIU/L)	6.9 ± 1.1	12.3 ± 1.0	11.4 ± 1.0	0.003	N<(D=P)
HOMA-IR	1.3 ± 0.4	3.2 ± 0.4	5.2 ± 0.4	<0.001	N<P<D
Adiponectin (ug/ml)	143.9 ± 11.6	67.6 ± 10.6	23.6 ± 10.5	<0.001	D<P<N

Legend: HOMA-IR, Homeostatic Model Assessment of Insulin Resistance; N, Normal; D, Diabetic; P, Pre-diabetic

In Table 2, the comparison of the adjusted means of insulin, homeostatic model for insulin resistance (HOMA-IR) and adiponectin among the three study groups is shown. The means were adjusted for age and BMI to avoid bias since both significantly differed among the study groups. Insulin was significantly decreased (p=0.001) in normal subjects [(Mean ± SEM) 6.9 ± 1.1 mIU/L] compared to the pre-diabetic (12.3 ± 1.0 mIU/L) and diabetic groups (11.4 ± 1.0 mIU/L). *Post-hoc* analysis revealed that there is no significant difference between the insulin of diabetic and pre-diabetic groups [N< (D=P)]. HOMA-IR was significantly lower (p<0.001) in the normal group (1.3 ± 0.4) compared to the pre-diabetic (3.2 ± 0.4) and diabetic groups (5.2 ± 0.4), and *post-hoc* analysis also showed that the HOMA-IR of the pre-diabetic group was also significantly lower than the diabetic group (N<P<D). Adiponectin was found to be significantly lower (p<0.001) in the diabetic group (23.6 ± 10.5 ug/ml) compared to the pre-diabetic (67.6 ± 10.6) and normal groups (143.9 ± 11.6 ug/ml), also, the *post-hoc* analysis revealed that adiponectin levels of the pre-diabetic group was significantly lower than the normal group (D<P<N).

Table 3. Age and BMI Adjusted Means of Adiponectin Between Insulin-Sensitive and Insulin-Resistant Groups

Parameter	HOMA-IR < 3	HOMA-IR > 3	p-value
Adiponectin (ug/ml)	95.1 ± 9.9	57.1 ± 11.2	0.014

Legend: HOMA-IR, Homeostatic Model Assessment of Insulin Resistance

To assess adiponectin levels and influence of insulin resistance, the subjects were further divided based on homeostatic model assessment of insulin resistance (HOMA-IR) into insulin sensitive (HOMA-IR < 3) and insulin-resistant (HOMA-IR > 3) groups, similar to the previous study of Urbanavičiu *et al.* (2008) [17] (Table 3). Adiponectin was found to be significantly lower (p=0.014) in insulin-resistant group [(Mean ± SEM) 57.1 ± 11.2 ug/ml] compared to the insulin-sensitive subjects (95.1 ± 9.9 ug/ml).

HOMA-IR, the index regulated by FBS and fasting insulin level, is a method used to evaluate the insulin resistance where insulin secretion capacity is sustained to some extent, and is widely used as a research tool in epidemiological studies [18]. Decreased serum adiponectin levels in insulin resistant compared to insulin sensitive group may be due to its association with insulin sensitization. The findings of this study show that adiponectin secretion is closely related to insulin resistance and insulin sensitivity appear to be a major determinant of adiponectin levels, consistent with previous studies [7, 17].

Table 4. Partial Correlation Adjusted for Age and BMI of Adiponectin Among Other Variables in All Subjects Combined

Parameters	$r_{xy.z}$	*p-value*
Waist-Hip Ratio	-0.019	0.866
Systolic (mmHg)	0.155	0.165
Diastolic (mmHg)	0.109	0.330
Fasting Blood Glucose (mmol/L)	-0.370	0.001
Insulin (uU/ml)	-0.131	0.239
HOMA-IR	-0.326	0.003

Legend: HOMA-IR, Homeostatic Model Assessment of Insulin Resistance

In Table 4, the partial correlation of adiponectin among other variables in all of the subjects is shown. Adiponectin levels have a significant inverse correlation with fasting blood glucose (rxy.z=-0.370, p=0.001) and HOMA-IR (rxy.z= -0.326, p=0.003). This indicates that higher adiponectin level correlates with better insulin sensitivity and glucose metabolism, and lower adiponectin level correlates with higher insulin resistance and abnormal glucose metabolism, consistent with previous studies [7, 17, 18]. Adiponectin also has a negative correlation with insulin but this was not statistically significant. The correlation of adiponectin with waist-hip ratio, and systolic and diastolic blood pressure, likewise, did not significantly differ.

The results of this study showed the ability of adiponectin in differentiating diabetic from pre-diabetic and normoglycemic individuals. Based on the findings, adiponectin secretion is already altered in pre-diabetic conditions leading to much lower adiponectin levels in the diabetic state. This is supported by the findings of the study of Ahsan et al., (2012) [18] wherein it was mentioned that adiponectin indicates the energy abundance in the body and its secretion is neither regulated nor influenced by the glycemic status of the individuals, rendering this hormone a suitable candidate for assessment of pre-diabetes. Thus, lower serum adiponectin levels leading to abnormal glucose metabolism is associated with the development of Type 2 diabetes mellitus. The mechanism is not very clear, however; it was mentioned in the study of Durrani et al., (2013) [8] that the diabetes susceptibility locus which is seen on chromosome 3q27 has been found to contain adiponectin gene and multiple polymorphisms of the adiponectin gene have also been observed in Type 2 diabetes mellitus.

IV. CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, the researchers hereby make the following conclusions: (1) Subjects with Type 2 diabetes mellitus and pre-diabetes exhibit lower levels of serum

adiponectin compared to normal individuals (23.6 ± 10.5 ug/ml & 67.6 ± 10.6 ug/ml vs. 143.9 + 11.6 ug/ml; p<0.001). (2) Lower serum adiponectin level is associated with the presence of type 2 diabetes mellitus. (3) Adiponectin is inversely associated with FBS (rxy.z= -0.370, p=0.001) and HOMA-IR (rxy.z= -0.326, p=0.003). This indicates that higher adiponectin levels correlates with better insulin sensitivity and glucose metabolism, and lower adiponectin levels correlates with higher insulin-resistance and abnormal glucose metabolism. The researchers conclude that lower adiponectin level is associated with insulin resistance and development of type 2 diabetes mellitus.

The researchers recommend for further investigations that will warrant a longitudinal large-scale study to be conducted due to the limitation of this cross sectional study. Other risk parameters including oral glucose tolerance (OGTT), lipid profile, glycosylated hemoglobin, metabolic syndrome and obesity are also recommended to be included. A more homogenous age group among Filipino population is also suggested.

The researchers also recommend for future studies to elaborate the role of adiponectin in insulin sensitivity including its mechanism and other factors that could affect its level in relation to the development of Type 2 diabetes mellitus.

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Analyzing the Response of an RLC Circuit

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Abstract- RLC circuit response and analysis is modelled using MATLAB. We calculate the stability of system using bode plot method. Bode plot is one of the convenient method for stability calculation since using it we not only calculate stability but also phase margin ,gain margin, phase crossover frequency, gain crossover frequency at a time. The response of RLC is examined from different input form using MATLAB.

Index Terms- RLC, Response ,System order, BIBO, GUI

I. Introduction

An RLC circuit (also known as a Resonant circuit or a tuned circuit) is an electrical circuit consisting of a resistor (R), an inductor (L), and capacitor (C), connected in series or in parallel. An RLC circuit is called a *second-order* circuit as any voltage or current in the circuit can be described by a second-order differential equation for circuit analysis. One very useful characterization of a linear RLC circuit is given by its Transfer Function, which is (more or less) the frequency domain equivalent of the time domain input-output relation.

We use MATLAB for analyzing the frequency response of the circuit, time response of the circuit. To analyse other standard circuit configurations such as low pass and high pass RLC network, we use interactive GUI. In GUI you can change the RLC parameter and see the effect on the time and frequency response in real time.

II. Time Response

The **time response** represents how the state of a dynamic system changes in time when subjected to a particular input. The time response of a control system is divide into two parts (a)transient response (b)steady state response. The transient response is the part of the response which goes to zero as the time increases and steady state response is the part of the total response after transient has died. MATLAB provides many useful resources for calculating time responses for many types of inputs.

III. Frequency response

In LTI systems, if the input to the system is sinusoidal, then the steady-state output will also be sinusoidal at the same frequency but in general with different magnitude and phase. These magnitude and phase differences as a function of frequency comprise the **frequency response** of the system. The frequency response of a system can be found from the transfer function in the following way: create a vector of frequencies (varying between zero or "DC" to infinity) and compute the value of the plant transfer function at those frequencies.

IV. Stability

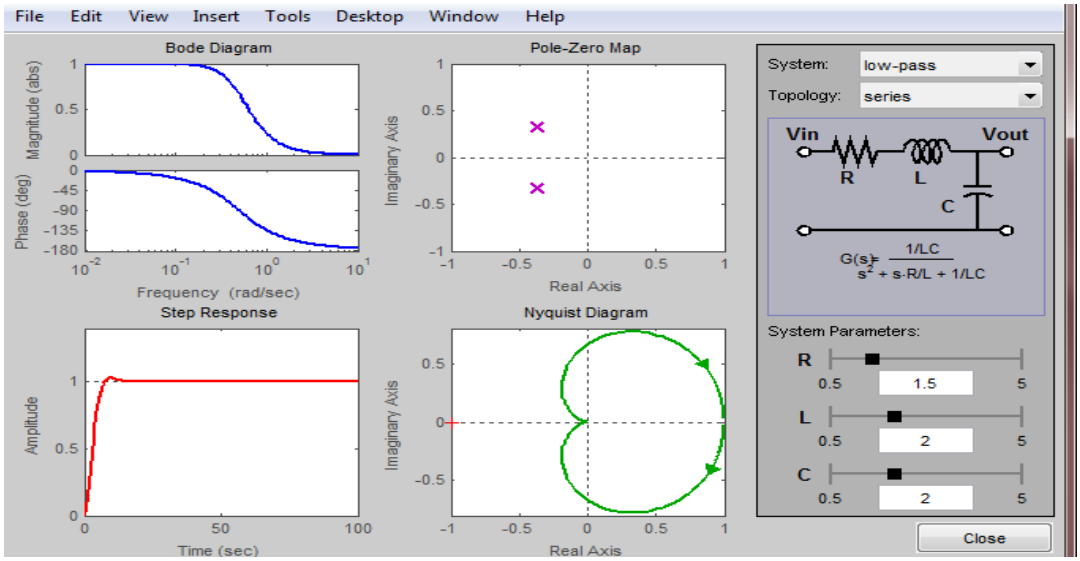
We use the **Bounded Input Bounded Output (BIBO)** definition of stability which states that a system is stable if the output remains bounded for all bounded (finite) inputs. We use transfer function representation to analyse stability. If all poles of the transfer function (values of s at which the denominator equals zero) have negative real parts, then the system is stable. If any pole has a positive real part, then the system is unstable. If we view the poles on the complex s-plane, then all poles must be in the left half plane (LHP) to ensure stability. If any pair of poles is on the imaginary axis, then the system is marginally stable and the system will oscillate.

V. System order

The order of a dynamic system is the order of the highest derivative of its governing differential equation. It is the highest power of s in the denominator of its transfer function. Based on power of s we have first order, second order and highest order system.

VI. Result

To analyze other standard circuit configurations such as low-pass and high-pass RLC networks, series and parallel networks, we use an interactive GUI. In this GUI, you can change the R, L, C parameters and see the effect on the time and frequency responses in real time.



VII. SOFTWARE USED

Here we are using MATLAB software. The version we are using is 7.10.0.499(R2010a).MATLAB is a software package for high performance computation and visualization. The combination of analysis capabilities, flexibilities, reliability and powerful graphics makes MATLAB the premier software package for engineers and scientists. MATLAB provides an iterative environment with more than hundreds of reliable and accurate built-in mathematical functions. These functions provide solutions to a broad range of mathematical problems including: Matrix Algebra, Complex Arithmetic, Linear Systems, Differential Equations, Signal Processing, Optimization and other types of scientific computations . In this paper, the need for MATLAB as a pedagogical tool in engineering research and teaching is highlighted.

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In quest of understanding more about rural poverty and an adaptable rural growth among rural poor households in rwanda: new realities, new choices for tomorrow;

Evdence from two villages in Rwanda's Northern Province

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Abstract: This research paper focused on the nature and extent of persistent rural poverty in rural areas, and in particular to the ways in which rural residences may affect ones poverty status in Rwanda. The central theme of this study was to fully describe what rural poverty is, how rurality leads to extreme poverty and what it actually means to be poor especially when it comes to the eyes of the beholder; the poorest of the poor in the rural areas. It is these poorest of the poor who were the subject / unit of analysis in this study. Two villages in Rwanda's Northern Province were selected as a case study. The study was mostly qualitative and much focus was put on a down to earth naturalistic inquiry about rurality and rural poverty as a whole. The study used participatory qualitative research methods which were supplemented with quantitative research methods.

This study used methods like the questionnaire and focus group discussions to collect data from the rural poor. In data analysis, the study used descriptive statistics and also the researcher relied on established theories to process and concretely analyse the information. Generated theory was compared to existing theory on issues concerning rurality and rural poverty.

This study presents new realities about how poor people living in deep rural areas define poverty and what they understand poverty to mean, as well as what the rural poor specifically conceive to be the major causes of rural poverty, and how the poor people survive in deep rural areas of Rwanda. Increased attention of this study was put on rural social processes with a firm foundation to understanding what rural poverty is, its causes and impact, people's attitudes and experiences of living with it in a landlocked country like Rwanda. The study further explored the possible survival strategies the rural people have initiated on their own to lessen the difficulties they go through.

The study did not intend to provide any solutions to alleviating rural poverty because there as many policies as there are theories on poverty and from the beginning of the 2nd quarter of the 20th century, the World Bank, UNDP, and nongovernmental organizations, suggested very, very many policy options to fight poverty in different places at different times. Governments all over the sub-Saharan Africa have implemented the various policy initiatives to fight poverty but there seems to be no big improvement. As a result, this research study' impression was that, if the poverty eradication solutions have not done an expectedly good job, why don't we go back to the drawing board and see backwards to the grass roots, what exactly the problem is. Given the different scale of concentration of rural poverty in rural areas, the different levels of services available to rural people and the differences in institutions and social norms, there is certainly some reason to expect that there should be different strategies to fight poverty in rural places.

This research strictly intends to contribute to existing knowledge by sharing new ideas, realities and choices with policy makers, civil rights activists and various governments in the great lakes region on the assumption that our efforts to reduce poverty in rural areas were hampered by our lack of knowledge on how living in rural areas affects ones chances of realizing higher standards of living. Our lack of understanding about the effects of concentrated rural poverty on rural communities could just be a cause of the failures to have the efforts to reduce the level of rural poverty.

The researcher was very much interested in this study because, poverty has often been described by people who are not poor themselves and to make matters worse, poverty has often been generalized as the same type of poverty in both urban areas and rural areas. Yet as a matter of fact, poverty found in rural areas is so much different from the type of poverty found in urban areas.

The study found out that rural poverty is often unseen, misunderstood, or misperceived by outsiders, those who are not themselves rural and poor. The study also found out that there is a great interrelationship between rurality and rural poverty; one of them leads to the other and one of them determines the other. The research result shows that rural poverty depends on rurality. It is again discovered that, the further away one stays from urban areas, the higher the chances that he or she is vulnerable to being poor. This is the place effect theory in determining rural Poverty.

The study contends that social scientists, administrators, field workers, academics, non governmental development practitioners do always misperceive and neglect the ideas of poor people who are living in the country side. The poor in their own words, made this

research discover that their views on poverty, their opinions on poverty and their general knowledge on poverty are rarely listened to. If we were to listen to their voice, we would surely have a rich knowledge on the hidden nature of rural poverty.

Rural poverty has been misperceived from generation to generation of researchers, educationists, and social scientists. A culture of rural bias has been inherited to the extent that today, there is a debate about the meaning of the word rurality itself. Some schools contend that the word rurality does not exists in the English language while others contend that the word exists; this shows the level of biasness and the level of misunderstanding the whole concept of rurality and rural poverty pose. It defeats one's understanding that even to day, in this 21st century: in a world full of educationists, great researchers and academics, several of them still take rural poverty to be synonymous with urban poverty. They see that there is nothing new about knowing or rather discovering more about the ills of rurality and rural poverty. They just think that they know it all.

But, it is surprising that in this study the poor themselves have described the situation. They are living a life which so much different from what several of these scholars have been assuming to be knowing as poverty. Its common sense that what is perceived depends on the perceived. Several people who think they know much about poverty do not actually know much about rural poverty. They have been fronting their own interests, preferences and preconceptions, their own rationalizations and their own defences for excluding or explaining the discordant and the distressing. Chamber (1983) states that such people are often ignorant about rural poverty and yet they do not want to know what they do not know. The less they have direct and discordant contact and learning, and the less they know, so the easier it is for the myth to mask the reality. The culture of rural bias has been carried on from a generation of scholars in the last century to another generation of scholars in this century. This study was, therefore, a fundamental step in attempting to argue out the idea that rural poverty should not be misperceived as having the same face as urban poverty. This study also argues for a new professionalism, with fundamental reversals in outsiders learning values and behaviours, and proposes new models which are more realistic on understanding more about rural poverty backed with a more realistic action for tackling rural poverty.

Key words: Rurality, Ruralism, Rural Poverty, Rural Poor, Mbabazize Rurality Attitudes model.

CHAPTER ONE: INTRODUCTION

Background to the study

This research study focused on studies of persistent rural poverty in rural areas, and in particular to the ways in which rural residences may affect ones poverty status in Rwanda. The study was mostly qualitative and much focus was put on a down to earth naturalistic inquiry about rurality and rural poverty as a whole.

This study focused attention on the poorest rural households in Rwanda and addressed the real faces of poverty among rural poor households specifically in the selected two villages of the Northern Province of Rwanda. This study sought to address questions about the determinants of rural poverty among the rural households. The study focused on how poverty is defined, how it is understood, what are its causes and impacts, and what are the coping strategies the rural poor have come up with to survive within the Rwandan context. This research sought to inform stakeholders, particularly the local elites, to understand the complexity of rural poverty in the region.

The study did not intend to examine solutions to poverty alleviation because there as many policies as there are theories on Poverty. From the beginning of the 2nd quarter of the 20th century, the World Bank, UNDP, and nongovernmental organizations, suggested, very many policy options to fight Poverty in different places at different times. Governments all over the sub-Saharan Africa have implemented the various policy initiatives to fight poverty but there seems to be no big improvements. Policies to fight poverty have changed from one policy to another, albeit from one government to another. The 2006 (NISR 2006) Rwanda poverty update report shows that at least 92 percent of the total population lives in rural areas and out of this 58 percent are women and 24 percent are men in rural areas.

Table 1. 1: Distribution of household groups by urban and rural percentage distribution

Household type		urban	Rural	National
Female headed	17.3	82.7	100.0	
Widow headed	16.9	84.1	100.0	
Child headed	22.9	77.1	100.0	

Source: 2006 NISR poverty report

Many rural dwellers in Rwanda are landless peasants living in conditions of extreme poverty. Moreover the HIV/AIDS epidemic is wreaking human resource development to which 8.7 percent of the rural population is affected (MOH, 2010). Rural poverty in Rwanda is mainly accelerated by the issue of population increase. Today the rural population is 10.9 million and it is estimated to reach 36 million people by 2030 (UNDP 2011). Rwanda has (2398 Sq km^2) only, which is much smaller than Lake Victoria. The little land available is also covered with a rough terrain and erosion. Rwanda is a landlocked country in which all these constraints keep poor farmers in rural areas from earning sufficient income from agriculture.

1.1.1 The situation of rural poverty in the world

One of the demographic characteristics of the developing world is its rural nature of the population. According to the World Poverty Report (2011), some 3.1 billion people or 55% of the population in developing countries live in rural areas. It however predicts that between 2020 and 2025, the total rural population will reach its peak and then start to decline and thereafter the developing countries' urban population would overtake its rural population. The basic fact is that most of these people in rural areas live in poverty, finding it difficult to enjoy the necessities of life. According to the World Poverty Report (2011), at least 70% of the world's very poor people are rural.

The livelihoods of rural poor households are diverse across regions and countries, and within countries. The World Bank Report (2000), estimated that 20 million people in Africa live in abject poverty. The report estimated that which 50 percent of sub-Saharan people live below the international poverty line of one American dollar a day. Rwanda is classified as a low income economy or a low human development country (World Bank 2000, UNDP report 2010) by the UNDP whereby human poverty is affecting over 80 percent of the population. Even before the 1994 Genocide, poverty headcount index has always been above 58 percent. In 1993 it was estimated at 53 percent, in 1995 it was 70 percent, and in the 2001 it was 65 percent (GOR 2002, HCLS 2000).

In planet earth where we live, there are two salient "evils" disturbing mankind. These "evils" are wealth and poverty; to have a better welfare, or a poor life style. It is this poor life style that has made a billion people (World Bank, 2010) live from a bad lifestyle to a worse lifestyle. This is the real face of poverty.

It is not surprising that some people are well off while others are badly-off. It is like those who are well off are already in heaven while those who are badly off are already living a life comparable to living in hell. In rich homes, families and clans, someone dies in the evening whereas in poor homes, someone dies in the morning due to differences in health service accessibility. George Bernard Shaw (1907) argues more than 100 years ago, that the greatest of evils and the worst of crimes is poverty. Poverty today, is just a tragedy with consequences which is completely ruining the lives of many people across this planet earth.

Nelson Mandela (2005) observes that, massive poverty and obscene inequality are such terrible scourges of our times; times in which the world boasts of breathtaking advances in science, technology, industry and wealth accumulation that they have to rank alongside slavery and apartheid as social evils. However, as for purposes of fighting this greatest scourge and evil ever to have consumed almost every 80% of the world's generation of mankind, we need to know what it is, depending on where we are, whether in rural areas or in urban areas. We need to come up with options to reduce it or alleviate it although some people would prefer eradicating it completely which would not be perfectly tenable. Whatever form of poverty mankind is facing, we just need to know it and reduce it. That is what matters as stated by Ladarch, Stewart and Staith (2003) in their new paper on poverty concepts and definitions.

As for this study, poverty was taken to mean a situation of deprivation of the general basic needs of man. This study also looked in details at the relative terms of poverty such as: relative poverty, absolute poverty, chronic poverty and extreme poverty. These forms of poverty were defined very well and also were compared to how the World Bank takes poverty to be in terms of income per capita and the amount of US dollars one is able to spend per day.

Rural poverty as used in this study, referred to the type of poverty commonly found among people who are living in deep rural areas. Rural poverty should be distinguished from urban poverty which is the type of poverty mostly affecting people living in urban areas such as towns, trading centers and district headquarters.

Poverty has denied us of all our rights to freedom and choice in African countries, poverty has denied us happiness and if one stands along the road and observes ten people who pass by him or her, three are happy while seven cross while talking and grumbling to themselves with all the gestures of being unhappy (Duncan, 2008). The causes and consequences of poverty have made men and women live unhappily in African tradition. It is widely known that the man is the major bread earner in the family and if a husband fails to feed his family, the consequences affect the woman in forms of domestic violence.

Although many countries have seen substantial economic growth over the past two decades (Brann 2008), many poor people have experienced considerable improvement in their welfare. For some countries, people's progress has been dismally slow. The very poorest individuals tend to be from socially excluded groups, live in remote areas with little education and with few assets. Women and children in rural areas are the biggest casualties.

1.1.2 The situation of population and poverty in Rwanda

Rwanda is a landlocked, resource deficient country. The population is about 12 million people, and 87 per cent of Rwandans live in rural areas. The population density in the country is the highest in Africa, with about 379persons/km². The annual demographic growth rate is 3.7 per cent, and the population is expected to increase to about 14 million by 2015.

Table 1. 2: Rwanda National population Statistics

GNI per capita, Atlas method (current US$) (2010)	520.0
Population, total (2010)	10,624,005.0
Rural population (2010)	8,616,068.1
Number of rural poor (million, approximate) (2010)	5,531,515.7

Source: United Nations Statistics (2010)

The above figures were for 2010 and they show the total rural population at about eight million people. This can be compared to the population structure by stratum in the table below which was having population figures of 2005 and 2006. Common to both tables is that both surveys show that the population in rural areas is much bigger than the population in urban areas.

Table 1. 3: Population structure, by stratum

	EICV1		EICV2	
Stratum	Estimated Popn	Share(%)	Estimated popn	Share (%)
City of Kigali	663,000	8.3	703,000	7.4
Other urban	618,000	7.8	865,000	9.1
Rural	6,683,000	83.9	7,893,000	83.4
Total	7,963,000	100	9,460,000	100

Source: Integrated living condition survey (EICV 1 & EICV 2), National Institute of Statistics of Rwanda- NISR (2005/2006)

Rwanda is a country of many hills and it is densely populated as compared to other countries in Africa. It is still a generally poor country and an essentially rural one. This has been partly caused by its significant demographic and social shifts. Rwanda's population multiplied eightfold in just half a century (IFAD 2008). The 1994 Genocide followed this spiraling demographic growth.

The 2010 UNDP report shows that 94 percent of the population lives in the countryside and is engaged in peasant agricultural farming, generating barely 100 US Dollars in gross domestic product. Rwanda's demographic structure has also changed whereby women today account for about 52 percent of the population (Koster 2008). And, as a direct consequence of the genocide, many households are headed by women.

Every economy recovering from war is a always affected severely (Lopez and Wooden 2005) and this impact can be long lasting and a great percent of these negative consequences normally affect the rural poor people who end up living with a very poor livelihood. Rwanda is classified into a group of African countries facing the most serious binding constraints in development (Ndulu and O'Connell 2008). In addition, its history of social division and ethnic diversity increases the country's needs for ethnically neutral institutional development (Bigsten and Isakson 2008). The country is one of the poorest in Africa. Gross domestic product per capita was US$530 in 2008, and Rwanda ranked 166th out of 187 countries in the 2011 United Nations Development Programs Human Development Index. Poverty is widespread throughout the country. In 2006, 56.9 per cent of the total population was living below the poverty line and 37.9 per cent was extremely poor. In rural areas about 64.7 per cent of the populations were living in poverty.

The genocide of 1994, which led to the loss of about 1 million lives and the creation of some 800,000 refugees and displaced persons, had a devastating social and economic effect on the country. It led to a change in the country's demographic structure and women today account for about 54 per cent of the Rwandan population. In addition, many households are headed by women and orphans. Households headed by women (29 per cent of the total rural population), households headed by children, and households affected by HIV/AIDS are also affected by poverty or are at risk of falling into poverty. Close to 14 per cent of rural dwellers have become landless peasants who live in conditions of extreme poverty, and, a large number of demobilised young soldiers have swollen the ranks of the unemployed. The National Bank of Rwanda (Central Bank, BNR) assessment report (1998) reveals that by 1960, 45 percent of the population was living in one form of Poverty, By 1990 the number of those living in poverty had risen to 75 percent and, mostly rural women were more affected. About 30 percent women in urban areas and over 45 percent of them lived in rural areas lived in poverty. A report by the World Bank (2010) shows that about 76 percent of Rwanda population was living below the poverty line of one (1) US dollars per day (600 Rwandan franks) as per the 2012 average prices

Throughout the world, poverty is a concern. But this concern should be more than people think or look at it. If they were to understand the real nature of poverty among the rural poor in a land locked country like Rwanda, their ideas would help such a country which is rising from Genocide. Much as the United Nations declared 1996 an International Year for the eradication of poverty and then a decade following (1999-2006) also being declared a united Nations Decade for Education of Poverty, this multi-faced "evil" of poverty is still on the rise.

Whereas some people are becoming rich in urban areas, rural women and men are becoming poorer and poorer. Every year the world celebrates 19th October as a special international day to eradicate poverty. In Rwanda the government has established the 2020 vision, Vision Umurenge, EDPRS and many other private oriented programs to alleviate poverty. This research study did not look at policies to alleviate poverty; instead, it intended to explore more about rural poverty as a whole, circumstances that make it prevail, its costs and adaptable ways to which the rural poor have tried to live.

1.1.3 The concepts of rurality and rural poverty within the Rwandan context

Poverty rates are highest in the most urban and most rural areas of the world. Rural poverty has received less attention than urban poverty from both policymakers and researchers. This research study examined the factors affecting poverty in rural areas. It focused on studies that explore whether there is a rural effect that is whether there is something about rural places above and beyond demographic characteristics and local economic context that makes poverty more prevalent in those places.

Fisher and Weber (2005) used the Panel Study of Income Dynamics to develop measures of asset poverty for metro and nonmetro areas. They found out that residents of central metropolitan counties are more likely to be poor in terms of net worth, but that nonmetropolitan residents are more likely to be poorer in terms of liquid assets. Rural people tend to have non liquid assets, such as homes, that they may not be able to convert to cash in times of economic hardship. Urban people, on the other hand, do not appear to

be as able to accumulate non liquid assets, but may be better able to withstand short-term economic disruptions. Households in rural areas are more likely to be poor than their urban counterparts. There is apparently something unmeasured about being in a nonmetro or rural area that affects the odds of being in poverty, even with controls for individual and community characteristics.

All of this contextual research suggests that there is something about living in a rural area that increases one's chances of being poor. This conclusion holds even when one considers individual and household characteristics. Two people with identical racial, age, gender, and educational characteristics in households with the same number of adults and children and workers have different chances of being poor if one lives in a rural area and the other lives in an urban area. The one living in a rural area is more likely poor. The conclusion holds when one also controls for certain community characteristics: people with similar personal and household characteristics are more likely to be poor if they live in a rural labor market as compared to those in an urban labor market, even if the labor markets have the same industrial and occupational structure and unemployment rate.

In this study, rural poverty was taken to be the type of poverty persistently existing in rural areas. The Rwanda National Participatory Assessment Reports (RNPAR), combined with the National statistical surveys, has provided these definitions of rural poverty. At an individual level a man or woman is considered poor if; they are confronted by a complex of inter-linked problems and cannot resolve them. All those people who do not have enough land, enough income or other resources to satisfy their basic needs, and, as a result live in precarious conditions, are all categorized to be poor. People who lack basic needs like food, clothing, medical costs, children's school fees and are unable to look after themselves are also taken to be poor. Households whose total level of expenditure is of less than 64,000 Rwf per equivalent adult in (Year 2000 prices), or if their food expenditures falls below 45,000 Rwf per equivalent adult per annum, then such a household is considered poor. At the household level, land owned, household size and characteristics of the head of household were important criteria for poverty. In particular, households headed by widows, children, the elderly and the handicapped are deemed likely to be poor. At the community level, the shortages of economic and social infrastructure and of natural resources are as well important criteria for poverty.

Rural poverty is a very complex and multidimensional phenomenon. It can be relative, absolute, transient, and chronic. The impact of the crisis of rural poverty is particularly acute on the most vulnerable sections of the society; women and children (UNDP 2003). The worst kind of poverty is when people do not have access to basic food and water to fulfill their basic physical needs. However, education attainment, health status, women's participation and empowerment of the poor do also matter.

From the confinements of this study, in which two villages in Rwanda's Northern Province were key, the following table shows the percentage of population which is poor per province and also comparison is made on the percentage prevalence of poverty in both urban and rural areas of Rwanda. The comparison of observation is taken from the surveys since the year 2000 to 2011 as shown below.

Table 1. 4: Percentage of the Rwandan population identified as poor

Province	2000/01	2005/06	2010/11
Kigali City	22.7%	20.8%	16.8%
Southern Province	65.5%	66.7%	56.5%
Western Province	62.3%	60.4%	48.4%
Northern Province	64.2%	60.5%	42.8%
Eastern Province	59.3%	52.1%	42.6%
Urban		28.5%	22.1%
Rural		61.9%	48.7%
Total	58.9%	56.7%	44.9%

Source: The evolution of poverty in Rwanda 2000 to 2011. Published by the National Institute of Statistics of Rwanda (2012)

from

The

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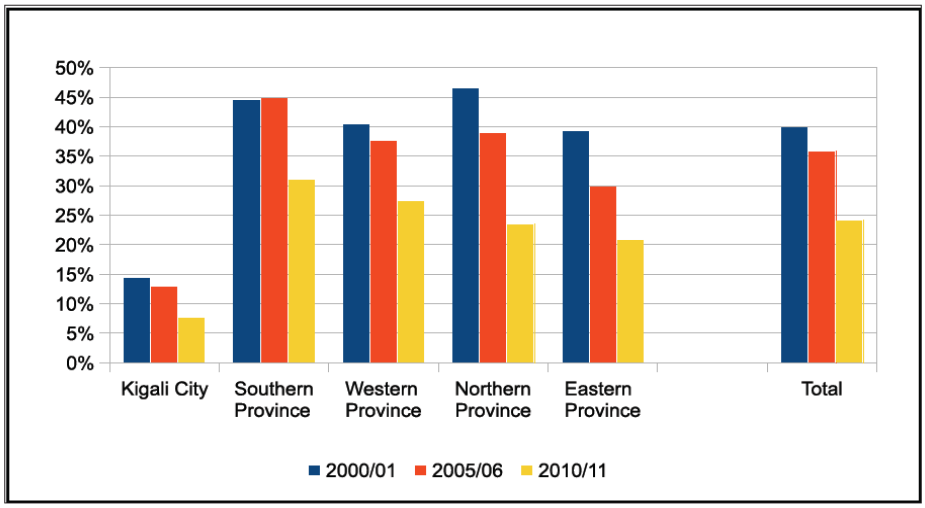
above table depicts that the type of poverty in areas is 61 percent, far much more than the percentage of poverty in urban areas which is 28percent

Figure 1. 1: Percentage of the Rwandan population identified as extreme poor



Source: The evolution of poverty in Rwanda from 2000 to 2011. Published by the National Institute of Statistics of Rwanda (2012)
The analysis has been put on test to further analyse the percentage of the population which is extremely poor per province in Rwanda. In the above table, it is clearly seen that by the year 2001, the Northern Province had the poorest population(47percent) in general, followed by the Southern Province which had about 45% of the most poorest people. This was the basis of this research study.
The Comprehensive Food Security and Vulnerability Analysis conducted in 2009 by the World Food Program, in close collaboration with the Rwanda National Institute of Statistics, indicated that 4% of the households had poor Food Consumption Scores, and 17% had borderline Food Consumption Scores (WFP, 2009). This presents a marked improvement from the 2006 rates of 7% and 28%, respectively. Although access to primary education has improved in rural areas (where the school enrolment rate is 77 per cent, against a rate of 87 per cent in urban areas), the enrolment rate in rural secondary schools is as low as 6 per cent, and dropout rates are higher than those in urban areas, particularly for girls.
When we look at the Rwanda household surveys carried out by the National Institute of Statistics(NISR) like that of EICV1 and that of EICV2, there were also important regional dimensions to Poverty as shown in Table 1.4 below. For instance the poverty headcount fell substantially in Eastern Province, fell by smaller amounts in Northern Province and the City of Kigali, and actually rose slightly in Southern Province. Calculations show that 68% of the total reduction on poverty was accounted for by poverty reduction in Eastern Province.
Table 1. 5: Poverty headcount by province, EICV1 and EICV2 (%)

PROVINCE	EICV1	EICV2
City of Kigali	24.4	20.2
Southern Province	65.8	67.3
Western Province	63.1	62.0
Northern Province	66.9	62.7
Eastern Province	61.8	50.4
National	60.4	56.9

Source: Computations from EICV1/2 surveys carried out by the National Institute of Statistics of Rwanda (2006, 2007.

Rwanda has achieved considerable economic growth over the last decade and a decrease in poverty levels from 77 percnet (1995) to 57 percent (2005). However, the 2006 household survey indicates that the benefits of this growth are unequally divided and the incomes of the poorest 20 percent have stagnated over the last ten years. This means that the rural poor in particular have not benefited fully from economic growth. Poverty is widespread throughout the country, with 2005/06 poverty rates ranging from 50 percent in Eastern Province to 67 percent in Southern Province. The southern province is the only province where the poverty headcount has increased since 2000/01. In Northern Province, things are worse. The poor are primarily rural households (98 percent) and households headed by women or children. Two-thirds of all rural people are poor and have little access to health facilities (13 percent). Many of them are illiterate (44 percent compared with 26 percent in the urban areas, and 49 percent for women) despite access to primary education having improved in rural areas, with 77 percent school enrolment against 87 percent in urban areas (DHS, 2009).

1.1.4 Rurality and rural poverty within the global context

Globally, rural poverty has started declining since the beginning of this millennium with more than 350 million rural people (IFAD, 2011) having lifted themselves out of extreme poverty. Although 70 percent of the developing world's 1.4 billion people are extremely poor and are still living in rural areas particularly in sub-Saharan Africa and south Asia. It is estimated that between the

years 2020 and 2025, two major demographic changes will take place: first the rural population will peak, then total number of rural people will start to decline. Secondly, in the developing world, the urban population will overtake the rural population (Ravallion and Sangraula 2007). Further empirical evidence from the figure below shows that in sub-Saharan Africa in which Rwanda is inclusive, the rural population is increasing. Whereas other countries will reach their peaks by 2025, in sub-Saharan Africa, we shall reach our peak by 2045.

Figure 1. 2: Population of rural trends globally

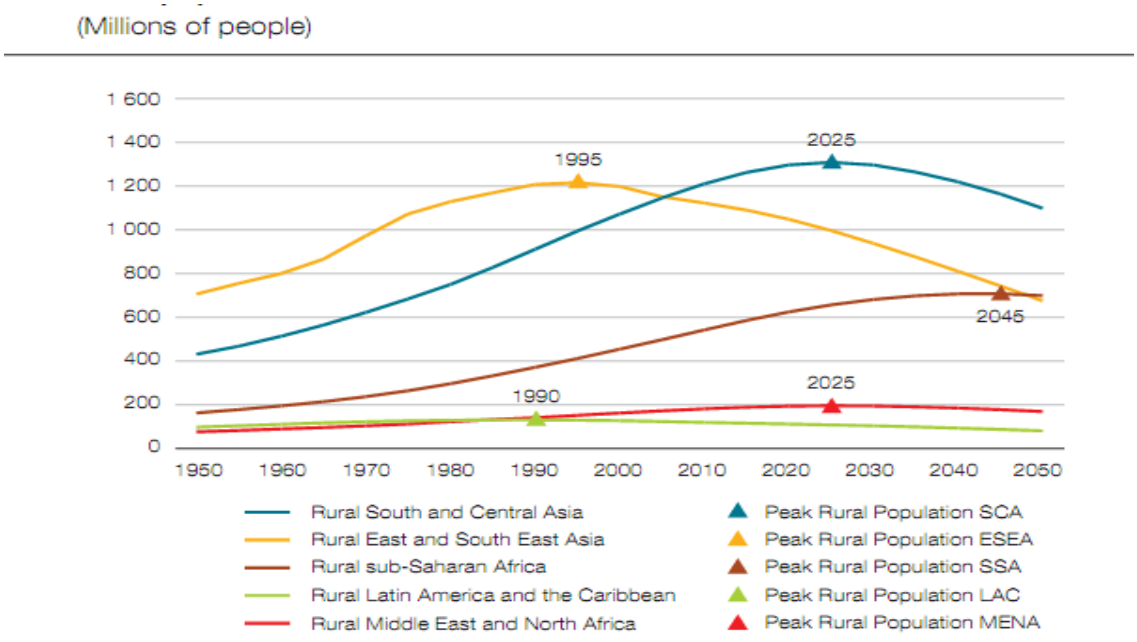
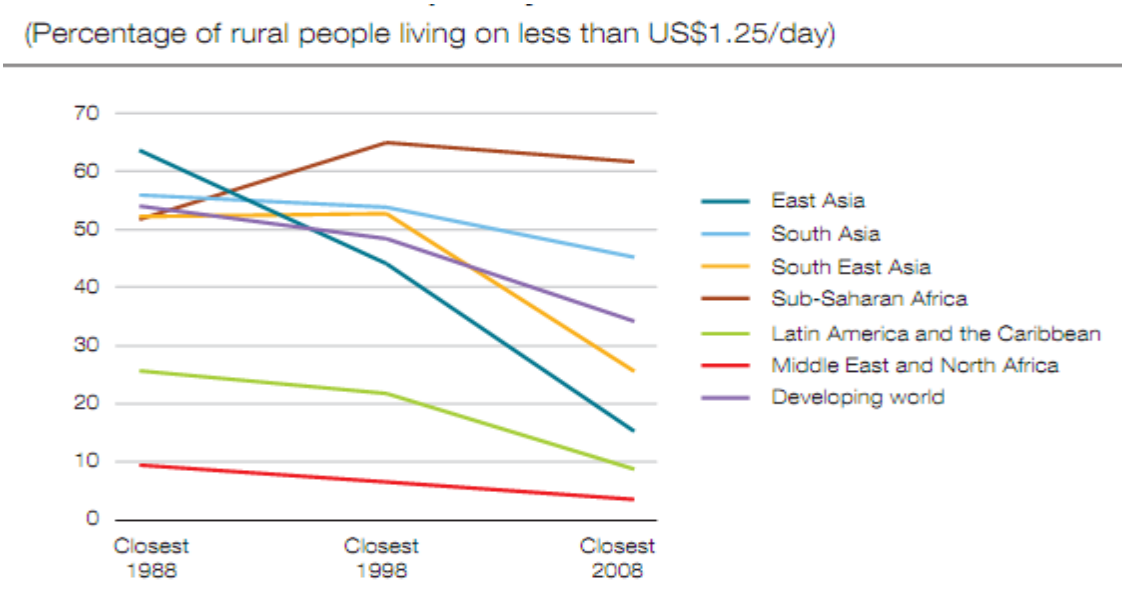


Figure 1. 3: Incidence of extreme rural poverty

Source: IFAD, Rural Poverty Report 2011

Needless to say, is the rural people in Sub-Saharan Africa are facing extremely high levels of poverty compared to their counterparts in other countries. Figure 1.4 below shows that almost 90 percent of the rural population which lives on less than 2 Us dollars per day .



Source: IFAD, Rural Poverty report 2011

Figure 1.4 above shows that in sub-Saharan Africa millions of people in rural areas are becoming poorer and poorer and the number of people living below the poverty line (below 1 US dollar per day) is increasing and, averagely higher compared with rural poverty in other countries.

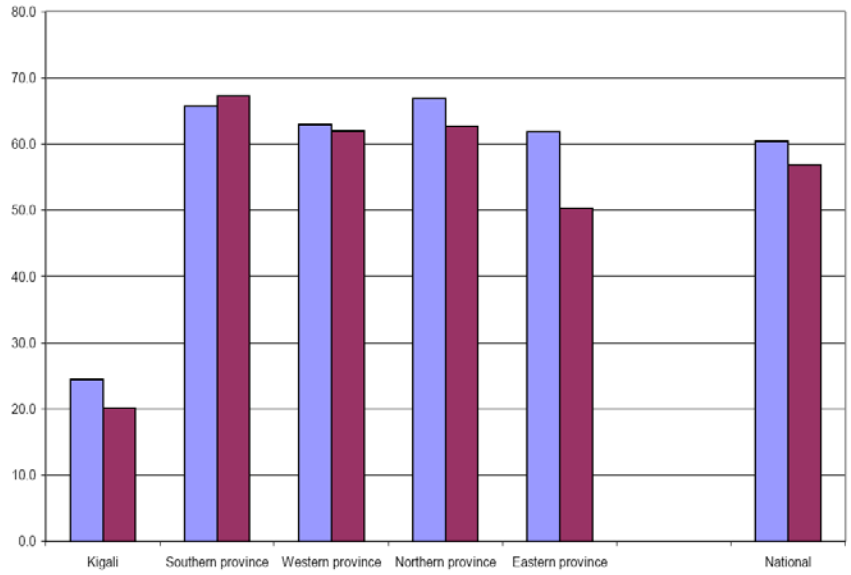
1.2. Problem Statement

Rwanda has a strong economic policy which has focused on reconstruction and GDP growth and it is financed largely by foreign funds through multiple channels of international donors and a few public investment sources. Today, Rwanda boasts of peace, security, political and economic stability throughout the east African region. There is a great and remarkable improvement in the business environment and as a result, private investment has increased from about 6% in 2001 to an estimated 9% of GDP in recent years (Morris et Al. 2008). Although the country has made a remarkable progress in many key areas such as education, economic stability, peace and general economic development; there is still poverty, especially among poor rural households in the country side.

Notwithstanding its improving economic performance and strong focus on health and education, Rwanda is still one of the World's poorest countries, ranked 161 out of 177 countries on the UNDP Human Development Index in 2007. And then in 2011, Rwanda ranked 166th out of 187 countries in the United Nations Human Development Index (UNDP, 2011). Life expectancy is estimated at 45.2 years. An estimated 45% of children in rural areas suffer from chronic malnutrition, 28% of the population is food insecure and another 24% is highly vulnerable to food insecurity. Over half of the population is poor. Women represent 54% of the population and generate 70% of total agricultural output. In 2006, poverty in women- and widow-headed households was about 60%. In 2006, 56.9 per cent of the total population was living below the poverty line and 37.9 per cent were extremely poor. In rural areas about 64.7 per cent of the population was living in poverty.

The 2011 international multidimensional poverty index ranks Rwanda as a country still with low human development index and positioned at 168th position and Uganda is in the position of 161, Kenya 143, Tanzania 152, and Burundi at 185 and Congo DRC at 187 (MPI, 2011). The multidimensional poverty Index (MPI) also shows Health (Nutrition and child mortality), education (Years of Schooling and number of children enrolled) and the standard of living (water, toilet, cooking fuel, electricity) for Rwanda are inadequate. The MPI helps to measure the intensity of poverty and head count ratio to which by the Year 2005 the percentage population in severe poverty in Rwanda was 50.6 percent and 58.5 percent of its population was living below the income poverty line, its Gross National Income (GNI) per Capita (PPP 2005) is 1.133 US dollars.

Figure 1. 4: Percentage of urban poverty and rural poverty in Rwanda's provinces



Blue =rural poverty Purple= urban poverty

Source: Rwanda Poverty Update Reports (December, 2006). Integrated living conditions surveys of the National Institute of Statistics

To put the whole situation down to earth, the government of Rwanda carries out systematic surveys on the integrated living conditions (EICV) of its population. Such surveys have been significant in showing the level of urban livelihoods and rural livelihoods of people per province. Borrowing a leaf from the first survey (EICV 1) and the second survey (EICV 2) which were carried out in 2005 and 2006 respectively by the National Institute statistics of Rwanda (NISR) as shown in the above figures and tables, it is seen again here that our area of study, Northern Province as the one with the highest level of rural poverty. It is from this background, therefore, that this area necessitates a serious investigation into the real causes of persistent rural poverty, its causes and effects, as well as way people here have been able to cope with rural life to survive all this long.

Therefore, this study is imperative because it seeks to come up with better views about rural poverty rather than urban poverty. Rural poverty has, in most cases been synonymously related to urban poverty and yet here in Africa, a rural lifestyle is quite different from an urban one. Many scholars and researchers have tended to take poverty as one general evil with the same features, both in urban and rural areas.

To make matters worse, as various scholars have put forward different definitions of poverty, it is eminent that many of them have always defined poverty while seated in western capitals and talking all the hell about poverty in air conditioned conference rooms and offices without exactly going down to the grassroots of rural people in very deep villages of the developing world.

It should also be noted that in the last millennium, pioneer scholars and researchers about poverty especially beginning with the 1960's when they first "discovered" this scourge of poverty, have always taken poverty in general as either that type of poverty in urban areas and studying it together and giving the same conclusions as with the same type of poverty in the rural areas.

Today, in this millennium, rural poverty is a completely new phenomenon which needs to be studied on its own as different policies all over the globe have been initiated to alleviate poverty but, there seems to be no big difference. Rural poverty in the modern era operates on somewhat different dynamics from those class based urban poverty.

According to the rural policy research institute (RUPRI 2004), rural places have different characteristics from those of urban areas: different levels of access to resources, different economic structures, different institutions, different social norms as well as different demographics which in turn distinguish the causes and consequences of rural poverty from those of urban poverty. Urban approaches

for reducing poverty and its negative effects are unlikely to be equally effective in rural areas.The main concern of this study is attempting to move a step to rediscover more about circumstances of rural poverty as it persistently lives as a scourge among the rural societies in particular. Since poverty eradication solutions have not done a deservedly well step, there is need to go back to the drawing board and see backwards to the grass roots; what exactly the problem is, given the different scale of concentration of rural poverty in rural areas.

Could it be that our efforts to reduce poverty in rural areas were hampered by our lack of knowledge about how living in rural areas affects ones' chances of being well off? Could it be that our lack of knowing what is rural poverty and how it is understood by the rural people could be responsible for the high poverty levels? Or could it be that our lack of understanding about the causes and effects of concentrated rural poverty on rural communities could just be a cause of the failures to have the efforts to reduce the level of rural poverty a blimp?; And what are the coping strategies the rural households should use to lessen their difficulties in living with rural poverty in Rwanda? In the rural areas to which this shall be the main focus, rural poverty seems to be fluid. It is a situation or condition people find themselves in and not a permanent characteristic. Most people living in rural poverty do not suffer fatalism or low aspirations; rather, they take initiatives to their conditions and most of them are confident that with hard work they will prevail. Poor people value freedom and social relationships, and they want to use them to improve their wellbeing in a variety of ways. But their initiatives, whether individual or a collective, often come up against blocked opportunities in rural areas due to nothing else other than rural poverty.

1.3 Purpose of the study

This research study investigated the reasons behind the trend or nature of poverty in rural areas with specific reference to two selected villages in Rwanda's Northern Province. The rural dwellers were important when it came to seeking their views, which was able to guide this research study. The study aimed at exploring and describing the lives and experiences of the rural poor households. The study also, ascertained the reasons as to why the rural people are poor, discovered the consequences of rural poverty on their lives and researched on the rural poor's own self-initiated adaptable livelihood (coping) strategies they have always used to cope up; and finally, the study advanced appropriate models on what they ought to do with this evil of rural poverty.

1.4 Objectives of the study

The following were the research objectives that formed the basis of this research study:

To determine how the rural poor describe, in their own opinion what rural poverty is.

To establish the coping strategies the rural poor have resorted to; so as to advance a model on what the rural poor should do in order to live a fulfilled livelihood and move out of rural poverty.

1.5 Research questions

Basing on the research objectives stated above, the following were the research questions that guided this study.

How do the rural poor in these two selected villages of Rwanda's Northern region understand rural poverty?

How should the rural poor households adapt or cope up with the situation they are in so that they can be able to survive and live a fulfilled livelihood?

Answers to these questions gave the study more conclusions and recommendations in exactly knowing what rural poverty is. The reality about the life style in the villages was not overlooked as it ended up being paramount in understanding rural poverty, depending on place and the social-cultural attitudes of the people in that area.

1.6 Justification of the study

This study was carried out to establish the difference between rural and urban poverty. This is because many social scientists have, flattened the whole world by giving an impression that poverty is similar in both rural and urban areas. In the great lakes region, little research has been done on rural poverty and even the little available research carried out on poverty is based on urban and peri-urban areas. This shows that, that there has been little contact with rural poverty, which, in general, is the deepest poverty. This is because most academics find it cheaper, safer and more cost effective in terms of academic output to do research work in urban areas or village trading centres rather than doing it in the deep rural areas. If rural work is to be done, then peri-urban is preferable. Work in fairly remote areas is can be done, but not in the most remote rural areas.

This study was carried out, also, so as to break up the dichotomy of lies brought up by the rural development tourism paradox. Most of the observations and studies on poverty are done by urban based professionals who just occasionally pay brief rural visits on special occasions like breakup of disasters such as cholera, floods, landslides and perhaps accompanying a minister's visit to such areas. These visits and studies stop only at village trading centres. To make matters worse, these academic visits (by some researchers) and political visits have three things in common; they all come from urban areas; they want to find something out as fast as possible (in line with their calculations on allowances so as to remain with a balance of profit); and they are short of time. Chambers (1983), in his studies on rural development said that unless this trend of rural development tourism is checked, then all academic works by technical specialists may in practice have little contact with the rural people living in rural poverty. The emphasis below shows how and why studies and mere observations through rural visits or rural tourism by officials from Aid agencies (like ACTION AID, WORLDVISION etc), government officials, academic researchers, politicians, diplomats, and technical specialists; compel them to miss the reality on exactly what rurality and rural poverty is; and what it means to be poor.

"More and more of their time has to be spent being shown and moved around. Inundated by the celebrated village farmers, progressive village traders, chairmen and chairwomen of village committees, women clubs like self-help associations which is doing well, and only one home which is doing well averagely in that village are the ones visited only, just for special purposes of impression. The visitors then get the opulent treatment as the rural poor people put on their best clothes and faces to receive them well. Due to courtesy, the visitors are given goats, huge bananas; speeches are made in praise of the village achievements according to ecology,

economy, and culture. School children sing and clap, photographs are taken, new varieties of harvested crops are got from a different distant urban place, flown in and shown to the visitors as if that is the village's output and they are shown like a trade show, exotic birds and animals are shown and villagers are deceived that instead of demanding for Rural electrification, they can use or collect cow dung from their animals and generate electricity through Biogas Technology. What a complicated idea to a rural poor person who can't even afford to maintain one exotic cow? What a hell of advice? Recommending biogas technology to rural poor people is just going astray by whoever recommends it! As the process of being moved around continues, a fluent guide follows a standard route and standard routine. The same people are met, the same buildings entered the same books signed, the same polite praise inscribed in the book against the visitors names and finally the visitors leave with memories of some of those who are better off and impressed by the charisma of the well-dressed villagers".

Source: Adapted from Chambers (1983, 11-17); other emphasized examples are by the researchers' own observation during his pilot studies and data collection process, deep in rural areas.

Most of these officials do not hang around for more than two days in these rural areas. They just find out what they want quickly and go. Checking information is difficult with rural people who are unlikely to read what is written and most visits by such officials makes them both actors and victims in the brief rural visits. Lack of Time and overloaded programs are visible on the officials' side. As the day wears on and heats up, the officials (journalists, politicians, aid agencies, researchers and more others) become less inquisitive, ask fewer questions and finally retire to the circuit bungalow, the guest house, the guest officials' residence, or back to an urban home or hotel. The village returns to normal, no longer wearing its artificial special face the next day.

The above emphasis deeply shows the nature of lies in the paradox of rural development tourism in regard to the extent of rurality, rural poverty and urban poverty. It is clearly seen here that, the real poor people from the deepest places in the villages and the country side shift away out of site and are never seen. They (politicians, researchers, journalists, Aid agencies, etc) see some ribbon developments along roadsides which ends up giving them a wrong impression because the better the road, the nearer the urban centre. The fact is that the real poorer people are always hidden from the main streets and the places where people meet. The bureaucrats and some researchers mostly see those who are better off and those who are extremely poor living in deep rural areas are not seen and have never been seriously researched on.

This study therefore, intended to narrow this gap and do the opposite so as to come out with new realities on rurality and rural poverty. The researcher fully did this by staying with the rural people, deep in the villages, eating and sleeping with them for over eight months.

Much work on this study therefore concentrated on rural poverty behavioral underlying circumstances and changed the above impression. To add further to this point, the poverty eradication solutions have not been satisfactorily applied in solving rural poverty because many of them have been implemented basing on the studies done on poverty in urban areas.

The findings in this study are expected to be shared and provide more knowledge and new ideas on rural poverty so that social scientists, policy makers, civil rights activists and all necessary stakeholders must know that, actually, actually rural poverty is quite different from urban poverty and that concentrated rural poverty in rural areas has hampered much the economic development of rural households. This study was carried out with a major bias on rural poverty other than urban poverty because it was hoped that it could help stakeholders in development economics understand much better the rural social processes with concrete data so that in future, the failures to have rural poverty reduced should not be linked to lack of knowledge. By this study, these stake holders are now equipped with knowledge about the extreme poverty levels in rural areas.

1.7 Significance of the study

This research study offers a wide range of significance to the academic world and to the general political decision makers in the region. The research will contribute to a new understanding of rural Poverty and it will also show how rural people in the Northern Province of Rwanda distinguishes poor rural people, poor urban people, rich rural people and rich urban people. This study also helps the local political decision makers and technical province and district officials to design effective options and appropriate policies to reduce rural poverty and lift rural growth basing on the various advanced models in uplifting rural livelihoods.

Throughout the world, poverty is still the biggest challenge; it must be tackled with a real fight so as to achieve economic growth. But experiences in other parts of the world on how poverty is being fought may not work for rural poverty warfare especially in a land locked country like Rwanda and especially in these particular two villages up country in Rwanda's Northern Province. This study was able to bring up new ideas, approaches and options on understanding rural poverty in places with similar geographical, historical, economical and religious circumstances like this province. Such places include; the rural population of the Democratic Republic of Congo, the rural populations of Uganda bordering the Rwanda's Northern Province, the rural populations along the volcanic mountains of Muhabura and Virunga, as all these three countries share these mountains.

Poverty can be diverse but rural poverty among typical rural people can be more diverse and with complex dynamics. Much as this research recognized the fact that some studies have been carried out on poverty in Rwanda, little none has been done in the deep rural areas, hence making it difficult for rural poverty to be understood from a rural context. It was the purpose of this research study that such an anomaly must be removed and the nature of rural poverty, its causes and symptoms, should be put to its exact rural contextual understanding.

A mastery of this rare discipline of rural poverty will be beneficial to rural societies as the researcher intends to continue living alongside the rural environments in this region and contributing to rural growth. Therefore, this study is of great contribution to policy dialogue and for Rwanda to achieve the 2015 millennium development goal of reducing poverty (MDG Goal 2015); as it needs serious professional inputs like this area of study.

1.8 Operational definitions of language and syntax used.

The key operational terms that were used in this study include among others: rural poverty, rural areas, rurality, the rural poor, and poverty theories.

Rural Poverty

Various concepts of poverty and the magnitude of concentration of poverty in both urban and rural areas were looked at. Rural poverty in this study was categorically implied to be the type of poverty found in deep, extremely remote village areas as compared to urban poverty which is said to be the type of poverty concentrated in cities, towns, municipalities and trading trading centres.

Poverty, in general, manifests itself in different forms, and various scholars have defined poverty in different ways. There are as many definitions of poverty as there are scholars in this world.

This is due to lots of research on poverty being focused on different criteria over time due to divergent research interests. Scholars like Orshansky (1969), Oyen (2005) have asserted that poverty, like beauty, lies in the eyes of the beholder. However, despite the wide range of definitions poverty attracts, it generally describes a wide range of circumstances associated with need, hardship and lack of resources to satisfy basic human needs (Nolan and Whelan ,1996; Abbott and Pollard, 2004). Chambers (2002) notes that, the mood of definitions and rhetoric on what poverty is depends on who asks the question, how it is understood and who responds.

Many other scholars have described poverty to be a situation where one lacks the daily necessities of life such as food shelter, clothing and medicine. Chambers also added that poor people were so powerless and they do not make their own decisions collectively. Poverty also needs to include the social ,economic and political deprivations for individuals, families and groups within a given population.

Tsakloglon and Papadopoulos (2002) contend that poverty and social exclusion are often inseparable as both terms refer to when people are prevented from participating fully in economic social and civil life. Poor people therefore are deprived of many opportunities and in general are incapable of participating in the collective governance of their societies and there is totally no collective decision making among the communities

The Rural Poor

This research faced a problem of using the words like the rural poor people, the rural poor women, the rural poor men, the rural poor households and the poorest of the poor living in rural areas. This study sought to enable the poorest rural people trapped in deep rural areas of Rwanda to express their views about what they knew on rurality and rural poverty.

So in order to avoid mixing up the meanings of the above words, the researcher decided to use one major word, “the rural poor” to refer and describe the rural poor men and women living in deep rural areas of Rwanda. The rural poor were taken to be all women, men, children and all categories of rural households in the villages of the study area mentioned herein. The rural poor terminology also was used to imply all the very poor men headed households, very poor women headed households, and very poor children headed households in the deep far away isolated villages.

Rural Areas

In this study, rural areas were meant to be those areas which are isolated, found very far away from an average trading center or urban area. They can also be referred to as countryside areas or upcountry areas in the common layman’s usage. Rural areas, or upcountry, or countryside areas of land are those that are not urbanised.

However, when large areas are described, country towns and smaller cities can be included among the areas which are rural as far as the modern way of “rural areas” usage is concerned. They have a low population density, and, typically, much of the land is devoted to agriculture and there may be less air and water pollution than in an urban area. The degree to which areas of wilderness are included in the term varies; very large uninhabited wilderness areas are not likely to be described by the term in most contexts.

In most parts of the world, rural areas have been declining since the 19th century or earlier, both as a proportion of land area, and in terms of the proportion of the population living in them. Urbanisation encroaches on rural land, and the mechanisation of agriculture has reduced the number of workers needed to work on the land, while alternative employment is typically easier to obtain in cities. In parts of the developed world, urban sprawl has greatly reduced the areas that can be called rural, and land use planning measures are used to protect the character of rural areas in various ways.

Rurality

Rurality is simply a new word in English attempting to express the notion of what it involves and means in leaving in the deepest rural areas. It is related to ruralism. According to the world English dictionary, rurality when used implies having rural characteristics or having rural traits. The rural characteristics in this case would imply things like subsistence farming, backwardness, and primitivity; having traditional characters relating to rural areas which are too primitive and backward. The word itself is originates from the word rural, which also originates from a Latin word; ruralis or “rus” which means country side.

This means that this research study took “rurality” as a new concept in the modern world categorically meant to refer to the nature of people who, all the time have a lifestyle more synonymous with the traditional country life or more typical with village life in the typical African villages in general. However, this research confined itself on the particular typical village lifestyle of two selected villages in Rwanda’s Northern Province. Sociologists define the term “rural” as those areas which are not urban in nature but just places in the country side (Duncan Green, 2008). This study used rurality as a term to mean therefore, a traditional country lifestyle, or “a rural lifestyle” or “villagism” or simply “ruralism”.

1.8.5 Rural Poverty theories and causes

The various theories that cause poverty are divergent, and each results in a different type of community development intervention strategy. Although there are many other causes of rural poverty in the Northern Province of Rwanda, a region investigated by this

study, emphasis was put on the theories of poverty we are presenting below. This study endeavored to operationalise and test their validity in explaining whether in Rwanda, rural poverty is also a result of similar causes.

Individual deficiencies' theory

This is poverty caused by individual deficiencies. This theory of poverty is a large and multifaceted set of explanations that focus on the individual as responsible for their poverty situation. Typically, politically conservative theoreticians blame individuals in poverty for creating their own problems, and argue that with harder work and better choices the poor could have avoided (and now can remedy) their problems. The belief that poverty stems from individual deficiencies is old. Religious doctrine that equated wealth with the favor of God was central to the Protestant reformation (Weber 2001) and blind, crippled, or deformed people were believed to be punished by God for either their own sin or their parents' sins.

Cultural systems theory

The second theory of poverty roots its causes in the "Culture of Poverty". This theory is sometimes linked with the individual theory of poverty, but it recently has become so widely discussed that its special features should not be minimized. This theory suggests that poverty is created by the transmission, over generations, of a set of beliefs, values, and skills that are socially generated but individually held. Individuals are not necessarily to blame because they are victims of their dysfunctional subculture or culture (Bradshaw, 2006)

Poverty Caused by Economic, Political, and Social Distortions or Discrimination

Whereas the first "individualistic" theory of poverty is advocated by conservative thinkers and the second is a culturally liberal approach, this is a progressive social theory. Theorists in this tradition look not to the individual as a source of poverty, but to the economic, political, and social system which causes people to have limited opportunities and resources with which to achieve income and well being

Geographical disparities theory

This is when poverty is caused by geographical disparities. Location of an area and distance from a major urban centre or distance from the ribbon developments of roads, commercial infrastructures in form of a trading centre, do matter a lot in the livelihoods of the people.

Rural poverty, ghetto poverty, urban disinvestment, southern poverty, third-world poverty, and other framings of the problem represent a spatial characterization of poverty that exists separate from other theories (Bradshaw, 2006) While these geographically based theories of poverty build on the other theories, this theory calls attention to the fact that people, institutions, and cultures in certain areas lack the objective resources needed to generate wellbeing and income, and that they lack the power to claim redistribution. As Shaw (1996:29) points out, "Space is not a backdrop for capitalism, but rather is restructured by (capitalism) and contributes to the system's survival. The geography of poverty is a spatial expression of the capitalist system."

However, it should be worth noting right from the beginning that in operationalisation of the theories, this study had to lean more on the Geographical disparities theory, which tends to explain about "rurality and rural poverty". This theory gives a better impression that rural poverty is persistent at times due to the remoteness of the area, location of the area as these impacts negatively on the livelihoods of individuals. And this eventually formed what was majorly the main basis of investigation in this research.

1.9 Scope of the study

This study focused on exploring the real meaning of rural poverty in the minds of the lowest common man and woman in Rwanda. The researcher particularly selected two remotest villages in Rwanda's Northern Province as the case study. These villages were;

Kamanyana, found in Cyanika sector (Burera district)

(ii) Nyabigoma found in Kinigi Sector (Musanze District)

The time scope for this study was a research time period from 2011 to 2013 and then the research findings were presented to the School of Post Graduate Studies and Research-Nkumba University.

Rwanda being a landlocked country, its biggest population is rural. The country is divided into five provinces and with thirty districts commonly known as Akarere. The provinces are, Northern province, Eastern province, southern province, western province and Kigali urban city as a province (MINECOFIN, 2003).

This study investigated the reasons behind the trend of or nature of poverty in rural areas with specific reference to the above two villages in the Northern Province of Rwanda. The 2007-2008 Rwanda demographic and healthy survey (NISIR, 2009) shows that the wealthiest proportion of the population (70 percent of the two richest quintiles) live in urban areas and rural areas are extremely poor. It can be said that the Northern Region is one of the poorest in the country.

The Theoretical scope of this study was limited to rurality and Rural Poverty among the rural poor households in Rwanda. Despite the various urban and trading centrs, this study was strictly rural based and the research participants (respondents and interviewees) were picked from these deep rural village areas. For this reason, the results specifically depicted the state and nature of rural poverty among the rural poor. The study, specifically sought to establish new realities and new choices for tomorrow in as far as "Rurality and Rural Poverty" is concerned. This called for an independent understanding and a down-to earth inquiry which was described as a naturalistic inquiry at the beginning of this chapter.

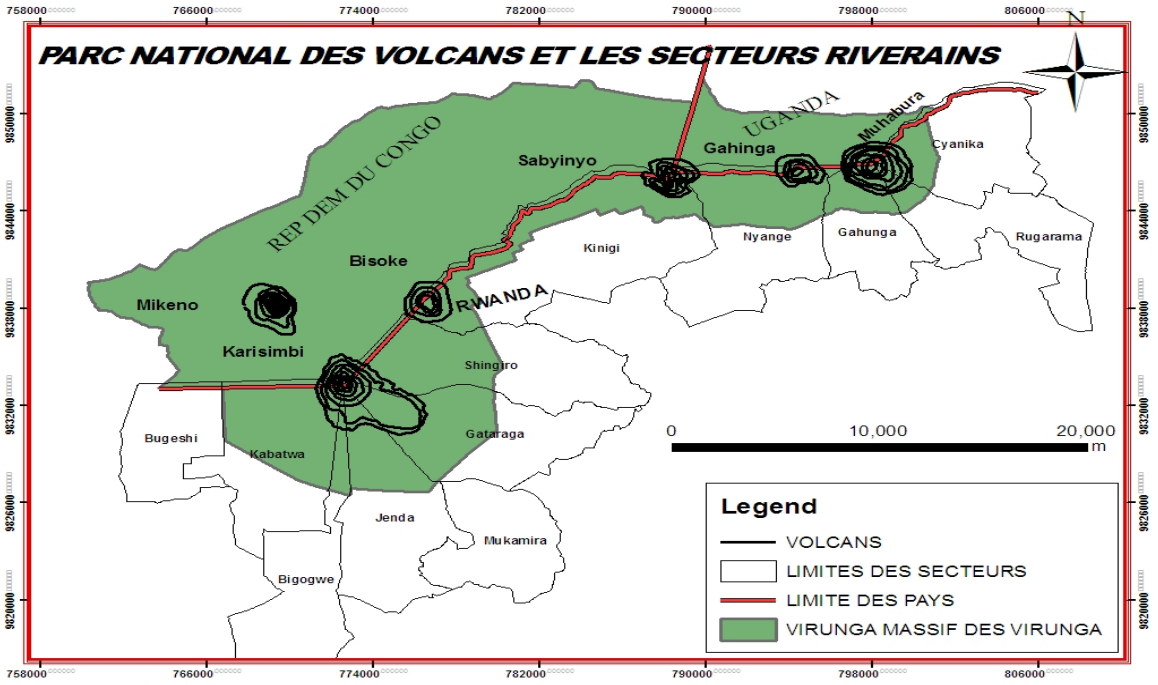
People in rural areas perceive poverty differently, depending on their social, political, religious, cultural and economic backgrounds. There have been several government programs for poverty reduction and several studies about poverty have been carried out in Rwanda, but not at least on how the rural poor understand poverty to be.

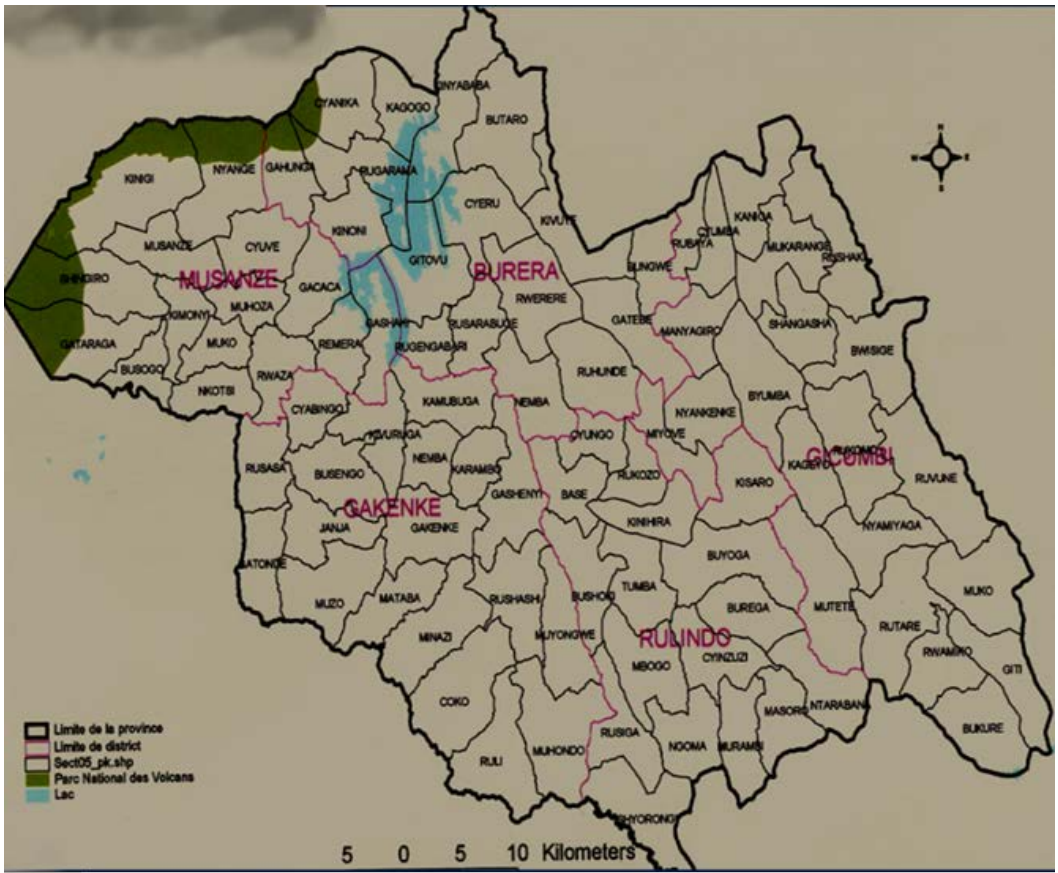
There was, therefore, a need to discover first, how different individuals and groups, men and women, who are so poor, so rural, and so primitive; take poverty to be. It was the basis of this study; which sought to fully attempt examining the above issues. These issues were based on the Rwandan Rural cultural context; how rural poverty is described and defined, what are its causes, and how the rural poor are adapting to that type of life; what they ought to do as a survival strategy. It is hoped that the stakeholders can be boosted with more ideas, realities and options about the new choices for tomorrow to lift rural growth by basing on the findings and advanced models presented in this study.

Map 1: Showing the remotest rural areas which this study was mainly focused.

Source: Demographic and Health Survey 2007-2008 (NISR, 2009)

As seen from the above areas, it is important to note that the research were carried out along the villages which lie along the Virunga-Muhabura Mountains as shown above and these mountains are shared by Uganda, DR Congo and Rwanda. There is a similar culture in these rural areas and these areas are well known for tourist attraction as they are the monopoly hosts of the renowned, largest silverback mountain gorillas in the whole world. Rwanda has five administrative provinces for purposes of proper service delivery and these include Northern Province, Southern Province, Western Province, Eastern Province and Kigali Urban Province. This research mainly concentrated in the rural areas of the Northern Province.





Map 2: Showing the names of villages and various cells in the five Districts of the Northern Province, Administrative map

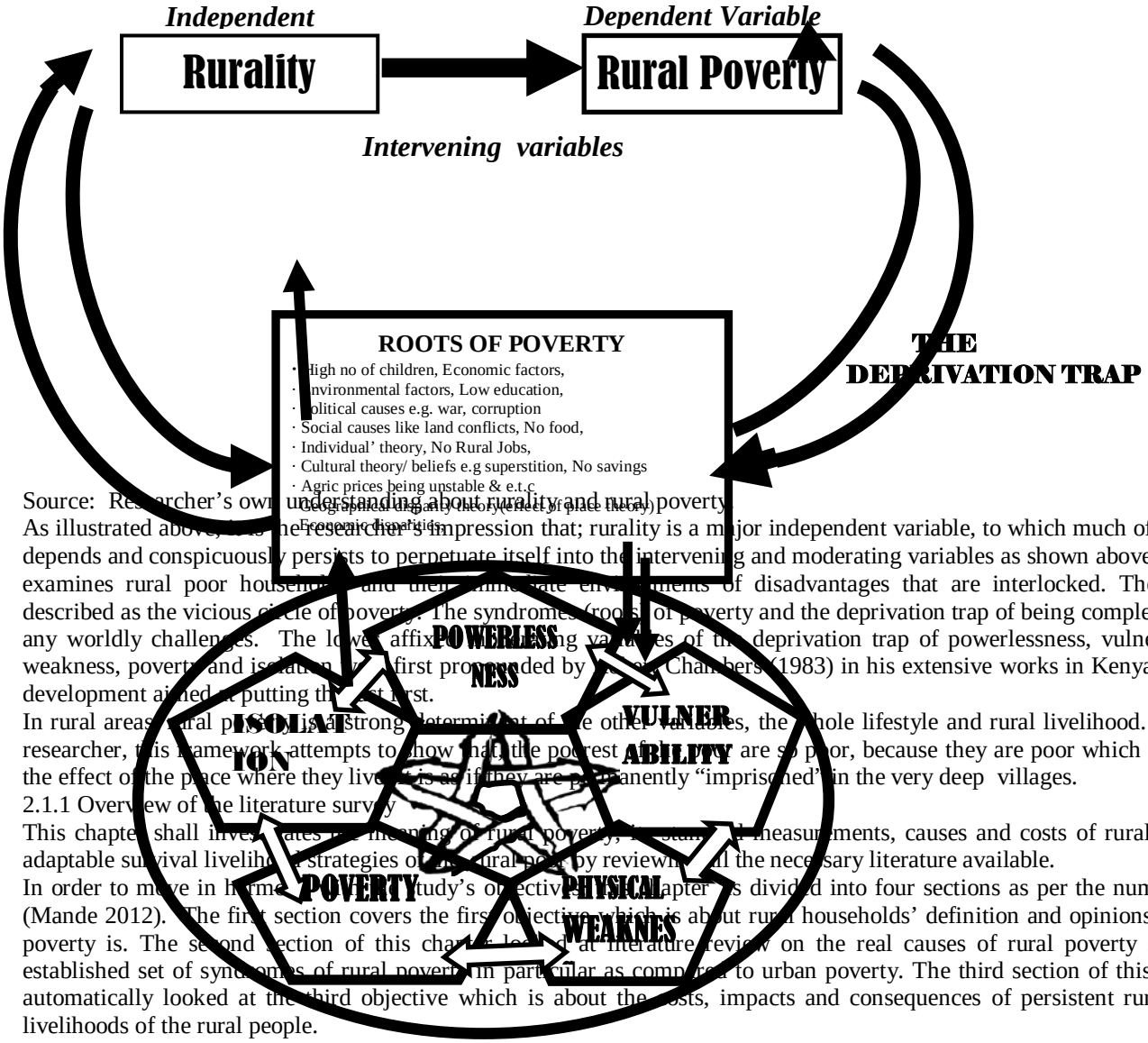
Surface Area: 3293.3 km² ,Districts: 5 ; Sectors: 89, Cells: 413, Villages: 2740; Households : 345,826 ; Estimated house hold per

sq.km 550 people ; Population estimated to 1.6 Million
Source: Northern province administrative map; NIS, (2010)

CHAPTER TWO : LITERATURE REVIEW

2.1 CONCEPTUAL FRAMEWORK

This chapter shall examine all literature basing on the following conceptual framework as seen from the figure below.
Figure 2. 1: Conceptual framework showing rurality and rural poverty



Source: Researcher's own understanding about rurality and rural poverty

As illustrated above, it is the researcher's impression that; rurality is a major independent variable, to which much of the rural poverty depends and conspicuously persists to perpetuate itself into the intervening and moderating variables as shown above. This framework examines rural poor households and their proximate environments of disadvantages that are interlocked. These are variously described as the vicious circle of poverty. The syndromes (roots) of poverty and the deprivation trap of being completely vulnerable to any worldly challenges. The lower affixed interlocking variables of the deprivation trap of powerlessness, vulnerability, physical weakness, poverty and isolation was first propounded by Robert Chambers (1983) in his extensive works in Kenya concerning rural development aimed at putting the rural first.

In rural areas, rural poverty is a strong determinant of the other variables, the whole lifestyle and rural livelihood. According to the researcher, this framework attempts to show that the poorest people are so poor, because they are poor which is also because of the effect of the place where they live. It is as if they are permanently "imprisoned" in the very deep villages.

2.1.1 Overview of the literature survey

This chapter shall investigate the meaning of rural poverty, its standard measurements, causes and costs of rural poverty, and the adaptable survival livelihood strategies of the rural poor by reviewing all the necessary literature available.

In order to move in harmony with the study's objectives, this chapter is divided into four sections as per the number of objectives (Mande 2012). The first section covers the first objective which is about rural households' definition and opinions about what rural poverty is. The second section of this chapter looked at literature review on the real causes of rural poverty so as to have an established set of syndromes of rural poverty in particular as compared to urban poverty. The third section of this literature review automatically looked at the third objective which is about the costs, impacts and consequences of persistent rural poverty to the livelihoods of the rural people.

Then, finally, there will be a literature review in harmony with the fourth objective which is related to the livelihood survival strategies initiated by the rural households to cope with the difficulties they face deep, in the rural areas where they permanently live.

2.2 UNDERSTANDING CONCEPTS OF RURAL POVERTY AND URBAN POVERTY

Literature available shows that a research study was carried out about the poor and their poverty by World Bank in the 1990's. It was carried out by Deepa Narayan (2000) and it was referred to as: "Voices of the Poor". This was the first study to deal with poverty in the rural communities. In this study, the researcher adds on this body of knowledge by going beyond what the poor say about the faces, cases and costs of living with rural poverty. Deepa Narayan's (2000) work may have based his collection of views on generalization about poor people in urban areas and trading centres of developing countries.

This research study specifically dealt with rural poverty in rural areas and not even semi-urban areas or trading centers. Emphasis was be put on the deep villages of the Northern province of Rwanda in deep villages of Northern Province of Rwanda.

This research was able to determine how these rural people understand poverty, what are their real needs and priorities, also what do they think as major causes of rural poverty and what from their own minds, could be more helpful to raising their rural life and, at least, have an average change of wellbeing in those deep rural areas.

This research study, therefore, was aimed at making a little contribution to academics and rural policy makers of Rwanda about understanding the nature of rural poverty. The study establishes that what should be done with urban poverty is not the same as what should be applied to rural poverty.

2.2.1 The meaning of poverty in general

Generally, poverty is the lack of the means to satisfy the basic necessities of life. Several development economists agree that poverty is just being in the situation of lacking the daily necessities of adequate food, water, shelter and clothing. Amartya Sen (1999) goes further to add a widely accepted view that poverty could also be viewed as the absence of the capabilities, choices and opportunities to change the bad conditions in which a poor person is. Poverty could also be a situation where the resources of individuals or families are inadequate to provide a socially acceptable standard of living (Batchelder, 1971).

Depending on place and who is defining poverty, and who is the culprit of poverty or victim of poverty, we can have as many definitions of poverty as we wish. This is due to lots of research on poverty being focused on different criteria over time due to divergent research interests. Scholars like Orshansky (1969), Oyen (2005) have asserted that poverty, like beauty, lies in the eyes of the beholder. However despite a wide range of definitions poverty attracts, it generally describes a wide range of circumstances associated with need, hardship and lack of resources to satisfy basic human needs (Nolan and Whelan ,1996; Abbott and Pollard, 2004). Chambers (2002) notes that, the mood of definitions and rhetoric on what poverty is depends on who asks the question, how it is understood and who responds.

Poverty like an elephant is more easily recognized than defined. The word poverty originates from the Latin word "panpertus" implying restricted means, which include limited food and other livelihood resources (Nuwagaba 2011). Misery, an extreme form of poverty originates from a Latin word miseria, which means intensive unhappiness, discomfort or suffering. Various approaches have been used in defining poverty. These include: conventional definitions based on income and consumption, absolute and relative definitions of poverty and participatory definitions of poverty.

Many other scholars have defined poverty to be a situation where one lacks the daily necessities of life such as food, shelter, clothing and medicine. Chambers also adds that poor people are so powerless that they cannot make their own decisions collectively. Poverty also needs to include the social ,economic and political deprivations for individuals, families and groups within a given population.

Tsakloglon and Papadopoulos (2002) contend that poverty and social exclusion are inseparable as both terms refer to when people are prevented from participating fully in economic, social and civil life. Poor people, therefore, are deprived of many opportunities and in general are incapable of participating in the collective governance of their societies and there is totally no collective decision making among the communities.

Some poor people may take poverty to be a situation of low incomes, whereas scholars such as Ravallon (1998) take poverty to be a situation where incomes of families are insufficient to obtain the minimum necessities for the maintenance of physical efficiency.

Because poverty exists in different places, urban and rural areas and given the level of inequality in the world, there have been several understandings of poverty and this has posed a serious problem to alleviating it. The way poverty is defined, may determine the way it should be measured. Any solution to poverty must begin with the definition of poverty. Adeyeye (2001) and this provides a focus by which one can determine the limits of understanding poverty.

Alcock (1993) points out that, we must know what poverty is before we can identify where and how it is occurring or attempt to measure it and before we can begin to do anything to alleviate it. The World Bank and UNDP, also have their own way of interpretation and defining poverty. In 1997, the World Bank first defined poverty as a deprivation in well being, to be poor is to be hungry, to lack shelter, clothing and also to be illiterate.

2.2.2 Urban poverty

In a layman's language, urban poverty refers to that type of poverty affecting poor people in urban areas like trading centres, towns, and cities. Wratten (1995) points out that there is no consensus on a definition of urban poverty, but two broad complementary approaches are worth mentioning

Economic Interpretations

Anthropological interpretations

The economic interpretation use the income and consumption as real measures or definitions of urban poverty, and complemented by a range of social indicators such as life expectancy, infant mortality, nutrition, the proportion of the household budget spent on food, literacy, school enrolment rates, access to health clinics and drinking water. This majorly classifies people against an index of material welfare.

On the other hand, rural anthropologists and socio planners working with rural communities in the third world alone have expanded the definition to encompass perception of non-material deprivation and socio differentiation (Sattertwaire, 1995). Great value is attached to qualitative dimensions such as independence, security, self respect, identity, close and non exploitative social relationships, and decision making, and freedom, legal and political rights.

2.2.3 Rural Poverty

Rural poverty refers to that particular poverty found in rural areas. The rural areas could include the homes and scattered homesteads of people very deep in the villages. This study will put more emphasis on this form of poverty which is rampant, persistent and

perpetual in rural areas of Rwanda's Northern Province. It is this form of poverty which makes rural people become more vulnerable and hopeless throughout their generation to generation.

When we talk of rural poverty, we need to limit our focus specifically to a rural life style in rural communities. We need to limit our focus on the factors of lifestyle of rural societies, the rural economy and their rural political systems. It should also be noted that in the last millennium, pioneer scholars and researchers have done a lot of study especially beginning about poverty, especially beginning with the 1960's when they first "discovered" this scourge of poverty. However, they have always taken poverty as either that type of poverty in urban areas and studying it that way and giving the same conclusions it were the same poverty in the rural areas.

Today, in this millennium, rural poverty is a completely new phenomenon which needs to be studied on its own as different policies all over the globe have been initiated to alleviate poverty but there seems to be no big difference.

A widely shared assumption today by recent development economists and researchers is that rural poverty in the modern era operates on somewhat different dynamics from those of class based urban poverty.

To underscore the international concern for this problem, the United Nations declared 1996 an international year for the eradication of poverty ″and the October 17th each year, was set aside as an international day for the eradication of poverty worldwide in the millennium development goals. It clearly and ambitiously stated that the developing countries worldwide should have eradicated poverty by 2015. Yet before that, the World Bank had declared a whole decade of 1997-2006 to fight poverty, to which today (2012) no clear indicators are seen to be fully eradicating rural poverty. Poverty may reduce in some urban areas due to all the above World Bank efforts but rural poverty remains a mystery and a great force and scourge to reckon with and that is why this study would like to put a new emphasis and approach of understanding what exactly is rural poverty and how it could be measured and reduced so as to lift the rural life.

According to the rural policy research institute (RUPRI 2004), rural places have different characteristics from those of urban areas – different access to resources, different economic structures, different institutions, different social norms and different demographics which in turn distinguish the causes and consequences of rural poverty from urban poverty.

As with the rural communities themselves, rural poverty is often cast in the shadow of urban and suburban issues (Amis 1995). Rural children, rural women and rural old men and women are more likely to be poor, and poverty is more likely to be more enduring and persistent in rural areas than in urban areas. Burkey (1993), asserts that urban approaches for reducing poverty and its negative effects are unlikely to be equally effective in rural areas.

An area's natural environment, it is climate, natural resources and isolation, is often a distinguishing feature, and those endowments often determine its economic vitality; and in turn, its depth and persistence of poverty (Blank 2004). Blank points out that, urban areas are located where they are, historically at least, because the locale was accessible to the resources people wanted. Rural areas, in turn, are rural because they lack some geographical advantage. Geographic isolation, for example, creates distance from product and labour markets.

Demographics, Blank argues, are more helpful in discerning patterns; for example, how many elderly people live in a region, how many families earn more than the poverty level, or how many people have a college education. However, demographic trends cannot answer why the community is less educated or why the elderly are over represented. It is a demographic fact, for example that rural areas have lower educated population. But do people get less education as they live in rural areas, or, do they choose rural living because they have less education? It is therefore difficult to untangle causes and effects when the characteristics of places are such a critical part of the equation.

In studying about rural poverty today as a new subject or phenomenon, it is no longer viable to simply describe the extent of an area's misery in terms of low incomes, low consumption or purchasing power and a life of living below one US dollar per day.

Rural poverty is more than lack of income. The complexity of rural poverty requires a research strategy that is multi- disciplinary, multi - method and long term. Amy Glasmeier (2005) notes that to move beyond describing the extent of rural poverty in an area requires a new multidimensional and multi-disciplinary approach.

That is why this proposal is in place to endeavor to add knowledge about what is rural poverty and forecast how the rural areas life style can be enhanced or improved.

It is also clear that rural people are the most affected of all sorts of problems that befall urban areas. Just like the proverbial African saying that when two elephants are fighting, it is the grass which suffers and then when the two elephants are making love, the grass suffers the more.

Over the years, several poverty reduction initiatives have been implemented and there are as many policy initiatives as there are scholars. When these policies are implemented, the urban poor benefit but the rural poor benefit little or even nothing at all. With today's increase in the levels of corruption, nepotism and, discrimination, any good program sponsored by international institutions like World Bank, IFAD and IMF do always benefit the urban poor and the rural poor come out with nothing. So this implies that the rural poor are more vulnerable than the urban poor. Vulnerability of rural people makes poverty worse and a real scourge, evil and more so it is imprisoning.

A rural person is completely choice less, with no option, no alternative, no hope, no future and he or she lives a totally hopelessness life style. Vulnerability is not synonymous with poverty but refers to defenselessness, insecurity and exposure to risk, shock and stress (Chambers, 1995). Vulnerability is reduced by assets, such as; human investment in health and education, productive assets including houses and domestic equipment; access to community infrastructure and access to financial institutions.

It is in the researcher's view that whereas, poverty has always been defined as realistically, a low standard of living where one is unable to spend more than one US dollar a day (UN. Charter 1995), rural poverty on the other hand in particular should be differentiated from general poverty as a whole.

Rural poverty should be a low standard of living in rural areas that lasts long enough from generation to generation, in a vicious circle, and with time, ends up undermining the health, moral and self-respect of an individual or groups of individuals in rural areas.
Miller and Pamela (1996) point out at least three possible ways of defining and understanding rural poverty; each starting from a specified set of assumptions and leading to its own conclusions about the extent of poverty and the degree to which it is being ameliorated.
People living in rural poverty, especially in rural areas, have no sources of income other than the environment where they cut firewood and charcoal for sale, plant some agricultural products for sale to which they are even cheated and they end up selling at relatively low prices. This implies that, market sales deny them sufficient income for their basic needs. When such degrees of denials increase, then they end up in circumstances of being denied their own needs of basic living. The rural poor find themselves, eventually excluded from taking part in activities which are expected as part of their life in the society. This is the vulnerability discussed in the study.
More generally, there has been widening of the debates on rural poverty to go an extra mile and include more subjective definitions such as vulnerability, entitlements and social exclusion.
Entitlements refers to the complex ways in which individuals or households command resources which vary between people over time in response to shocks and long term trends (Chambers 1995). Rural people are denied their entitlements which are social, political, cultural religious and economic entitlements and, hence, being more and more vulnerable than the urban poor.
On the other hand, social exclusion is seen as a state of ill-being and disablement or disempowerment, inability which individuals and groups experience. It is manifested in patterns of social resources which are associated with citizenship (ILO 1996).
The many faces of poverty as a whole reinforce one another. It is worse with rural poverty. Poor people in rural areas are discriminated against, but also powerlessness seems to be at the core of the bad life. Duncan Green (2008) points out that the reverse of such multidimensional poverty is not simply wealth (although income is important), but a wide notion of wellbeing, springing from health, physical safety, meaningful work, connection to community and other non-monetary factors. Good development practices should build on the skills, strengths and ideas of people living in poverty rather than treating them as empty receptacles of charity.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 OVERVIEW

This chapter focuses on the methodological approach and justifications as to why the study used such methods. Essentially, this research study generally used primary data as the main focus in this study was to investigate the nature and extent of rural poverty among the rural households in Rwanda.
The ultimate objective of this study was to explore new realities about rural poverty, how the rural people's perceptions about their own poor life-style affects them in their rural settings or localities and get views from the poor rural people on how they have managed to adapt to living with poverty as a survival strategy initiated by themselves.
As there are many policy frameworks and solutions that have been initiated by various researchers, government and international financial institutions like the World Bank, and IMF, to help reduce this scourge of rural poverty. This study was not fully preoccupied with designing such possible policies to fight poverty. The principle occupation in this study was to go to the grassroots, inquire from them how they understand this scourge of rural poverty, and see if they can be able to distinguish their understanding of rural poverty from urban poor or urban rich using manageable and easily understandable measuring options of what rural poverty is. This is because all the solutions and measuring options that could make people understand the scourge of poverty have been based on urban poverty and slowly relating urban poverty to be synonymous with the type of poverty in rural areas. Yet poverty in rural areas is very different from poverty in urban areas. So the main task was to discover more about what rural poverty is, what mainly causes it, its impact and coping strategies for survival by the rural poor people.
This chapter describes the research methodology which the study used. This includes how the case study as a research strategy was selected, an overview of the case study, how the respondents were selected, how data was collected and analysed as well as how the study triangulated the findings.

3.2 RESEARCH DESIGN

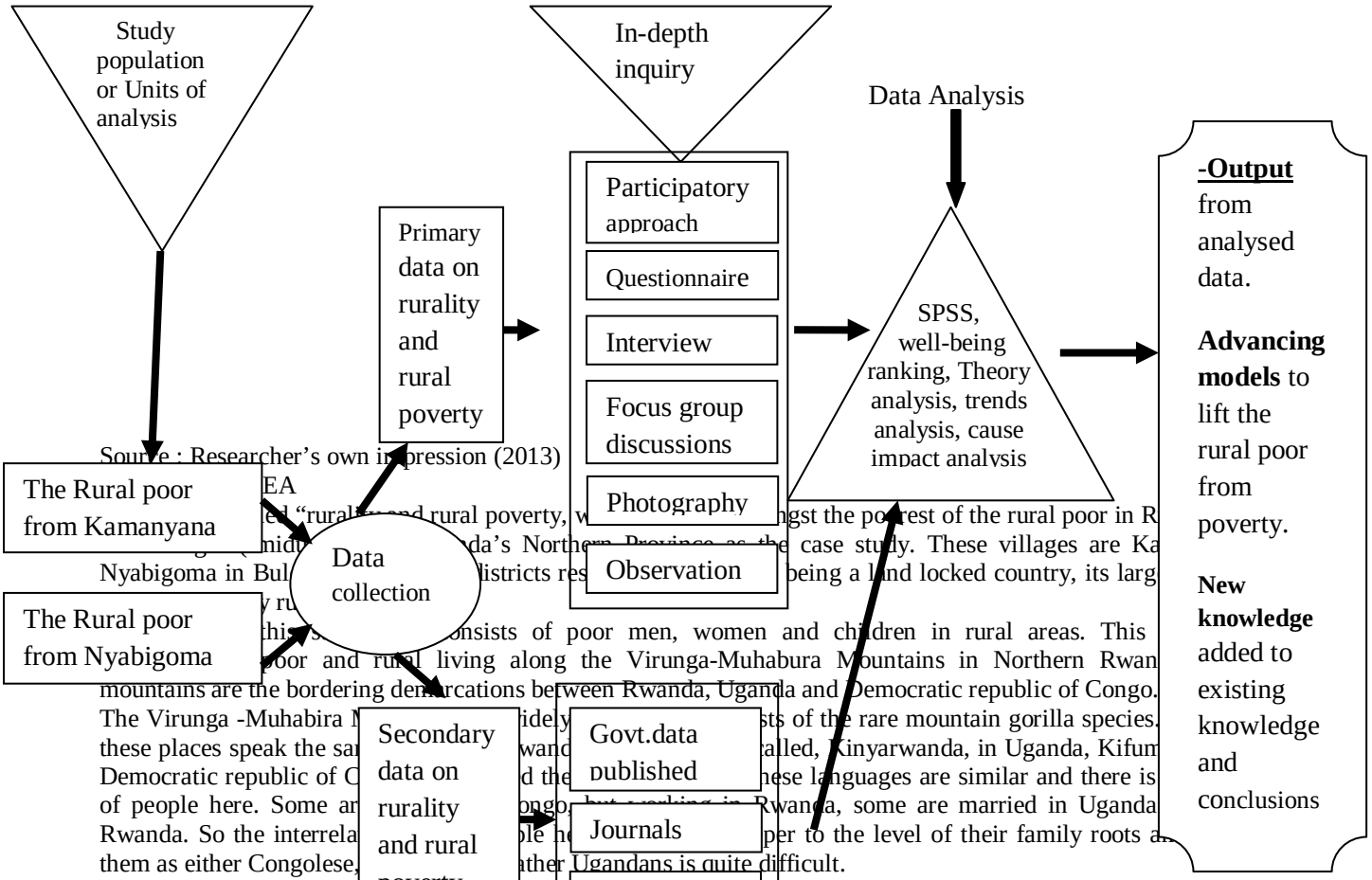
This study used inductive and deductive approaches which mostly entailed qualitative approaches supplemented by quantitative approaches in analysing the nature of rural poverty. In most instances, the study relied more on qualitative research designs and descriptive approaches than quantitative research designs since it was expected to describe the

nature and trend of rural poverty. In order to achieve the above stated objectives and targets effectively, this study used the following research strategies;
Case study as form of research strategy. (Two villages in Rwanda's, Northern Province)
Naturalistic inquiry (Patton, 1990). (A "down- to- earth" investigation depicting the real situation as it is on the ground in the remotest rural areas).
The survey technique. (This included Questionnaires and interviews)
The above target calls for the use of a naturalistic inquiry (Patton, 1990) from the rural poor people so as to fully describe rural poverty in Rwanda's Northern Province. Some scholars call this (naturalistic inquiry) a "down-to-earth" approach as it gives an in-depth description and analysis of the whole situation.
In planning for the research study, the researcher was mindful of the need to have a well-articulated research design. Such a research design was desirable for the objective of data collection that was useful in addressing the research questions. It was therefore, a veritable guide for data generation, especially primary data. Another research strategy that was adopted in this study was the survey technique. This strategy was chosen because of the nature of the research topic which demands the collection of a significant amount of data from a meaningful population size in an efficient manner. Because this method is well understood and perceived as authoritative by most people, it was most appropriate for its adoption.
Two survey methods, including questionnaires and interviews were used because the respondents had diverse backgrounds. Questionnaires were used to obtain information from the literate men and women within the area of study, and interviews were used to get information from the illiterate men and women amongst the sampled population. The study also used focus group discussions on small groups of men and women from the two villages.
In-depth interview with individuals, and in-depth discussions with the most rural poor women, most poor rural men, observations, small group discussions, listing, scanning, ranking and trend analyses were all used.

3.2.1 Justification for using a case study methodology and the qualitative approach
This study was able to demonstrate the exact face of rural poverty among poor rural households in Rwanda. This, therefore, necessitated a case study methodology. The case study methodology is drawn from process studies that place importance on establishing the cause of certain outcomes (Mucunguzi, 2010). The case study design is thus employed when one is interested in answering the why and how questions in research (Yin 1994; Saunders et al. 1997).
According to Mutai (2001), a case study in essence is concerned with the study of everything of something rather than the something of everything. Mutai argues that a case study is an in-depth study which accommodates valuable and unique approaches of a natural setting.
However, as Bryman (1989) asserts, such questions are better answered if the study picks one or a few cases to represent the whole population. That is why two villages were selected as the basis of the case study.
The study was able to use a combination of quantitative and qualitative research designs for gathering information. This is because of keeping with the principle of triangulation in which different methods of data collection and data types are used in a single study. Triangulation refers to the application and combination of several research methodologies in the study of the same phenomenon (Bogdan & Biklen, 2006). Brewerton and Millward (2001) also support the notion of using a case study and combining of different data collection methods in the following argument;
"In case study research, the notion of combining qualitative and quantitative data offers the promise of getting closer to the "whole "of a case, in a way that a single method could not achieve. This idea is based on the principle of triangulation which advocates the use of many different sources of information on the topic with a view of obtaining convergence on an issue"

The case study method becomes important in such a study because it will allow an in- depth analysis of the selected case, and also due to the fact that it allows various methods of data collection and analysis to be combined (Mucunguzi, 2010).
Qualitative approach recognises that anybody is capable of constructing knowledge. This means that the disadvantaged groups, although poor and voiceless are capable of authoring knowledge if given chance. Using qualitative approach, the study can assume the role of providing a voice to the disadvantaged groups. Chambers (1995) observes that this special characteristic of qualitative approach empowers disadvantaged groups by giving them a chance to be heard.
It should also be noted that emerging issues to social political and economic developments in third world countries also have enhanced the use of qualitative approaches and descriptive approaches in search of sustainable solutions to the myriad of problems facing them (Sengendo, 2012). Many researchers and experts have argued for qualitative approach especially in Africa because communities in Africa have traditionally communicated information by word of mouth rather than written form. This has been through folklore, an issue relating to beliefs, taboos, sickness, social mythology and family life among others.
The research design of this study has been summarized in the figure as shown below. The figure shows a summary of the study's research design framework. It attempts to show the study population or the unit of analysis that was used, the sources of data collection, data analysis, and the output from the presented data.

Figure 3. 1: Research design framework



Source : Researcher's own impression (2013)

EA

ed "rural" and rural poverty, w ngst the poorest of the rural poor in R
nidi da's Northern Province as the case study. These villages are Ka
Nyabigoma in Bul districts res being a land locked country, its larg
y ru

this s onsists of poor men, women and children in rural areas. This
oor and rural living along the Virunga-Muhabura Mountains in Northern Rwan
mountains are the bordering demarcations between Rwanda, Uganda and Democratic republic of Congo.
The Virunga -Muhabira M idely sts of the rare mountain gorilla species.
these places speak the sa wand alled, Kinyarwanda, in Uganda, Kifum
Democratic republic of C d the hese languages are similar and there is
of people here. Some ar ongo, but working in Rwanda, some are married in Uganda
Rwanda. So the interrela ple h per to the level of their family roots a
them as either Congolese, ather Ugandans is quite difficult.
In terms of their rural liv ultiva sinesses, it is even quite complex. Men and Women involved in commercial a imple cultivation for subsistence farming, have farms and gardens in Uganda although they stay in Rwanda. Along the Rwanda-Congo Border, small scale rural traders with rural merchandise traverse the borders freely and have businesses in Rwanda, while they sleep in Democratic republic of Congo.

3.4 STUDY POPULATION, SAMPLE SIZE AND SELECTION OF THE RESPONDENTS

As described above in the study area, this study was conducted in these types of people with diverse inter-country connections along the borders of the rich fertile volcanic soils of the dormant Virunga-Muhabura Volcanic Mountains. This study was aimed at analyzing the nature of rural poverty among the rural poor households (poorest of the poor) living in deep rural areas which are often isolated and neglected. The study was limited, however, to those people of the two villages in Northern Province in Rwanda although the study could also be important to the neighboring population as they share the same culture, but they are in different countries.

The two villages in the Northern Province were selected by multistage random sampling and purposive sampling techniques by seeing which village is very rural and very far away from the main trading centers. The researcher also used random selection of the rural poor households, men and women heads on probability proportional size. Information was collected revolving around the following conceptualised areas of interest on rurality and rural poverty as per the area of study:

Socioeconomic characteristics of respondents - age, gender, marital status, household size, years of formal education, primary occupation in rural areas.

Income, activities engaged in by residents of the study area, different livelihoods available in the rural areas.

Social and infrastructural facilities accessible to the respondents, amount spent to access these amenities on the rural communities.

Consumption and expenditure on food and non-food items in rural areas.

Different perceptions about rural poverty, different indicators of rural poverty and general well-being and assets or items valued most in the lives of respondents in the rural areas.

Major causes of rural poverty, degree of commitment to hard work, socio-economic effects and costs of rural poverty to the lives of the rural poor households.

(vii)Coping mechanisms the rural poor can use to survive and checks and balances the rural poor would wish to be put in place for them as major rural priorities if given opportunity.

The study picked the population of Kamanyana and Nyabigoma based on the following distribution as shown below. The table below also shows how the total population of the study area is placed under the Raosoft(2004) sample size calculator to get an appropriate sample size of 324 people that should be considered.

Table 3. 1: Distribution of the Sample Population

Names of Villages	Kamanyana	Nyabigoma	TOTAL POPN SIZE
Total no of people	518	402	920 RAOSOFT(2004) SAMPLE SIZE CALCULATOR IS 272

Source: Own (2013). To note here is that the above total number of people per the villages were extracted from the recently carried out National population census by NISR (2012). In Rwanda, it is also estimated that the number of people per sq km is 550 (NISR, 2008). The WORLD BANK gives it at 430 people per sq.km(2012), in 2007, at 394 people per sq.km; Working for a world free of poverty; World Bank report (2011)

3.4.1 Sample size determination

In order for the researcher to reach the population of the Study with equal and balanced investigations, it was necessary to use a sample population derived from the main population by using equal sample cluster frequency distribution.

This is when sample clusters are given equal treatment and equal consideration. And this depends on the critical nature of the study which may necessitate purposive sampling. Purposive sampling methods are good in that they may somehow be random sampling or just intuitive judgments by the researcher. Bogdan and Biklen (1982) states that they are not real random sampling but rather a type of sampling which can be used to ensure that the characteristics of the subjects in the study, appear in the same proportion as they appear in the total population.

Since the rural poor exhibit the same characteristics from one village (Umudugudu) to another, the researcher used homogeneous sampling technique. As Mugenda (2008) puts it, this technique is very useful as it gives in-depth study of a homogenous group. This technique, according to Mugenda, allows the researcher to collect comprehensive data with equal treatment and equal proportion of the sampled population.

Therefore, since this population is a homogeneous and a finite one, it is convenient for the researcher to use one of the Taro Yamane's (Onwe, 1983; 1998) formula for the determination of the number of respondents to be sampled in such homogeneous groups (with equal treatment and equal proportion) of population as given below:

$$n = \left(\frac{N \diagup ncl}{2} \right)$$

Whereby; n = Number of respondents to be sampled in each cluster
N=Total sample size
ncl= Total number of cluster

The above formula gives how many people to sample in each cluster (say per village) which calls for preferential equal and proportional treatment and, that's why it is divided equally by 2, thus;

$$N = \frac{\left(\frac{272}{2} \right)}{2} = 68$$

Then for equal proportion in a homogenous population sample size (Onwe, 1983, 1998; Taro Yamane, 1951; Douglas A, L., William G, M., Samuel A, W 2005)

$$\frac{68}{2} = 34$$

Since the number of selected villages is 2, the total population size (272) which is divided by 2 and it gives 136 and later this is divided by 2 giving 68 as the total sample size.

The total sample size is then divided by 2 to give 34 which will be the total number of men and total number of women that was the total number of respondents in each of the two villages.

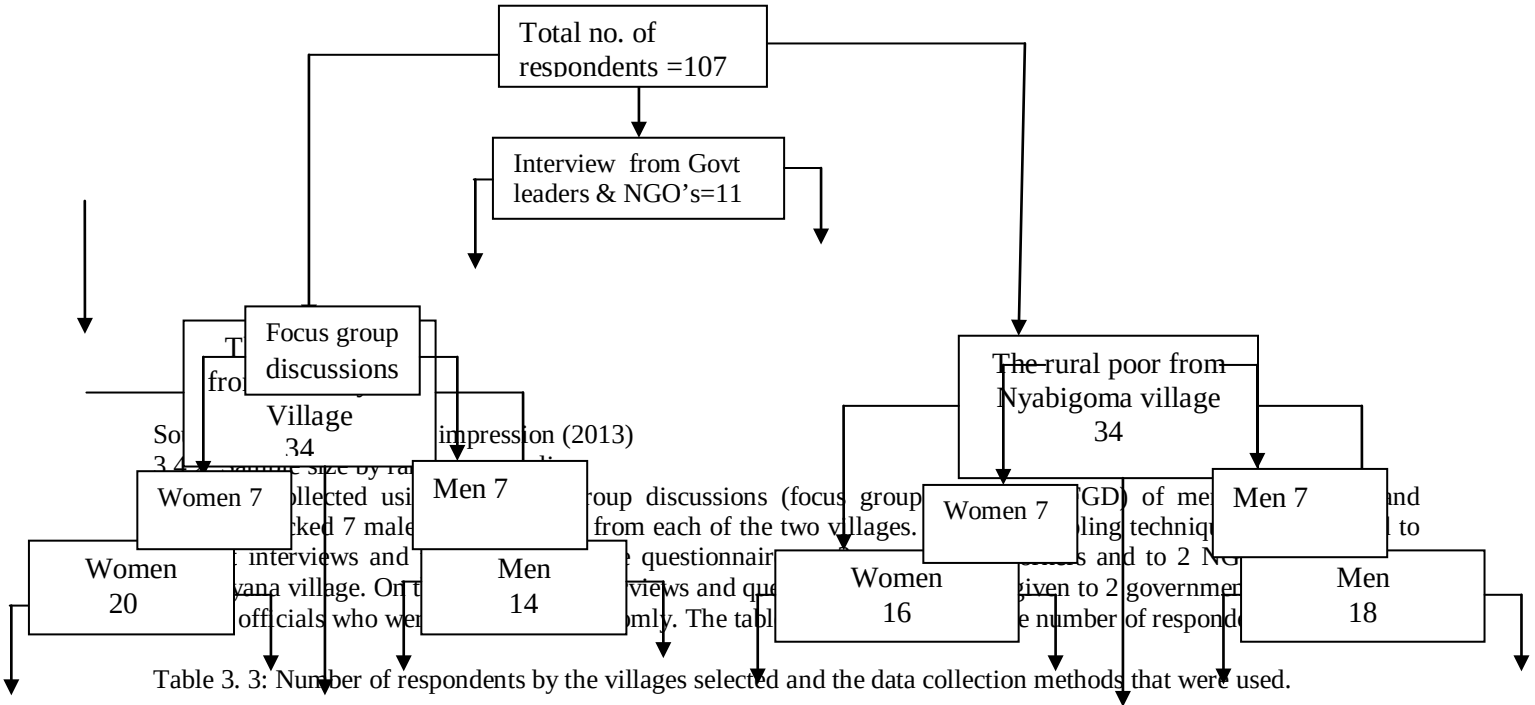
Table 3. 2: Distribution of the number of respondents in each cluster

	Respondents		
Names of villages	men	women	Total
Kamanyana	14	20	34
Nyabigoma	18	16	34
TOTAL SAMPLE SIZE	32	36	68

Source: Own (2013)

As explained in this section, this study took a population of 36 women and 32 men as the respective number of respondents for all the two villages. The two tables above shows the distribution of the sample population and the total sample size figures to which they were determined using the Raosoftware (2004), sample size calculator by considering in all the margins of error expected, the level of confidence expected, population size and the response level of distribution. A cross-section summary of the distribution of the sample size and the categories of population that was studied is shown in the figure below.

Figure 3. 2: Cross section of the distribution of the study population



So[illegible] impression (2013)

3.4 [illegible] collected usi[illegible]roup discussions (focus group [illegible]GD) of me[illegible]nd [illegible]cked 7 male[illegible] from each of the two villages. [illegible]ling techniq[illegible]l to interviews and [illegible] questionnair[illegible]s and to 2 N[illegible] yana village. On t[illegible]views and qu[illegible] given to 2 governmen[illegible] officials who wer[illegible]mly. The tabl[illegible]e number of respond[illegible]

Table 3. 3: Number of respondents by the villages selected and the data collection methods that were used.

Villages selected	Focus group discussions		Questionnaire and interviews		Interview questionn[illegible]		[illegible]tal spondents
	Males	Females	Males	Females	Gov't	NGOs	
Kamanyana	7	7	14	20	3	2	53
Nyabigoma	7	7	18	16	2	4	54
Total	14	14	32	36	5	6	107

Source: own (2013)

Interviews were also conducted among the poor, the village heads and the representations from the Government side. Selected government officials who stay and work for various extensive programs in those villages were also interviewed. We also considered church leaders and a few selected officials from the NGO'S. These interviews were carried out without a questionnaire, but were based on interview guides already prepared. Like the questionnaire, the interviews were characterised by open-ended questions and sometimes unstructured interviews. In the evening, after the interviews, some notes were made to remember the information obtained during the day. These notes contained many things such as: thoughts, impressions, words, opinions, site characteristics and others. Storey (1997:6) called this a blue book or methodology diary that helped him "to think through ideas, list avenues that had opened and closed, as well as things he needed to do". Thus, the blue book helped him to write up the research findings and facilitate the analysis of the findings.

For the poor, the interview was aimed at obtaining additional information from the responses to the questionnaire. While for others such as village heads, churches leaders, sub-districts officials and NGO officers, the interviews were intended to obtain the information relating to policies, programs and projects in the selected villages.

3.4.3 Selected respondents for FGD's and observation.

In addition, there is a group of people who were interviewed under the focus group discussions (FGD's), to which they were selected on equal representation in each village. Thus, 14 members formed two groups in each village and in each group; we had male and female representations. A Snowball sample random sampling technique was used to select respondents that were to participate under Focus group discussion. In snow ball women would refer the researcher to their colleagues in the same poverty stricken situation while men would also refer the researcher to their colleagues who are in the same poverty afflicted situation. On identification, they would be interviewed by the researcher and registered in the group. Snow ball sampling also helped the researcher arrive at the other respondents from the government and nongovernmental organisations.

This means that, two groups (A & B) participated in Nyabigoma village alone and two other groups (B & C) participated in Kamanyana village alone making a total of 28 people who were under focus group discussion.

Then there was observation method and photography while in the field. In this method, the researcher just observed the situation as he was busy on data collection. Observation was used to critically see the real situation the rural poor were going through by observing their housing standards, food consumption, daily economic activities and their general way of livelihood.

3.4.4 Raosoftware calculator (2004) Sampling technique and justification

The choice of sampling techniques depends on the feasibility and sensibility of how data is expected to be collected in answering the given research questions and objectives. Research objectives which require one to estimate the characteristics of the population from a sample require probability samples. Those which require generalisations can make use of non-probability sampling techniques (Saunders, Lewis, Thornhill 1997). Given the nature of the research topic, therefore, both techniques may be needed. This also partly explains how the above sample size was arrived at using the sample size Raosoftware calculator (2004). This software uses artificial intelligence to determine the sample size, for research objectives which requires a very big population. The Raosoft sample size calculator is automatic software which determines the margin of error, level of confidence, population size and the level of response distribution with great perfection.

Table 3. 4: Automatic Raosoftware determination of the sample size technique

Margin of error accepted; 5% is a common choice	5%	The margin of error is the amount of error that you can tolerate. Lower margin of error requires a larger sample size.
Level of confidence needed Typical choices are 90%, 95%, or 99%	95%	The confidence level is the amount of uncertainty you can tolerate. Higher confidence level requires a larger sample size
What is the population size ?	920	How many people are there to choose your random sample from? The sample size doesn't change much for populations larger than 20,000.
What is the response distribution Leave this as 50% ?	50	If you don't know, use 50%, which gives the largest sample size.
Hence, recommended samlpe size	272 Apprx	This is the minimum recommended size of the survey. This research used 272 as the total sample size from the two villages. This was later divided by 2 to get136; later also divided by 2 to get 68; again divided by 2 to get 34. As justified by the explanations above.

Source: Raosoft.inc (2004); A sample size software calculator and determinant

The most important aspect about this method on sampling techniques is that it represents the population effectively. Prior to that, however, the researcher had some preliminary informal interviews with local people in each Umudugudu so as to gain initial information and understand the selected Imidugudus very well. As Hay (2003) puts it that exploratory work like, reading, viewing television documents, observation and preliminary interviews often gives the researcher a clear understanding of the key informants. The participants in this study ranged from the ages of 18 to 60 years and the religious affiliations of the participants were not considered.

In this part of Rwanda (Northern Province), farming on both small scale and medium scale is the principle occupation deep in the rural areas. Hunting is limited, although it used to exist. No there is a gazetted area for wild animals. There are also small scale businessmen and women since tourism booms in this area and tourists come from the western countries to go to the Virunga Mountains to see the mountain Gorillas. This, therefore, means the

occupation of the participants shall be considered, but our aspect was about rural poverty concerns, whatever the occupation in the rural areas.

On selecting what kind of men and women to be interviewed and also given the questionnaire, the study used the snowball sampling technique. Mugenda (1997) calls it chain referral sampling. This is a technique which is vcery unique. It starts with displaying the qualities the researcher is interested in investigating. The researcher would then ask the respondent to suggest another person who is involved in the same activity and would be willing to provide information on the subject.

Finally, on this section of methodology as mentioned before, the research study used the qualitative research designs mostly because of the nature of the topic. The study really described the state and nature of rural poverty in the study area. Qualitative data if collected very well is good in that it focuses on a naturally occurring event because it is collected close to a specific situation. It is also powerful for assessing why and how things happen as they do as it assesses causality. Given the level of rural poverty, this method of data collection emphasises on people's live experiences and it ends up becoming important for locating the meanings people place on certain things. Kasomo (2006) elaborated that quantitative research information is numerical while qualitative, information is descriptive. The study was centred on individual levels of poverty in rural areas and that is why qualitative methods were found found most useful. Quantitative methods are based on generalisation, while qualitative is based on individual and while the later is so good for a natural setting or natural study like this, the former is good in an artificial setting (Kasomo, 2006).

3.5 DATA COLLECTION SOURCES

Data was collected from both primary and secondary sources. Primary data was collected using semi structured and in-depth interviews. Interviews were formalised and structured using standardised questions for the respondents as recommended by Abdullahi (2004). Semi-structured interviews were undertaken by taking note of responses to a list of questions on the subject matter. In order to ensure that enough, adequate, and reliable information were obtained, the following instruments were used in the collection of primary data:

(i) Observation checklist

Questionnaires

(iii) Focus group discussions

Photography

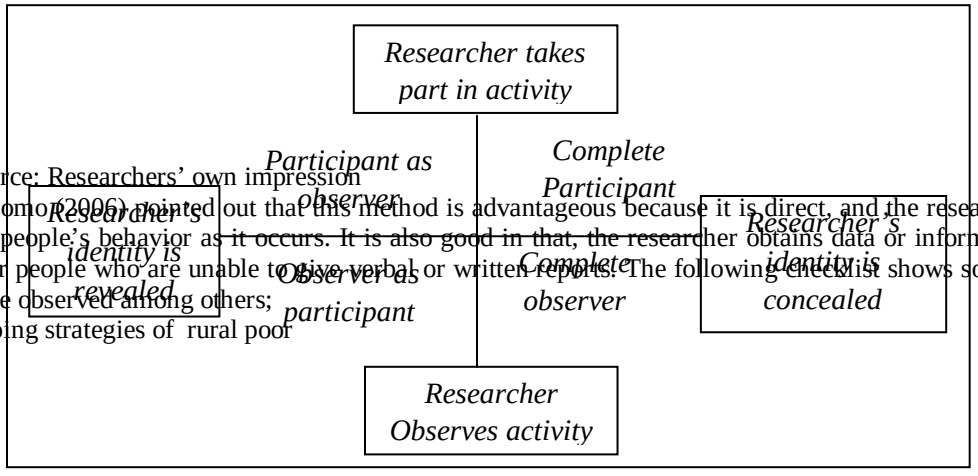
3.5.1 Observation

The researcher was able to observe events as they unfolded in those rural areas. Opportunity presented itself and the researcher started residing, eating, and sleeping with the poor rural people, this was used to observe critically their deprivations in their daily lives and activities.

This method according to Denzin (1989) helps the researcher share in the participants' subjective and symbolic world which creates opportunities to develop a thick and rich description of the life of the rural poor. Whyte (1984) also commends the use of participant observation because it gives the intending researcher the opportunity to make significant discoveries about the life of the rural poor that was not even anticipated by the researcher.

This research study was also impressed with the works of Kasomo (2006) on describing the importance of observation. According to Kasomo, the observation method can be participant observation or naturalistic observation. So since this study was a down to earth study, or rather a naturalistic study as mentioned earlier, naturalistic observation was paramount. The researcher was busy observing situations as they could occur in which the participants were not aware that they were being observed.

Table 3. 5: The typology of participant observation



Source: Researchers' own impression

Kasomo (2006) pointed out that this method is advantageous because it is direct, and the researcher is able to study the people's behavior as it occurs. It is also good in that, the researcher obtains data or information about the rural poor people who are unable to give verbal or written reports. The following checklist shows some of the issues that were observed among others;

Coping strategies of rural poor

Characteristics of rural poor
Feeding habits and consumption patterns of rural poor
Standard of living of rural poor (Household welfare)
Cultural attitudes of rural poor people
Level of community involvement and participation of rural poor
Level of choices and opportunities available to the rural poor
Settlement patterns of rural poor people
Level of individual sharpness, activeness and willingness to work hard
Major leading sources of income of rural poor
And others as the situation manifested itself while in the field

The researcher also had to utilise the observation method while in the field. The researcher simply observed the lifestyles of the rural dwellers. Some of the other key observation items included the houses, dressing style household items and utensils', meals consumed in a day, livelihood options like gardens and living environment. Observation as a method helped the researcher to critically see the real situation the rural poor were going through, especially, their housing standards, food consumption, daily economic activities and their general way of livelihood.

3.5.2 Questionnaire

Primary data was captured through the use of questionnaires structured as per the set of objectives that were to be investigated as shown below:

Section A (How do the rural poor define and understand rural poverty?)
Section B (What are the likely causes of persistent rural poverty?)
Section C (Investigations about the effects, consequences and costs of rural poverty)
Section D (Discovering how the rural poor in those villages are coping with rural life to lessen their difficulties in order to survive.)

The questions in the questionnaires tested the overall respondents views on the above concepts of the study and in order to measure the respondents views effectively, the study used the Lickert scale of 1-5 (1=strongly agree, 2=agree, 3=neutral, 4=disagree and 5=strongly disagree).

3.5.3 Focus group discussions (FGDs)

A focus group discussion (FGD) according to Krueger (1988), refers to a good way to bring together people from similar backgrounds or experiences to discuss a specific topic of interest. The group of participants is guided by a moderator (or group facilitator) who introduces topics for discussion and helps the group to participate in a lively and natural discussion amongst themselves. Morgan (1988) asserts that the strength of FGD relies on allowing the participants to agree or disagree with each other so that it provides an insight into how a group thinks about an issue, about the range of opinion and ideas, and the inconsistencies and variation that exists in a particular community in terms of beliefs and their experiences and practices.

In this study, FGDs were used to explore the meanings of the findings that could not be explained statistically. FGDs also helped the research to analyse a range of opinions/views on rurality and rural poverty which was the main topic of interest of this study. FGDs also guided this study to collect a wide variety of local terms used in the various villages of Kabanyana and Nyabigoma. A lot of descriptions on the rural lifestyle were presented and listened to using this method.

The participants were divided into four groups namely; group A, B, C and D. Group A and C were from Kabanyana village while group B and D were from Nyabigoma village. The details of what they were to be asked were prepared carefully through identifying the main objective(s) of the diferent meetings, developing key questions and developing an agenda. The research assistants and the main researcher were taking notes during the various sessions. After identifying suitable discussion participants, it was agreed that we use between six and eight as the ideal number in each group. This is also in line with Stewart and Shamdasani (1990) who observed that the best group in an FGD should be seven. Eventually, group A had seven members (three men and four women), group B had Seven members (three women and four men). Whereas groups C and D had eight members each; each group had four men and four women.

Key questions were asked jovially among the discussion groups by the research assistants and the main researcher who maintained a neutral attitude and appearance by reflecting and summarising the different opinions evenly and fairly. A detailed report of these opinions has been presented in chapter eight, nine and ten. It should also be noted that during this time, observations were made and have also been reported subsequent to this one.

3.5.4 Photography

Photography has a significant history of use as a research tool. The fields of anthropology, sociology and history have all developed diverse methods of using photography (Collier and Collier 1986; Edwards 1992; Prosser 1998). Ethnographic and documentary photography have long histories, especially in cross-cultural research.

This method is advantageous in that, it helped this study to demonstrate and record changes over time and render the details of a moment visible. Different photos were taken as seen in the Annex/Appendix of Photo plates in the last section of this study report. The photos were relied on also because they easily enhanced the ability to observe the real aspects or the key elements in this study of "rurality and rural poverty."

The researcher took various photos of various economic activities in the rural areas of Nyabigoma and Kabanyana villages. Photos of how the rural poor have opted to cope with survival strategies ranging from things like traditional methods of transport (IGIPIRINGISO), to traditional methods of bee farming, mat making, rearing of domestic animals, vegetable growing to Local brewing of traditional alcohol called IKIGAGE, have all been presented in the annex/appendix of the photo plates at the end of this report.

The photos helped this study also to know exactly how it is from other rural people who did not participate in the study physically and were from other places. This is especially so when the researcher visited local village markets which could take place in the mornings of every Saturday. In these markets, rural people from various villages could meet and the researcher was also able to talk to a wide range of rural people from various places. This argument is also backed by Jo Spence and Joan Solomon (1995). Jo Spence and Solomon (1995) asserts that photography can overcome a wide range of barriers to participation such as age, illiteracy, language differences, cultural differences, and even geographical distance. Noble and Jones, in Sankaran et al (2001) observed that photography provides a technology that literally enables researchers and their audiences to see the world in new ways, to make the invisible visible - to say "hey look at this !"

3.5.5 Secondary data sources

This form of data was through published and unpublished materials on the nature of rural poverty worldwide, regionally and locally in Rwanda. Some of these sources were obtained through national reports and national budgets. The sources of data were helpful in getting deep insights into the subject of the nature of rural poverty in Rwanda.

Renowned researchers such as Muo (2007) recognised the importance of secondary data, especially where comparisons are made in order to answer research questions and address the research objectives. It was therefore imperative to address the research questions using a combination of secondary and primary data. Secondary data that was consulted included both quantitative and qualitative data. The sources of secondary data were ascertained through literature review, informal discussions with experts, colleagues, seminars and conferences as well as published guides. Data on the Internet was also located using search engines such as;

The World Wide Web

Search engines such as;

(a)Yahoohttp://www.yahoo.com),
(b) Google (http://www.google.com)
(c) MSN(http://www.msn.com)

3.6 DATA PROCESSING AND ANALYSIS

Notes were written up everyday, often until sunset, at the end of each day the research assistants could join information collected from both villages, Kamanyana and Nyabigoma and analyse the findings and interpretations every day. In analysing the data obtained from this study, a number of analytical methods were employed and these included; descriptive statistics, established theories and SPSS.

Descriptive Statistics: - Descriptive statistics (such as means, tables, frequencies, percentages) were used to analyse, summarise and describe the socioeconomic characteristics of the respondents, their perceptions of rural poverty and the causes and effects of rural poverty.

Established theories to analyse data were also used. In data analysis, the good use of theory assists in designing the case study more effectively, as well as being useful for generalising the end results (Kamanzi, 2007). Theory, thus, assists in selecting the cases for study, specifying what is to be explored, defining a complete and appropriate description, stipulating rival theories, and generalising the results to other cases (Yin 1993). This means that, at the end of the data collection, the study was able to relate findings with what rurality is and how it affects rural poverty and also how the reverse becomes true.

Generated theory was compared to existing theory on issues concerning rurality and rural poverty.

CHAPTER FIVE: OVERVIEW ON THE CHARACTERISTICS OF THE RESPONDENTS

5.1 Introduction

In this chapter, the researcher describes in detail the respondents for the study. This chapter presents and analyses data on the respondents' characteristics. These respondents were mostly the poorest of the rural poor from Nyabigoma and Kamanyana villages. Nyabigoma village is in Musanze district while Kamanyana village is in Burera district. Both these districts are in the northern province of Rwanda. In this chapter, the researcher also looked at the social economic statuses of the respondents. It was important to make an overview on the characteristics of the respondents as a separate chapter so as to have a systematic flow of the realities as per the nature of this study which needed an in-depth inquiry into the nature of rurality and rural poverty.

5.2 Background information of respondents

The percentage of the rural poor people who had gone through school was low. From the FGD groups, the percentages were a bit visible. In the questionnaire group, the percentages for each high school are still very low.

Table 5. 1: Educational status of respondents- Kamanyana village

Education of respondents	Focus Group Discussion		Questionnaire	
	Frequency	Percent	Frequency	Percent
Never attended school	-	-	2	6%
5 Years primary school	5	36%	7	21%
7 Years primary school	6	43%	12	35%
At least attended secondary school	2	14%	9	26%
University/diploma	1	7%	4	12%
Total	14	100	34	100

Source: FGD with 14 respondents in each village
Questionnaires with 34 respondents

The FGD groups contained only one person who had graduated with a diploma in primary education. The vast majority of the respondents that participated in the focus group discussions had attained 7 years primary school represented by 43%. This was followed by primary five school represented by 36% and the 14% of those who participated in the focus group discussion had attained some secondary education. On the other hand, the largest proportion of the respondents that participated in the interviews or questionnaires had attained a 7 year primary school education represented by 35%, followed by those who had attained at least some secondary education represented by 26%, the lowest number of respondents represented by only 6% had never attended any school.

Table 5. 2: Educational status of respondents – Nyabigoma village

Education of respondents	Focus Group Discussion		Questionnaire	
	Frequency	Percent	Frequency	Percent
Never attended school	4	29%	2	6%
5 Years primary school	5	36%	12	35%
7 Years primary school	3	21%	7	21%
At least attended secondary school	2	14%	9	26%
University/diploma	-	-	4	12%
Total	14	100	34	100

Source : FGD with 14 respondents in each village
Questionnaires with 34 respondents

The number of participants with secondary education levels in Kamanyana village is greater than the number of participants with secondary education in Nyabigoma village.

Table 5. 3: Age distribution of participants by methods in the village of Nyabigoma

Age distribution	Focus Group Discussion		Questionnaire	
	Frequency	Percent	Frequency	Percent
Less than 14 year	-	-	-	-
15 - 22 years	4	29%	2	6%
23 – 30 years	8	57%	6	18%
31 – 38 years	1	7%	14	41%
39 – 46 years	1	7%	9	26%
47 – 54 years	-	-	3	9%
Above 55 years	-	-	-	-
Total	14	10	34	100

Source: Primary data, August data 2013

The age groups of 0-14 years and 55 years and over were defined as non-productive. These age groups are not actively seeking jobs and, hence, they do not really contribute to household income (Susanti et al, 1995). The reason is that the age groups of 0-14 is basically still in the school, while the age group of 55 years and above is too physically weak to work.

In the FGD groups, females and males accounted for 50% each. In the questionnaire group, females represented 50% and males 50%. They were all married couples and had an average of seven children.

Table 5. 4: Age distribution of participants by methods in the village of Kamanyana

Age distribution	Focus Group Discussion		Questionnaire	
	Frequency	Percent	Frequency	Percent
Less than 14 year	-	-	-	-
15 - 22 years	1	7%	2	6%
23 – 30 years	3	22%	6	18%
31 – 38 years	6	43%	12	35%
39 – 46 years	3	21%	9	26%
47 – 54 years	1	7%	3	9%
Above 55 years	-	-	2	6%
Total	14	100	34	100

Source: Primary data, August data 2013

As reflected in the table above, the average age of respondents from Kamanyana were aged between 31 – 38 years. The respondents from Kamanyana were on average older than the respondents from Nyabigoma.

5.3 Items measuring social economic status

The following were the main sources of income by the rural poor in the two villages where this study was carried out. Many of the villagers in the areas of study have resorted to these economic activities as a way of adapting to the situation. They are living a livelihood as per the location of their stay or place.

Table 5. 5: Main income generating activities ranked from common to the least common

Economic activities	Nyabigoma village		Kamanyana village	
	Male (frequency)	Female (frequency)	Male (frequency)	Female (frequency)
Agriculture	16 47%	11 32%	9 26%	14 41%
Trade	7 20%	11 32%	4 12%	8 24%
Teaching	3 9%	4 12%	2 6%	6 18%
Fishing	3 9%	1 3%	1 3%	2 6%
Transport	2 6%	1 3%	4 12%	0
Tailoring	1 3%	0	0	1 3%
Cattle keeping	2	5	1	4

	6%	15%	3%	12%
Saloon	2 6%	0	2 6%	1 3%
Restaurant	1 3%	0	1 3%	1 3%
others	4 12%	2 6%	3 9%	2 6%

Source: Primary data, August data 2013

Results in the table show that 79% of respondents from Nyabigoma are involved in agriculture of which 16% are males and 11% are females. On the other hand, 14% of the females from Kamanyana are also involved in agriculture. Generally agriculture is the main economic activity in both Nyabigoma and Kamanyana.

Another great activity carried out in both villages is of small scale trading. In Nyabigoma alone, 20% of the male respondents are involved in petty trade while 32% of the female respondents are involved in petty trade. On the other hand, in Kamanyana village, 32% of the male respondents are involved in petty trade. Only 24% of the female respondents in Kamanyana village are involved in petty trade. Other activities that were seen as quite important in both villages were teaching, followed by cattle keeping and the rearing of other domestic animals like rabbits, sheep and goats.

Conclusion

In this chapter, the focus has been on the characteristics of the learners which include: age, education level, occupation and marital status.

Statistics show that most of the respondents went up to primary seven, about 43%. Very few of the respondents have attended secondary education. Already, this says a lot on their capacity to work or be employed. It is not surprising that 79% of the respondents are involved in agriculture, which is the commonest rural subsistence and economic activity. These general characteristics of respondents have helped us study the respondents' likely interests and opinion.

CHAPTER FOUR: COPING STRATEGIES

4.1 Introduction

This chapter presents and analyses data on responses that the respondents gave about the coping strategies they are involved in so as to survive in the rural areas. Important however, is that some coping strategies the rural poor are involved in are in twofold: government led and rural poor led.

The causes of poverty in Rwanda are manifold. First, the population increase has not been matched by an increase in agricultural productivity. Rough terrain and erosion, combined with a lack of modern technology, place serious constraints on agricultural development, yet agriculture is the main source of rural livelihood

Rwanda, Africa's most densely populated country remains poor and essentially rural. Several significant demographic and social shifts in the course of its history have contributed to slowing its economic development. First, Rwanda's population multiplied eightfold in just half a century. Then, the 1994 genocide and the HIV&AIDS epidemic followed on this spiraling demographic growth, coupled with soil degradation and the resulting negative impact on farming – the major source of income for most Rwandans. Today an estimated 51.2 per cent of all Rwandans – 70 per cent of people living in rural areas – live in poverty. Recent data shows that 94 per cent of the population lives in the countryside, generating barely US$100 in gross domestic product (GDP) each year, compared with US$230 per capita nationally.

During the 12 months that followed the 1994 genocide, the population shrank by 30 per cent. Close to one million people died and more than two million refugees left the country. Most of the exiles were later repatriated. The nature of human settlements in many areas of the country has been altered, as many of those repatriated lost their land, housing and assets. The overall image of Rwanda's post-war economic recovery is quite positive. After a spectacular post-war boom, national income has continued to rise steadily with an average growth rate of over 10 % between 1996 and 2002. On the other hand, the actual translation of growth into poverty reduction has been disappointing (Ansoms, 2005 and 2007) which diminishes the government's hopes of a purely growth-led strategy for poverty reduction. However, the Rwandan Government aims at a pro-poor effect by, "looking for growth in the sector where the poor are located" (GoR, 2002).

In this chapter, therefore, the researcher explains the strategies used to cope with poverty. Despite the fact that the rural people are poor, they have learned to live with it over time. In this chapter, the researcher explains clearly what the poor do in coping with this situation.

Coping strategies

Basing on the fact that poverty is estimated to be 44.9% nationally, with 22.1% poor in urban areas and 48.7% poor in rural areas, there is bound to be a strategy of dealing with the poverty situation. The coping strategies are hereby looked at in twofold: the government led strategy and what the rural poor are actually doing to manage poverty.

4.1 GOVERNMENT LED STRATEGIES

4.1.1 Building an enabling environment

The state's main role is to create a conducive environment in which economic activity can take place effectively. The current thrust is towards a strong and competent state that provides a visionary leadership and management role. A delicate balancing act also needs to be created between market forces and the strong guiding and facilitative hand for the state.

The role of the state in helping the poor cope with poverty includes:

Providing a stable macroeconomic environment

Good governance and national reconciliation,

Enforcing a coherent legal and regulatory system which protects the property rights of all citizens, including the poor and enabling entrepreneurs to operate in a business-friendly environment,

Maintaining quality infrastructure

Promoting human resource development,

Protecting the environment

Intervening to correct market failures, promote equity and protect the vulnerable.

More so, poverty reduction affects all aspects of public action targeting both the urban and rural areas. It is, therefore, important to comprehensively guide all aspects of public policy. The current actions by government are grouped under the following core areas:

4.1.2 Good governance

Good governance, democratisation; national reconciliation, national political stability and security. Grassroots participation in development and decision making an all-inclusive economic system that allows effective participation of all social and economic groups in the population and creates an economy of stakeholders.

Policies

Policies to increase productivity and incomes of the poor, the measures to increase incomes focuses on employment and labour productivity, agricultural modernization, provision of rural credit and financial services, as well as support for micro and small scale enterprises.

Public action

Actions to improve the provision and accessibility to information and social services so as to improve the quality of life of the poor, The priorities include primary health care, primary education, water and sanitation, energy and housing, They also include assertive public action to address the high rate of population growth. Addressing the problems of vulnerable groups on a sustainable basis, replacing transfers with sustainable livelihoods and establishing safety nets

4.1.3 Poverty Reduction Strategy

The Poverty Reduction Strategy Paper (PRSP), a document that has been developed and is used as the platform for sector policy-setting in each ministry since late 2003.

The government published its PRSP in June 2002. Broadly speaking, it calls for high economic growth accompanied by measures to increase export earnings and agricultural production and diversify the economy by developing information technology and communications. Priority is placed on education as a means of creating a competitive, highly qualified and trilingual labor force (speaking Kinyarwanda, French and English) that is responsive to the needs of the marketplace. Through a broad national consultative process, six priorities were set as outlined below, in order of importance:

Rural development and agricultural modernisation

Human development

Economic infrastructure

Governance

Private-sector development

Institution-building

The first Poverty Reduction Strategy Paper (PRSP) document recognised the rural sector to be of crucial importance for Rwanda's economic future by presenting the agriculture and livestock sector as "the primary engines of growth"

(GoR, 2002:30). This ambition reappears in the new EDPRS (PRSP-2) policy which aims at equitable growth, sustainable development, and poverty reduction with rural development as important priorities (GoR, 2007). This hardly seems surprising, given that the primary sector employs almost 90% of Rwanda's active population and. It represents about 45% of its GDP. Moreover, rural poverty is more prominent and severe in comparison with the urban type. Based on a poverty line of 250 Rwf (Rwandan francs) per adult equivalent per day (1,22$ PPP, 2006 current exchange rate), 56,8% of the rural population are labeled poor, of whom 36,8% are considered extremely poor (living below the food poverty line of less than 175 Rwf per adult equivalent per day, GoR, 2007).

However, Rwandan 'poor' are not a uniform group, nor is the problem of rural poverty a homogeneous one that can be solved with a uniform package of policy measures that enhance agricultural growth. The contribution of this paper lies in the identification of different livelihood profiles for rural households in Rwanda. An understanding of the variations in the characteristics of different livelihood profiles, and the institutional constraints they face, is a prerequisite for effective rural policy making.

The livelihood approach finds its main roots in a paper by Chambers and Conway (1991). They define sustainable rural livelihoods as, "the capabilities, assets (stores, resources, claims and access) and activities required for a means of living" (Chambers and Conway, 1991:6). The approach has been taken up by many scholars as a framework for poverty and/or vulnerability analysis (Ellis et al., 2003; Bird and Shepherd, 2003; Bebbington, 1999; Moser, 1998 and Chambers, 1995). In addition, it has been transformed into a more practical tool by and for development practitioners like UNDP, Oxfam, Care and DFID (Hoon et al., 1997; DFID, 2001 and Solesbury, 2003).

Finally, the country has no ocean access, and the closest port is 1,500 km from the capital. The resulting transport costs, together with the other constraints, keep poor farmers from earning sufficient income from agriculture.

4.2 THE RURAL POOR LED COPING STRATEGIES

What the rural poor are actually doing to manage rural poverty as reported from various interviews and focus group discussions has been presented in this section.

4.2.1 Appropriate income per day

On average, respondents required appropriately 2000 Rwf or more per day to live an appropriate life. Its only 2 married women from Nyabigoma and also 2 women from Kamanyana who said that between 200 – 500 Rwf was appropriate per day. All the other respondents from both Nyabigoma and Kamanyana said that an appropriate income should range from 1000 Rwanda francs and above. However, the third integrated household living conditions survey (2011/2) report suggests that an appropriate income per day would at least be 2500 Rwanda francs per day.

Table 9. 1: Income needed per day to live an appropriate life – Nyabigoma

Rwanda franks	Single		Married	
	Men	Women	Men	Women
200 – 500	0	0	0	2
1000 – 1500	6	5	5	3
2000 – more	15	10	7	9

Source: Field data, 2013

Table 9. 2: Income needed per day to live an appropriate life - Kamanyana

Rwanda franks	Single		Married	
	Men	Women	Men	Women
200 – 500	0	1	0	1
1000 – 1500	4	5	3	6
2000 – more	12	14	8	11

Source: Field data, 2013

4.2.2 Actual income per month

The majority of respondents' incomes in both Kamanyana and Nyabigoma is between 0 – 19,00 Rwanda francs per month the lowest level of income was 4000 Rwanda francs. It is only 4 respondents who were found to be above 40000Frw per month which is only about 4% of the respondents. While all the other 95% falls below the income level of below 40,000 per month. Specifically if the income is placed in a daily rate then respondents would be considered as living below poverty line.

Table 9. 3: Income needed per day to live an appropriate life

Income level Rwanda francs	Nyabigoma	Kamanyana

	Male	Female	Male	Female
0 – 19,000	12	2	7	13
20,000 – 39,000	6	4	6	2
40,000 – 59,000			1	1
60,000 - above		1		1

Source: Field data, 2013

Coping with poverty

Poor rural inhabitants' have adopted different strategies to overcome poverty. These strategies vary from person to person and from community to another community. Generally, however, the following strategies have been considered by the poor. Poverty is a multidimensional problem that goes beyond economics to include, among other things, social, political, and cultural issues. Therefore, solutions to poverty cannot be based exclusively on economic policies, but require a comprehensive set of well-coordinated measures. Indeed, this is the foundation for the rationale underlying comprehensive poverty reduction strategies.

So, why focus on macroeconomic issues? Because economic growth is the single most important factor influencing poverty, and macroeconomic stability is essential for high and sustainable rates of growth. Hence, macroeconomic stability should be a key component of any poverty reduction strategy

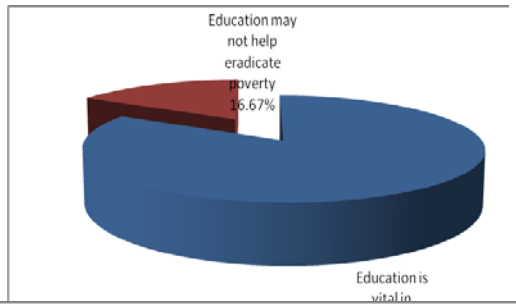
4.2.3 Educating our children

Rwanda is on the verge of a breakthrough. Having weathered one of the worst humanitarian crises imaginable. Just fifteen years ago, and with an impoverished countryside plagued by HIV/AIDS, hunger, and malaria, Rwanda seems to be an unlikely place for an economic renaissance. Yet, the nation's commitment to good government and support for free market solutions place it among the most likely countries to see rapid advancement in the coming decades. Such a future is far from guaranteed, and whether it comes to fruition depends largely on the country's system of education.

For Rwanda, more than any other country, education holds the key to the future. The Rwandan government has demonstrated its commitment to education by making education the largest area of spending, accounting for 27 percent of the budget. Rwanda's education sector must be a prime candidate. Strengthening education in Rwanda will not only help the Rwandan people overcome poverty, but it will also reinforce the democratic institutions Rwanda has developed in the last fifteen years. Educational reform has played a pivotal role in encouraging entrepreneurship in Rwandan youth. By making Entrepreneurship a compulsory course of study in secondary schools, students have acquired necessary tools and knowledge to be able to be more innovative and enterprising. The results are interesting. With more and more younger people getting involved in business ventures, there are clear signs that it has helped to transform lives and communities. Several Higher Education Institutions (HEI) offer certificates and diploma courses in Entrepreneurship, while, recently, the National University of Rwanda (NUR) alongside its partners organised a Students' Business Plan Competition. With support from various financial institutions, the competition is set to be a success. The role of education in this process is particularly one of achieving universal primary education and adult literacy

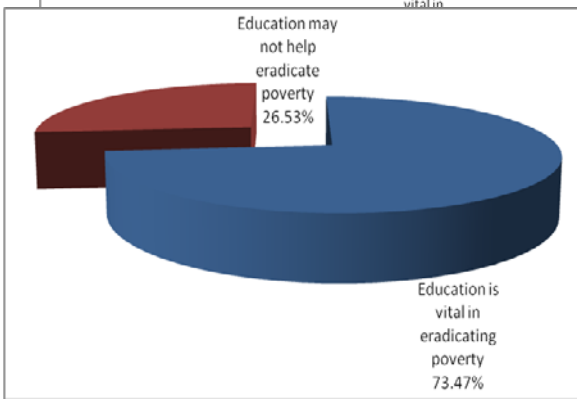
Poor children have numerous disadvantages in relation to their better-off counterparts. They are usually less healthy, their language skills less developed (a factor that has negative influence on school achievement), and they are generally less well equipped - socially, emotionally and physically - to undertake a school programme. If their disadvantaged position and different day-to-day experiences are not taken into account by school education, it is no wonder that they are unable to benefit fully from the school system. As previously mentioned, wealth creation is a significant aspect in education programmes intended to contribute to poverty eradication. How can education assist learners to create wealth? Integration of school education within the economic activities of a community is one example. For instance, in a carpet-weaving village, lessons would also cover various aspects of the carpet industry. In this way, school education would help children to improve traditional trade skills of the village alongside other curricular contents. It would ensure that their future employment possibilities and contribute to the (economic) wellbeing of the whole community. Furthermore, the school would not be alienated from the community and traditional trade would reinforce learning. For the education system to truly respond to the needs of poor children and to contribute to wealth creation in communities and society at large. It needs to take the issue of poverty into special consideration in the planning of educational services. Essentially, it has to stress the preparation of all children to achieve at school, and empower them by heightening their awareness of their rights and responsibilities, their abilities, and enhance their self-confidence to enable them to improve their lives. From the communities of Nyabigoma (83%) and Kamanyana (73%), the value of education in poverty eradication is not negligible.

Figure 9. 1: Education leads to eradication of poverty - Nyabigoma



Source: Field data, 2013

Figure 9. 2: Education leads to eradication of poverty - Kamanyana



Source: Field data, 2013

4.2.4 Accessing soft loans

Rwanda's "Entrepreneurial President", as he is fondly called understands this very well; 'In Africa today, we recognise that trade and investment, and not aid, are pillars of development".

Promoting policies that encourage trade and investment has been on Rwanda's agenda and if the ever growing number of financial institutions in the country is anything to go by, then his message is sinking in. Roselyn, a banker at Banque Populaire de Rwanda (BPR), a citizen-based bank said that "we are getting more and more people applying for loans". As it is, the majority of people are not financially able to create businesses. 'People from rural areas, especially the farmers have now learnt what they can do with a loan and how they can pay it back in the long-run. It is pretty exciting.' A loan scheme specifically targeted to farmers in rural areas allows them to get money to acquire livestock and be able to start their own businesses.

More importantly, the influx of banks and micro-finance institutions has created a sort of competition for clientele. This means that services have now increased and are easier to get from these institutions, and significantly, access to loans is much faster and easier. Loan schemes are growing in number as well and it is clear that many Rwandans have taken advantage of this.

The banks and micro-finance institutions conduct regular information sessions and sensitisation seminars to train people on the importance of entrepreneurship and how they can use loans and credit to develop their own businesses. The respondents from both Nyabigoma (71%) and Kamanyana (78%) appreciate the role of loans in eradicating poverty.

4.2.5 Agriculture modernising

Agriculture employs 80% of the labour force in Rwanda and accounts for about 33% of GDP. This creates a demand for modernising agriculture and makes it more productive. Normally, the Plan for Modernisation of Agriculture (PMA) is a holistic, strategic framework for eradicating poverty through multi-sectoral interventions enabling the people to improve their livelihoods in a sustainable manner. "Eradicating poverty by transforming subsistence agriculture to commercial agriculture" It is an outcome-focused set of principles upon which sectoral and inter-sectoral policies and investment plans can be developed at both the central and local Government levels. Furthermore, poverty reduction strategies that focus on agriculture modernisation are the strategies that would be considered pro-poor.

According to the Rwanda Operational Plan 2011-2015, updated in June 2012, the agricultural sector presents a great opportunity for poverty eradication because it employs over 80 percent of the labour force, and because agricultural growth can be accelerated substantially by the uptake of modern farming techniques. Over Based on the poverty focus and the need to transform agriculture, the vision of the PMA encompasses both the farmer and the sector. The

PMA vision is "poverty eradication through a profitable, competitive, sustainable and dynamic agricultural and agro-industrial sector." Achieving this vision in Rwanda will depend on two related processes: transforming the subsistence farmer, and transforming the agricultural sector in general. The objectives of the PMA are to: increase incomes and improve the quality of life of poor subsistence farmers, improve household, food security, provide gainful employment, and promote a sustainable use and management of natural resources. In a broad sense, to achieve this vision, it is essential to maintain prudent macroeconomic and sectoral policies, undertake institutional reforms and adjustments, and implement the identified priority interventions. During the study, the respondents interviewed in Nyabigoma (89.4%) and Kamanyana (79%) villages were positive that investments in agriculture would help get them out of poverty.

4.2.6 Assistance from NGOs - Girinka Munyarwanda (one Cow per family)

The support from nongovernmental organisations (NGOs) was also mentioned as vital in the eradication of rural poverty. In Nyabigoma, at least 77% of the respondents were very appreciative of the contribution of NGO's while in Kamanyana 69.3% of the respondents were confident that with the support from NGOs, poverty would be totally eradicated. Respondents also said that NGOs had already made vast contributions towards the eradication of rural poverty and their increased contribution would lead to further eradication of rural poverty.

NGOs like CARITAS, and World Vision were mentioned and appreciated for their efforts in eradication of rural poverty. Assistance from NGOs and government initiatives like "Girinka Munyarwanda" was mentioned as the key element of poverty eradication in Rwanda.

In this context, it is worth referring to Jeffrey D. Sachs's strategy for alleviating poverty. According to Sachs (2005), a 'poverty trap' must first be solved in combating poverty. Although the poor have willingness to overcome their ill-being, they are not able to do it by using their own resources. There are so many factors that trap the poor until they are in powerless conditions, such as diseases, climate stress, environmental degradation, physical isolation, and also extreme poverty itself. Sachs states:

"The world's poor know about the development ladder: they are tantalised by images of affluence from halfway around the world. But they are not able to get a first foothold on the ladder, and so cannot even begin to climb out of poverty" (Sachs, 2005: 19-20).

Essentially, the poor must be helped to exit from the poverty trap. If it can be reached, there will be an opportunity to get a first foothold on the ladder of development. In helping the poor to climb out of poverty, NGOs use two approaches: supply-side and demand-side (Clark, 1995).

In a similar sense, Fowler (1997) identifies two types of NGO tasks: micro-tasks and macro-tasks. From the supply-side or micro-tasks approach, NGOs provide various basic public services to the poor. It is argued that especially in countries where government lack public services, NGOs play a significant role in the direct provision of social and economic services. In general, NGOs emerge and play the roles as service providers. There are also several Non-Governmental Organisations that set up trainings and workshops for entrepreneurial training.

4.2.6 Strengthening of cooperatives

Cooperatives are at work in almost every country and economic sector. More than 760 million people around the world are engaged in the cooperative movement. Whether a rural cooperative in Benin, which ploughs back profits into building reservoirs and upgrading roads, or a savings and credit cooperative in Sri Lanka, providing insurance and postal services to its members, a cooperative can play a significant role in fulfilling development objectives. It is, generally, recognised that cooperatives respond effectively to the ever-changing needs of people.

For example, in response to the effects of globalization, people continue to choose cooperatives to address their needs. In a number of countries, people are starting new cooperative enterprises in such areas as social care and information technology. Women and youth are also choosing the cooperative form to start enterprises of their own, thus creating new jobs and opportunities. The cooperative advantage extends to the users of cooperatives and indeed to the communities in which they operate. Cooperatives set industry standards by putting into practice their values and ethics. In some countries, cooperatives are seen as leading agencies in promoting food safety and security, and in protecting the environment. Further more,, cooperatives are building peaceful societies by promoting understanding and collaboration among people of different cultural and income backgrounds. The values of cooperation - equity, solidarity, self-help and mutual responsibility - are the cornerstones of cooperatives and should be sustained so that cooperatives can continue to respond with flexibility and innovation to changes and challenges posed by globalization. This part of the world is yet to benefit from globalization as the people live by 2 US dollars a day.

Cooperatives, and in this case we are specifically limiting ourselves to agricultural marketing cooperatives, have emerged as a critical rural development institution in Tanzania. They have been the kingpins of development interventions aiming at alleviating poverty of the small holder farmers spread out in the rural areas of Tanzania. The colonial governments promoted the formation of agricultural marketing cooperatives particularly for cash crops,

mainly coffee, cotton and tobacco. The Nationalist post colonial government saw cooperatives as an important vehicle which could be harnessed to spread the benefits of development to a wide section of the Rwandan population.

During the study in Nyabigoma and Kamanyana, although respondents did not seem to understand exactly how a cooperative works, they felt that it was still necessary in eradicating poverty. In Nyabigoma village 76% of the respondents looked at cooperatives as a credible means for coping with rural poverty while in Kamanyana 88% considered cooperatives as credible means of eradicating poverty.

Currently the cooperative movement is increasingly being promoted by international development organizations as a means for participatory development in Rwanda.

One of these promoters is Chapman who focused on the promotion of the cooperative sector in Rwanda as outlined in the country's Poverty Reduction Strategy Paper. Her research included visits to many cooperatives in Kigali, the capital, and interviews with officials working with development policy. The broad-ranging nature of a cooperative, allows for multiple growth opportunities. Cooperatives not only offer a means for attaining economic growth, but also offer an opportunity for empowerment of otherwise marginalized populations in social and political realms of everyday life.

4.2.7 Protection of environment

The protection of the environment has been seen as a key poverty reduction strategy by both the respondents from Nyabigoma (82%) and Kamanyana (78.2%). The Poverty Reduction and Environmental Protection Programme responds to three of the four outcome areas outlined in the Country Programme Document: capacity-building for peace and human security, increased livelihood opportunities and improved natural resources management, and gender equality.

Its core work is divided into three pillars: Supporting formulation and implementation of strategic economic development policies with focus on small and micro-finance for inclusive growth; empowering local communities to analyse, participate in and advance recovery and development through encouraging local enterprise, managing conflict and fostering sustainable environmental management as well as ensuring that environmental and natural resources are utilised in a sustainable, equitable, gender and conflict-sensitive manner, by supporting formulation and implementation of strategic policies.

Poverty Reduction and Environment Protection Programme supports vulnerable communities by providing pro-poor social services towards achieving the Millennium Development Goals and by creating an enabling environment for reconstruction and development. It strives to increase local communities' income, improve their ability to manage natural resources, and prevent or mitigate the impact of disasters, both natural and man-made. The programme particularly focuses on community support with an inclusive range of partners at the community level and in the private sector. Environmental Protection efforts targets MDG7, ensuring environmental sustainability. It also promotes sustainability of the sources of livelihoods for the majority of the population that depends on productivity of natural resources. It has also already been agreed that poverty reduction and environmental conservation should go hand-in-hand.

4.2.8 Family planning and child spacing

Family planning plays a pivotal role in population growth, poverty reduction, and human development. Evidence from the United Nations and other governmental and nongovernmental organisations supports this conclusion. Failure to sustain family planning programmes, both domestically and abroad, will lead to increased population growth and poorer health worldwide, especially among the poor. However, robust family planning services have a range of benefits, including maternal and infant survival, nutrition, educational attainment, the status of girls and women at home and in society, human immunodeficiency virus (HIV) prevention, and environmental conservation efforts. Family planning is a prerequisite for achievement of the United Nations' Millennium Development Goals and for realizing the human right of reproductive choice.

This position on family planning as another means of coping with poverty was agreed on both Nabigoma and Kamanyana. The respondents in Kamanyana and Nyabigoma however looked at family planning as a means of reducing the burden of children related expenditures.

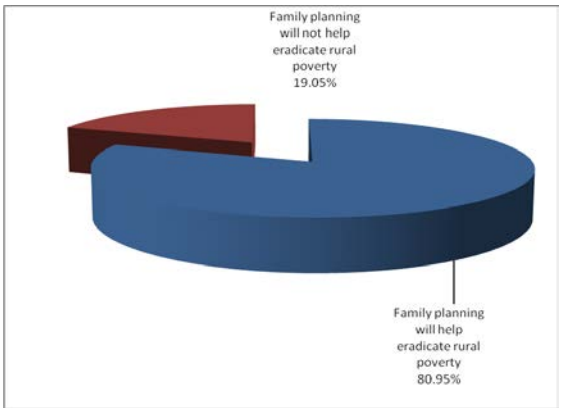
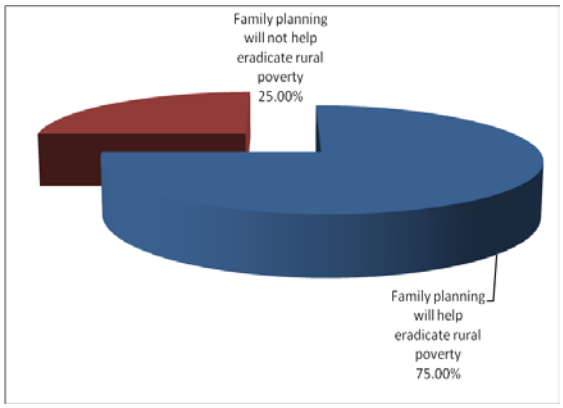


Figure 9. 3: Family planning will help eradicate rural poverty- Nyabigoma

Source: Field data, 2013
Figure 9. 4: Family planning will help eradicate rural poverty- Nyabigoma



Source: Field data, 2013
As noted in the charts above; 80.95% of the Nyabigoma respondents were in agreement with the contribution of family planning in the reduction of rural poverty. Also in Kamanyana the response was not far different either; 75% agreed that the reduction of rural poverty would require the component of family planning not to be ignored.
In relation to family planning, when it comes to population growth, the United Nations has three primary projections. The medium projection, the one most commonly used, has world population reaching 9.2 billion by 2050. The high one reaches 10.5 billion. The low projection, which assumes that the world will quickly move below replacement-level fertility, has population peaking at 8 billion in 2042 and then declining.
If the goal is to eradicate poverty, hunger, and illiteracy, then we have little choice but to strive for the lower projection. Slowing world population growth means ensuring that all women who want to plan their families have access to family planning information and services. Unfortunately, this is currently not the case for 215 million women, 59% of whom live in sub-Saharan Africa and the Indian subcontinent. These women and their families represent roughly 1 billion of the world's poorest people, for whom unintended pregnancies and unwanted births are an enormous burden.
Former US Agency for International Development (USAID) official Joseph Speidel notes that;
"If you ask anthropologists who live and work with poor people at the village level; "they often say that women live in fear of their next pregnancy. They just do not want to get pregnant."

The United Nations Population Fund and the Guttmacher Institute estimate that meeting the needs of these 215 million women who lack reproductive healthcare and effective contraception could each year prevent 53 million unwanted pregnancies, 24 million induced abortions, and 1.6 million infant deaths. Family planning can lead to economic growth both at the family level and at the national level, making it a critical component of strategies to reduce poverty.

4.2.9 Stabilizing prices of our agricultural products

Village dwellers in Nyabigoma (73%) and Kamanyana (82%) believe that one of the factors that have sustained poverty in their villages is the fluctuating and low prices of agricultural products, yet agriculture is the main economic activity for them. This creates a dire need for stabilizing prices of agricultural products. Recognising the important influence of agricultural price stabilisation and support policies on agricultural development, on consumption levels, on farm incomes, and on international trade, is paramount. The desirability of agreed principles to serve as guidelines to Member Governments in establishing or reviewing their agricultural price stabilization and support policies is paramount. The important contributions in this field made in the reports of the FAO Expert Working Party which met in 1956, of the Expert Panel which met in 1959, and of the regional meetings held in Asia and Latin America have to be recognized.
Fluctuation in market prices for agriculture products could adversely affect financial condition and results of operations. Prices for cereals, oilseeds and by-products, like those of other commodities, can fluctuate significantly. The prices that we are able to obtain for our agriculture products depend on many factors beyond our control.
Financial condition and results of operations could be materially and adversely affected if the prices of grains and by-products decline. Fluctuation in market prices for agriculture products could adversely affect our financial condition and results of operations. Prices for cereals, oilseeds and by-products, like those of other commodities, can be expected to fluctuate significantly causing adverse effects on the incomes of farmers. The prices that we are able to obtain for our agriculture products depend on many factors beyond our control.

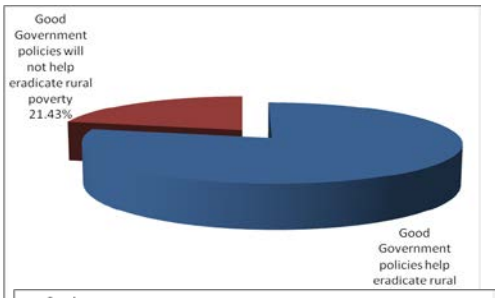
Price fluctuations are not only a situation affecting the farmers or villagers in Rwanda alone but also it is a global phenomenon. For example, from June 2005, to June 2006, prices in U.S. dollars for soya beans dropped by 8.75 %, the price of the corn increased by 11% and wheat increased by 15.6%. (CBOT- Bloomberg, 2006). The international price fluctuations also affect the prices on the local market.

4.3 Good Government Policies

Poverty alleviation is a deliberate effort by all countries that overcome it. This, therefore, calls for deliberate government effort to establish the right policy frameworks for poverty eradication. Economic growth is the single most important factor influencing poverty. Numerous statistical studies have found a strong association between national per capita income and national poverty indicators, using both income and non-income measures of poverty.

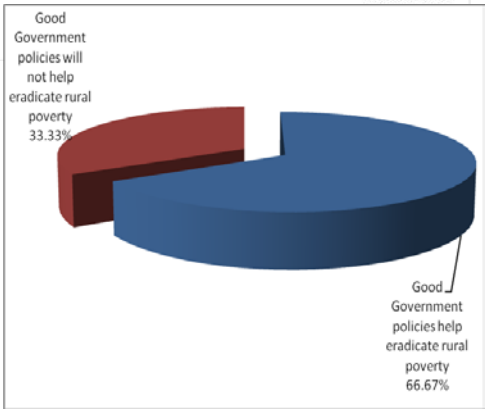
Nyabigoma and Kamanyana respondents believe that good government policies will help them get out of poverty.

Figure 9. 5: Good government policies will help eradicate poverty - Nyabigoma



Source: Field data, 2013

Figure 9. 6: Good government policies will help eradicate poverty – Kamanyana



Source: Field data, 2013

Pro-poor policies are vital in eradication of rural poverty or in copying with poverty.

4.4 Macroeconomic policies and private sector investment

One recent study consisting of 80 countries covering four decades found that, on average, the income of the bottom one-fifth of the population rose one-for-one with the overall growth of the economy as defined by per capita GDP (Dollar and Kraay, 2000). Moreover, the study established that the effect of growth on the income of the poor was, on average not different in poor countries from that in rich countries. The poverty–growth relationship had not changed in recent years, and that policy-induced growth was as good for the poor as it was for the overall population.

Studies show that capital accumulation by the private sector drives growth. Therefore, a key objective of a country's poverty reduction strategy should be to establish conditions that facilitate private sector investment. No magic bullet can guarantee increased rates of private sector investment. Instead, in addition to a sustainable and a stable set of macroeconomic policies, a country's poverty reduction policy agenda should, in most cases, extend across a variety of policy areas, including privatisation, trade liberalisation, banking and financial sector reforms, labour markets, the regulatory environment, and the judicial system. The agenda should include increased and more efficient public investment in a country's health, education, and other priority social service sectors. Macroeconomic stability is the cornerstone of any successful effort to increase private sector development and economic growth. Cross-country regressions using a large sample of countries suggest that growth, investment, and productivity are positively correlated with macroeconomic stability (Easterly and Kraay, 1999).

Although it is difficult to prove the direction of causation, these results confirm that macroeconomic instability has generally been associated with poor growth performance. Without macroeconomic stability, domestic and foreign investors will stay away and resources will be diverted elsewhere.

In fact, econometric evidence of investment behavior indicates that in addition to conventional factors (past growth of economic activity, real interest rates, and private sector credit), private investment is significantly and negatively influenced by uncertainty and macroeconomic instability (Ramey and Ramey, 1995).

4.5 Women and girls empowerment

It is also important to involve women and girls in the eradication of poverty.

Women face the direct impact of poverty in the rural areas of Nyabigoma and Kamanyana and it is an important aspect of coping with poverty. The respondents realised the need for women and girls empowerment and, to include them as key partners in development and coping with poverty. Particularly, women in Nyabigoma (92%) and Kamanyana (86%) felt that they needed to participate more in handling poverty. It is also important to encourage women to start doing some jobs that were previously marked for men only.

In situations of extreme poverty, women and girls are particularly at risk as they tend to inherit the poverty of their mothers. They are prone to abuse of all forms, and very often confined to households in which they are virtually slaves. UNICEF has been working on this issue as part of the follow-up to the 1993 Ouagadougou Pan-African Conference on the Education of Girls. Other groups of poor children who merit special attention are children orphaned by HIV/AIDS, street children, and children of some ethnic minorities. For them, the provision of non-academic support and security is essential in order to contribute to their total wellbeing and success in life. Moreover, dialogue and cooperation with parents and families should improve their participation and performance in education.

4.6 Main economic activities

Different economic activities take place in both Nyabigoma and Kamanyana.

Although each individual has different activities that they are engaged in, the predominant one is agriculture employing 38% of the males and 20% of the females and salaried job employing 29% of males and 29% of the females in Nyabigoma.

On the other hand in Kamanyana the main economic activities are agriculture employing 24% of the males and 30% of the females. The second economic activity in Kamanyana is the salaried jobs employing 14% of the males and 29% of the females.

Other economic activities taking place in both Nyabigoma and Kamanyana include: fishing, driving, carpentry, shoe making, haircutting, basket weaving, mats making, chairs, tailoring, mobile restaurant of snacks like chapatti, mandazi, mechanics, hunting, making local brew such as ikigage for alcohol, mining, farming and any sort of agricultural activity, witch craft, private salaried job, civil service or government job, trading such as operating a shop and selling of second hand clothes.

Table 9. 4: Permanent livelihoods in Kamanyana and Nyabigoma

Livelihood	Nyabigoma		Kamanyana	
	Male	Female	Male	Female
Fishing			8%	14%
Driving	3.5%		2%	
Carpentry	9%		2%	
Show making and saloon	6%	12%	2%	13.5%
Hand craft		8.5%	2%	4%
Tailoring	8%	14%	2%	13%
Cookery	2%	4%		6%
Mechanics	2%		3.5%	
Brewing	4%	8%		3%
Trading	8%	15%	9%	5%
Witchcraft				2%
Salaried jobs	29%	29%	14%	29%
Bee keeping		3%		3%
Agriculture: crop and animal husbandry	38%	20%	24%	30%

Source: Field data, 2013

All rural inhabitants from both Nyabigoma and Kamanyana interviewed were involved in multiple economic activities.

The main economic activity that all the respondents both in Nyabigoma and Kamanyana were involved in was agriculture which activity directly or indirectly employed up to 100% of the males in Nyabigoma, and 97% in Kamanyana. It also employed 76% of the males in Kamanyana and 100% of the females in Kamanyana.

The second major activity that employed multiple persons was trading, which employed 18% of males and 18% of females in Nyabigoma. On the other hand 4% of the males and 6.5% of the females in Kamanyana were also involved in trading.

Table 9. 5: Second livelihoods activities in Kamanyana and Nyabigoma

Livelihood	Nyabigoma		Kamanyana	
	Male	Female	Male	Female
Fishing			14%	
Driving	2%		4%	
Carpentry	9%		8%	2%
Show making and saloon	12%	26%	15%	14%
Hand craft	18%	29%		2%
Tailoring	9%	11%		14%
Cookery	14%		18%	13%
Mechanics	2%			
Brewing	4%	6%	4%	
Trading	18%	18%	4%	6.5%
Witchcraft				
Salaried jobs	7%	9%	12%	195
Bee keeping	2%	16%		20%
Agriculture: crop and animal husbandry	100%	97%	76%	100%

Source: Field data, 2013

4.7 Reasons for engaging in multiple jobs

Different people were involved in different economic activities and the said activities are ranked in the table below. Almost 100% of the males in both Nyabigoma and Kamanyana were engaged in more than one economic activity because of the low incomes they receive. The idea is that the incomes cannot help them to effectively meet their daily needs. So the individuals end up doing more than one economic activity to help them to manage their lives effectively.

Basically, the highest ranked reason for the rural poor doing multiple economic activities is the low incomes received from doing only one economic activity, thus, the motivation of doing more than one activity. The table below contains all the other reasons by the respondents for engaging in multiple economic activities.

Table 9. 6: Reasons for engaging in multiple jobs in Kamanyana and Nyabigoma

Reason	Nyabigoma		Kamanyana	
	Male	Female	Male	Female
Ranked reason from highest to lowest	Rank %ge	Rank %ge	Rank %ge	Rank %ge
Because of low incomes	100%	86%	100%	68%
Because of too much Poverty	82%	66%	70%	88%
Because of Rising prices of Basic necessities	54%	30%	47%	55%
Because of Family needs e.g. Many Children to feed at home	33%	20%	-	17%
Because of need to pay fees for my children	24%	-	32%	19%
Because of Need of Getting money for food	14%	11%	-	29%
Because of Poor Asset Base (No land)	-	13%	16%	-
Because of No easy Access to credit	4%	2%	8%	-
Need for income to help me get married	2%	-	-	-

Source: Field data, 2013

4.8 COPING WITH SOCIO-ECONOMIC PROBLEMS OF RURAL POVERTY

The residents of Kamanyana and Nyabigoma, have not remained passive in the face of the social and economic problems they confront. The concept of self-resilience to them has been of a veritable aspect in how they began to define their life styles, turning their vulnerability contexts into a promising situation to change rather than to maintain its state of prevalence.

Table 9. 7: Strategies for coping with problems

Most Cited Problems	Coping Strategy
Income	• Being a manual labourer • Crushing stones to sell, and quarrying sand and stones for building • Growing vegetables • Planting crops to sell • Collecting some fruit from other places and bringing them back to the village to sell Borrowing from relatives, close friends or neighbors.
House	• Using local materials such as wood, bamboo from the virunga mountains and "sago" leaves to build houses • With the income they obtained from the above sources, using a part to buy some materials from some shops in the town
Food	• Growing vegetables like cabbages, carrots and egg plants • Planting the crops • Buying from some shops in the town
Education/schools	• Most children attend the schools on a 12 year basic education which free primary education by government • Free education for 12 years primary school
Main poor road conditions	• The road connecting the villages to the town is also not good in times of rains and floods from the Virunga mountains
Job	• Self-employed (any manual laboring, farming, making bricks and crushing stones)
Electricity	• Using lantern lamps, local traditional candles.
Water	• Using water coming from the crater lake up at virunga mountain

Source: Fieldwork conducted in the village of Kamanyana and Nyabigoma

The sustainable livelihood frame as a holistic approach in defining rural poverty (Chambers and Conway, 1982) identifies the poor as a victim of poverty at the same time as a social engineer (Chambers, 1983) to act on the undesired social economic situation and come up with coping and adoptive strategies to stress and shocks, in any form and context it may exist.

4.8.1 Strategies on coping with low rural incomes

Income levels as already noted above are still very low. The study did not extend the scope of research to categorise the respondents in income classes, as this was thought to create a bias to the least income group and subsequently prevent the researcher from gathering a wide range of information.

In Rwanda, statistics have continued to indicate a high prevalence of poverty levels in rural areas (EDPRS 1 of the GoR, 2007) the middle income class is mainly in urban and peri-urban centre. At least 90% of the sampled population and the probed sample were economically employed in farming as centrally to most urban population of Rwanda. Village dwellers have been reported.

In Tanzania, for example, just like Rwanda, 90% of the poor people, are still in the rural areas although, there are higher poverty levels in villages. In Rwanda too, according to the similar report, it is on record that 64.7% of the rural population is still poor and 37% are in extreme poverty.

However, there are universally agreed upon coping strategies on how the rural population can withstand the problem of low incomes. Albeit the Indian noblest Amatya Sen in his work on sustainable livelihoods, produces a set of coping strategies namely Migration, diversification, hoarding, reduction in food consumption and others (Sen, 1984). Lower incomes in the rural population have affected largely the investment and production potentials of rural communities. Agriculture in Rwanda has lagged behind (IPAR Rwanda Report, 2009) due to unfavorable climatic conditions and poor soils, a factor that has bonded the rural population in the circles of poverty. This state and context would be altered if the rural population can find other sources of income to supplement the little and unguaranteed earnings from agriculture products.

In this study, participants in the focused group discussions were asked to suggest how they withstood the problems of low incomes in situations of stress and shocks. Answers to this inquiry were rotating around how the rural people

have decided to tolerate this problem and survive this cause by resorting to other off –farm productive activities where to earn a living.

Among the survival strategies listed were: being a manual labourer, crushing stones to sell, growing vegetables, planting crops to sell, collecting some fruits from other places, and borrowing from relatives. How stainable these coping strategies were, was outside the research limit of this study. But the interesting insight is the commonality of these strategies with the work of Robert Chambers, 1991 on sustainable livelihoods. Since this research never classified the respondents by income categories, it was difficult to establish the level of significance of a particular coping strategy. Providing manual labor was considered as surplus labor that would ensure sustained incomes.

Some rural theorists who have researched on the relationship between agriculture and rural industrialisation (Francissco Golletti, 2009), have attached agricultural development and food security in Asian countries in the late 1960's to the process of rural industrialization.

In many developing countries, in contrast many developed countries, agriculture and rural development, has not taken a good off well due to low levels of rural industrialisation. In Rwanda, this is not a unique occurrence among rural areas as factories are still on a low scale in number, activity and sparsely distributed. The industrial sector shares 15% of the total GDP (MINICOM, 2011).

Nyabigoma and Kamanyana Villages are not exceptional, the percentage and scale of rural industrialization in Rwanda still has a lot to be done in terms of extending textile industries and other manufacturing industries that can absorb the large number of labour employed in agriculture.

Another off-farm activity where the residents source an alternative income was stone quarrying. Although the mining industry is still picking momentum, the Government of Rwanda, supports local initiatives towards developing a strong mining sector (OGMR, 2010). The residents of Nyabigoma and Kamanyana find stone quarrying as an alternative source of income during the periods of income shortages particularly when expectations from sale of agricultural products are in vulnerability confrontations such as during poor weather conditions. To overcome such struggles, mining, is regarded as a survival strategy to the rural poor. Stone quarrying has not been specific to the villages of Nyabigoma and Kamanyana alone. The mining sector in Rwanda currently employs 20,000 people in addition to those working in mining concessions.

Volcanic eruptions that can be dated around 1882 (Wikipedia/wiki/Mount -Nyiragongo) is responsible for the amount of stone mass wasted along valleys and respondents confirmed that these are crushed and sold for building purpose. The study also established the fact that this would be a sustainable non-farm activity due to the rampant increase in construction of roads and other physical infrastructures.

Another social capital that was suggested by respondents as another form of coping strategy was income transfers in form of borrowed cash from friends and neighbors. These kinds of linkages have been commonly referred to as remittances. A study of the impact of cash transfer on social networks of Kenyan households participating in transfer programs reflects borrowed money as form of social capital (Phyllis Ressler, 2009). Social networks in many African societies particularly still in rural areas, reflect a great deal of kinship , brotherhood especially in the absence of formal financial structures many people in developing countries depend on borrowed money to reduce their exposure to risks(Salvado di Fallo and Erwin Bulte,2009).

In Rwanda, developments in information technology have diversified their products and service offer to include cash transfers by Mobile Telecommunication Company, which now in Rwanda has gone global (East African Business week, 2012). Across Africa , there has been money transfers as forms of survival strategies which seem to be filling lending gaps and defying the complex nature of the lending institutions like small village micro credits and middle men money lenders who charge high interest. Those who fully agreed with this form of support in both Kamanyana and Nyabigoma villages indicated that these remittances are sent directly from their relatives who leave in urban centres. According to Food Security and Nutritional Analysis Unit, Somalia (FSNAU, 2013) in Puntland and Somaliland, reports show a direct correlation between Family ties, remittances and livelihoods support.

Income shortages were also withstood by growing crops and vegetables. This, according to the respondents was more immediate as juxtaposed to other survival strategies. More emphasis here was put on the growth of vegetables which assured them ready market as compared to other edible crops. UNFPA-Rwanda, promotes the concept of Kichen Gardens as a strategy to supplement food requirement and food security as well as a source of income. However our present study did not establish the nature of the kitchen gardens and where they sell these vegetables, albeit many contended that there is a growth of lucrative markets within and outside the village boundaries that present potential consumers for these vegetables. This is an interesting result as it reflects the growing need for non-colonial cash crops.

In Africa, the agriculture sector in Sub Saharan Africa, is on the road to diversify its agricultural output to support the export volumes (Delgado and Christopher, 1995) thus leading to a growing population diversifying their agricultural crop choice, to vegetables although the study in the studied villages could not investigate their

exportation possibilities . But in Rwanda according to (EDPRS 1 of the GoR) there is an increasing percentage of vegetables to the agriculture export volume.

4.8.2 Strategies for coping with poor rural housing

The state of rural housing is still seriously cited as a problem in the villages of Nyabigoma and Kamanyana. Although the Government of Rwanda has a policy of improving the wellbeing of the rural population through rural electrification and provision of housing facilities, the problem still is prevailing (EDPRS 1,GoR,2007). In many rural areas of African countries houses are still in poor conditions and the problem is abbreviated with lack of incomes to buy modern building materials. According to (Nubi, 2000), lack of incomes in rural Nigeria is responsible for the poor state of settlement. In Rwanda, those residing in rural areas are particularly still in worst housing conditions; the structures are prone to environmental catastrophes like heavy rains and winds. However, lack of building materials due to shortage of incomes and unemployment is a significant problem. The main coping strategies to address this problem by the residents in Kamanyana and Nyabigoma villages was basically dependent on the environment itself as seen in their responses in the table above.

Development and environment are reinforcing (Shaofeng Chen, 2012). For example, in these two villages, local wood like bamboo, from Viruga Mountains, was cited as being of significant importance in the construction of houses. Still bamboo trees have a double role, direct incomes are generated from their sale and residents are in position to purchase building materials. In other rural areas, this is how the problem has been overcome. However, inspite of the fact that the incidence of poverty and lack of incomes has been very high, residents have devised the above coping strategies to solve their housing problems.

4.8.3 Strategies for coping with inadequate access to food in rural areas

Food shortage was among the problems faced by the residents of these two villages, although it was not clear whether there was a total lack of food, as some members of the sampled respondents interpreted the problem in terms of frequency (number of times they had their meals per day). Hunger and starvation are indeed synonymously used, According to the Comprehensive Food Security and Vulnerability Analysis (CFSVA) and Nutrition Survey 2012, the prevalence of chronic malnutrition among children under the age of 5 is still high, at 43 per cent (WFP, 2012) and the problem is on a prodigious scale in most sub-Saharan rural areas.

In the villages of Nyabigoma and Kamanyana, the predicament was compounded by low incomes and price fluctuations that have discouraged farmers from growing food crops. The main crop grown in these areas, has been Irish potatoes (https://agrifinfacility.org) which is supplierd to urban population. Respondents posed that prices are always increasing, and the increasing number of hotels in urban and peri-urban creates an excessive demand for this crop. This was evident in some cells as it was observed through large tracks of land under cultivation. Some respondents maintained that, the problem of food shortages existed.

The study went at further to establish that market liberalization and price allocation of resource was too responsible for the continued movement of food supplies from these villages to towns, as food traders competed for these less priced irish potatoes. Amatya Sen while examining the right to food, presents a relevant association of lack of freedom to entitlement failure (Amatya Sen, 1984). But in Rwanda, Sen's observation and, specifically, to these villages, is not of greater significance, as many pointed out that, it is the problem of land shortage that barred them from growing food. The coping strategies suggested were using their own incomes obtained from other sources to buy food from town shops, growing vegetables like cabbages and carrots as these were favored by the fertile volcanic soils.

4.8.4 Strategies for coping with the ever increasing costs of education

Education is expensive and schools are very few. This was cited as another challenge the residents of Nyabigoma and Kamanyana face. In these two villages, education still confronts major challenges. It was noted that many respondents, due to income shortages, can hardly be in position to send their children to school much as there is Free education being one of the Millennium development goals.

4.8.5 Strategies for coping with bad roads in rural areas

The nature of roads connecting town the center to villages is still poor, the residents reportedly find this a major hindrance to their economic prosperity, as transporting food crops and other materials has increased costs. This problem becomes more acute during periods of heavy rains as there are very minimal feeder road. Majority of the respondents expressed that this problem has isolated them from major and emerging economic opportunities in urban centers. But the government of Rwanda, through the Community Development Programs under Sustainable Growth for Jobs Flagship (EDPRS 1, 2007), has embarked on a countrywide approach of rehabilitating damaged roads and building new ones, that connectS markets to production centres. The residents of Nyakamana and Nyabigaoma, overtly indicated a positive support to any government initiative that will promote the infrastructural development of their villages.

4.8.6 Strategies for coping with the problem of unemployment

Full employment in rural Rwanda is still is hard as many do not have access to it. It is alarming in the villages of Nyabigoma and Kamanyana that many respondents reported to be facing this problem. The Government of Rwanda, through the short term strategy of achieving the long Vision 2020 economic development targets (EDPRS 1 and 2 0f GoR, 2008-2012) as earmarked, reveals that rural unemployment is still at high incidence and most acute among the rural youths.

With the implementation of the Vision 2020 Umurenge Program, Government embarked on strategies to address high level unemployment among the youth through public works, diversifying the rural economy, modernizing agriculture and eventually realising rural industrialization. The respondents, nevertheless, proposed coping strategies in finding alternative sources of incomes through farming, making bricks and crushing stones.

Chambers and Conway (1991) while debating on the nature of vulnerability contexts experienced by the rural poor people suggested that human capital, such as held skills can be used to find new jobs and sell what they referred to as human labour. They (Chambers and Conway) argue that migration in form of moving from a place with less opportunity to another with a vast opportunity can also be a better coping strategy. However, there was a dearth of information of members in these villages who had migrated to other areas in search for jobs.

4.8.7 Coping with rural sources of energy, water and sanitation

Rural electrification in Rwanda is among the national strategies to be achieved by the year 2020 (EDPRS 2). In Rwanda and notably in the researched areas of Nyabigoma and Kamanyana, residents mainly rely on the conventional methods of energy. Although Government has embarked on a nationalwide electrification programme, the costs of electricity are very exorbitant and rural farmers find it difficult to meet these costs. This has accounted for the slow growth of the non-farm activities such as processing and value addition to agricultural products which require electricity. Charcoal burning in Rwanda (Muhire, 2012) has been regarded as a source of livelihood but it has posed severe negative impacts to the rural population. The ministry of Environment in Rwanda, reports that conventional sources of energy are responsible in part to the poor climatic changes in Rwanda (REMA, 201). The respondents in the two villages on which this study is done, use lantern lamps, and local candles to meet their energy and lighting demands. However their experience clearly shows a discomfort for the electricity costs and they continuously call upon government to intervene and regulate these costs.

Water shortages and poor supply networks was another grave problem faced by the villagers of Nyabigoma and Kamanyana. The two villages are geographically mountainous and, extending piped water to such points has been problematic. Nevertheless, residents use water coming from the crater lakes up at Virunga Mountains. Problems associated with distance and the nature of terrain, were mentioned as major hindrances in using this water from crater lakes.

Table 9. 8: Needs and priorities to cope with poverty as ranked by focus group discussions in the two villages as most important priorities

Needs/Priorities	Nyabigoma	Kamanyana
Natural Assets		
• Land	√	√
• Forest		
• Sea		
Physical Assets		
• Road		
• Transport facilities	√	√
• Piped drinking water (pipe or pump)	√	
• Electricity	√	
Human Assets		
• Education (schools, teachers and others)	√	√
• Health (clinic, doctors, nurses, medicines)		
• Skills	√	√

Social Assets • Houses • Latrines • Community hall • Nutritious food	√	
Financial/Economic Assets • Capital/cash • Micro-enterprise • Permanent jobs • Fishing tools • Farming tools • General prices • Market	√ √	√ √

Source: Field data, 2013

In the field surveyed data, one of the operation questions in understanding poverty and rurality, employed was to establish the needs and priorities the rural poor required most. Respondents of both villages, Nyabigoma and Kamanyana suggested a number ofstrategies in withstanding with the vulnerability contexts as defined to them. Orientations were made to them for simplifications using the sustainable livelihood frame work (Chambers, 1991) as the holistic approach for guidance.

4.8.8 Coping rural efficiency utilization of scarce natural resources

As observed from the table above, there was a significant considerable association between the problems faced or lacked in what was viewed as the causal factors to poverty and remedial strategies as coping priorities. Although there was some degree of variance to what was placed as more significant need than others, five priority needs were identified as natural assets: physical, human, social, and economic assets.

The natural assets constituted, land, forest and sea. In both villages, land was ranked as an immediate need and placed top priority as a supportive tool to their poverty circles. Agriculture in Rwanda is the dominant employer, directly or indirectly to the rural population. Looking at the economic assumption as to why land is demanded by many in these two villages, it established that was many attached great values to it as a derived good. And this was associated, correspondingly to its economic value as the basic primary factor of production. The study deepened the investigation to establish land ownership practices and interestingly, many respondents, in both villages, reported to be facing structural and ownership practices that denied them the right to own land. This is also true in many agrarian ub-Saharan African countries. It is still an existing problem although it varies from society to society.

Access to and control of land was identified closely as a major hindrance. Transfer of land to the productively active farmers was unclear and basically a requirement of buying and selling land whilst financial resources were lacking. Villagers, therefore, needed land to fully support their livelihoods, practice farming and cope or adopt more resilient strategies such as the practice of mechanised, extensive and intensified agriculture that would guarantee food availability as well as increased incomes. Other economic activities like fishing and lumbering were not identifiable to them as possible priorities to address poverty. Respondents of Nayabigoma in particular, reported a great need of Electricity, piped drinking water and transport facilities as opposed to those in Kamanyana.

Looking at the United Nations Environmental reports (UN World Water Report, 2012; www.waterforpeeople.org), very few people can access clean and safe water in Rwanda. The severity of this problem is at high prevalence in rural areas and in places that are geographically isolated from urban centres whose requirement to address their poverty problem was basically the need for safe drinking water. This is as already detailed in the causes of poverty in these two villages. Agriculture and specifically farming, still faces critical challenges and, therefore, in response to modernising it, energy is fundamentally required. Electricity was explicitly pointed out in both Kamanyana and Nyabigoma villages as needed for addition of value to their agricultural primary products, alongside transport facilities to move the products to the nearby market centers.

Education and health are among human development indicators (UNDP, 2010), and these were the priority areas of emphasis among the human capitals required to improve the wellbeing of the population in both villages as ticked in the table above. In his analysis, Sen (1984) introduces the concept of capabilities in form of human functioning as imbedded in human beings which and needed to be promoted for example through provision of skills. This means

that poor health can be both a cause and a consequence of poverty. Therefore setting up hospitals, clinics and dispensaries as well as equipping them with enough medical practitioners, was also found to be a considerable priority for action in order to address their poverty levels.

Among social capital assets needed most was housing as mainly needed by the respondents in Nyabigoma. As already noted above, the Rwanda government is transforming poor houses into modern iron roofed houses. The Government of Rwanda has set up another home grown solution called "Nyakatsi" which is literally translated as bye-bye to grass thatched houses.

Financial or economic priorities included capital, microfinance, a permanent job, general prices and markets. These were provided to the respondents for choices of priority. Due to the problem of price fluctuations, and poor market systems, respondents in both villages, suggested that government should intervene and regulate the agricultural prices through buffer mechanisms as well as provide them with market access locally, within the region and more particularly in the neighbouring countries where these products can be exported.

Conclusion

In light of the effects of poverty in Rwanda's rural areas of Nyabigoma and Kamanyana, it is important to look closely at factors that might account for progress in reducing poverty in these rural areas. The reduction of poverty will help to mitigate the effects of the same in the rural Rwanda. One contributory factor will be the reduction in average household size over the period (implying reduced consumption needs); this is consistent with the declining fertility rate reported in the Rwanda's DHS surveys.

Based on the income data, the survey results show an important resilience among the population to cope up with the effects of poverty by practising multiple economic activities in order to raise the level of income that will help to solve the major problem of poverty.

Agriculture modernisation and agriculture related solutions like product price, market availability, will surely help stabilise income from agriculture. Analysis of the survey data confirms the importance of wage activity by identifying that there has been substantial creation of jobs, predominantly in non-farm activities, like trade, salon and show making.

Rwanda, generally, has registered an increased commercialisation of agriculture. In 2005/06, households sold around 18% of their output on average but by 2010/11, the average proportion of output sold had risen to 25%. There was increased demand for agricultural production from Rwanda over this period from neighboring countries and in part, in response to food crises elsewhere.

Finally, the evolution of poverty in Rwanda from 2000 to 2011: results from household survey

shows an important and impressive degree of progress. Rwanda has made over this five-year period; poverty fell over this period at a faster rate than recent reductions in the other most successful African countries in poverty reduction, including Ghana, Senegal and Uganda.

It is clear that the last five years have seen a substantial reduction in poverty in Rwanda and an improvement in the living conditions of many Rwandans. It is a good sign that the rural poor will cope well with poverty measures that will see villages become better places to live in.

CHAPTER FIVE: CONTRIBUTION TO KNOWLEDGE

5.1 Introduction

This chapter is in two sections:

Knowledge accruing from the objectives of the study.

Knowledge advanced on fundamental models to uplift rural growth and help in escaping rural poverty.

The first section is about the general knowledge this study attempts to bring to light based on the objectives of the study. This first section focuses on discussing the contribution this study makes to existing knowledge and the contribution focuses on the areas of perception and definition of poverty by rural inhabitants, causes of rural poverty, effects of poverty, and how rural people are coping with poverty.

The second section is about discussing the most appropriate models advanced by the researcher on how the rural poor livelihoods can be improved from a state of deprivation to a state of improved living standards. Although some recommendations are based on the interviews, questionnaires and participatory and focus group discussions of the rural poor in Kamanyana and Nyabigoma villages. It should be noted however, that, this study makes new revelations about the new realties on rural poverty and rurality.

The study has indeed helped to advance and formulate fundamental models to uplift rural growth which should act as routes of escaping from poverty. This chapter is also intended to help future researchers' that wish to focus their studies on rural poverty to authoritatively quote or use the new knowledge generated from this study.

5.2 General knowledge accruing from the objectives of the study

In this study, many respondents were from age category 20 to 40 years. They were readily available to offer information and refer the researcher to others.

The findings of the study revealed that there was a significant understanding on poverty by the rural poor: the information on poverty included the definition and perception on poverty, causes of poverty, effects of poverty and how the rural inhabitants were coping with poverty. This implies that with the right strategies the rural poor can be able to cope better with poverty.

5.2.1 Learning from the perceptions and definitions of rural poverty

It needs to be clearly understood that definitions and perceptions on rural poverty vary according to their narrowness or breadth, that is, in terms of: whether they are confined to the material core; the nature of that material core; and whether they also embrace relational/symbolic factors associated with poverty. This perception was also identified by Nolan and Whelan (1996).

Poverty can also be looked at in terms of inability to participate in society (which is broader than more 'absolute' definitions confined to subsistence needs), but emphasise that what is distinctive is the 'inability to participate owing to lack of resources' (1996: 1998). The definition of poverty can also be confined to consumption or participation which is primarily determined by command over financial resources. This perception was also discovered by Townsend (1996), Veit-Wilson, 1998, 2004)

From the study, it is very important to appreciate that poverty can also be looked at in terms of denial of choices and opportunities and violation of human dignity. This slightly contradicts with the commonly known definition of poverty that defines poverty in terms of income per day or consumption per day. Poverty kills a person's self-esteem and makes a person feel incapable even if they are capable. The UN, in her definition of poverty, also agrees with this finding of looking at poverty also in terms of participation in society.

Another important observation made during the study was that, poverty means not having a school or a clinic to go to, not having the land on which to grow one's food or a job to earn one's living, not having access to credit. This may either be because the facility is unavailable or that the facilities are available but individuals have no money to utilise them. Whatever the case, this situation is looked at as poverty. This finding is in line with the UN definition (1998) the definition also looks at poverty in terms of lack of social services and inability to utilise the services.

Furthermore, from the study, it was discovered that poverty is perceived as insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation. This finding also agrees with the definition by UN, June 1998 –signed by the heads of all UN agencies.

Another contribution that this study makes to knowledge is the view of looking at poverty in terms of failure to pay fees for the children. Schools may be available but there may be no funds to pay fees in the available schools. This

situation of failure to pay fees for the children can also be viewed as poverty. This finding is in line with the finding by Nolan and Whelan, 1996.

Man is said to be developing if he has the capacity to exploit natural resources around him for better usage. If man cannot have capacity to exploit the environment and get the best out of the environment, then he is considered poor. If man has land, water, minerals resources and forests around him and cannot make economic value out of them he is looked at as poor. This research finding is in line with the finding by Raveaud and Salais, 2001; Veit-Wilson, 2004 who also defined poverty based on the capacity to exploit the environment.

Furthermore, the research found out that the benchmarks for the definition of poverty are not the same in the rural and urban areas. It was discovered that whereas in the urban areas people look at poverty using the hard cash, in the rural areas people look at poverty in terms of capacity to own land and some domestic animals. It does not matter how much an individual has in hard cash but provided the individual has a number of cows and other domestic animals they would be considered very rich (Gordon et al., 2000b: 91), hinted at poverty parameters in rural areas as different from that in urban areas.

The study confirms that any type of joblessness is poverty. A job is not only where one is employed by another but anything a person does to earn a living is hereby considered a job. In other words, lack of training and lack of education are also considered channels that lead to poverty. This is based on the fact that education and training gives skills that help people to make incomes that enable them to overcome poverty. It is also important to observe that the International Academy of Education (IAE) a not-for- profit scientific association that promotes educational research, its dissemination, and the implementation of its implications that focus on solving critical educational problems that lead to poverty throughout the world. This point is also related to the findings by Orazem, Glewwe & Patrinos, (2007: 5) and Fields (2000), Deaton, 1997) that discovered that there is a relationship between education and poverty.

This study also realizes that the general perception in the rural areas is that to be rich in the rural areas one needs to have land to grow crops and keep animals. While to be rich in the urban areas one does not necessarily need land and animals but rather cash at hand.

There is now a trend that many wives and many children is a cause for rural poverty. This has led to the rural populations avoiding large families and rather now focuses on small families. This reveals a downward trend on the traditional belief that wealth is defined by the number of women and children one has. It is also a downward trend to the traditional thought of looking at women and children as assets

One may also add that an individual's wealth is seen in the kind of houses that they live in. this finding agrees with the finding by the Northern Ireland Longitudinal Study Research Brief of June 2011on House Value as an Indicator of Wealth and Predictor of Health agrees with the finding that type and value of a house is an indicator of richness.

5.2.2 Learning from the Causes of rural poverty

Agriculture is still the backbone of the Rwandan economy. It has contributed an average of about 36 per cent of total GDP between 2001 and 2008, and it employs more than 80 per cent of the population. But the sector is very fragile. Rough terrain, erosion and climatic hazards combine with geography, and the lack of modern technology to create serious constraints to agricultural development

Rural livelihoods are based on an agricultural production system that is characterised by small family farms of less than 1 hectare (ha), practising mixed farming that combines rain fed grain crops, traditional livestock-rearing and some vegetable production. Food crops account for 92 per cent of the cultivated area, and two thirds of food crops are earmarked for family consumption. A small number of farmers grow higher-value cash crops such as coffee and tea, which occupy 3 per cent and 1 per cent, respectively, of total cultivable land. The most vulnerable rural people are landless people and small-scale farmers who cultivate less than 0.2 haactares.

The rural enterprise sector offers alternative employment for a growing rural population living on increasingly scarce land. Microenterprises and small businesses have a role in construction, transport, trade and services, production of manufactured goods and processing of agricultural products, but this source of income remains largely untapped.

Modernisation of agriculture can be the main solution to eradication of poverty. In agriculture, the main programmes include the intensification of sustainable production systems in crop cultivation and animal husbandry; building the technical and organisational capacity of farmers; promoting commodity chains and agribusiness, and strengthening the institutional framework of the sector at central and local level. Environmental and land priorities involve ecosystems the rehabilitation of degraded areas and strengthening newly established central and decentralised institutions.

Special attention will be paid to sustainable land tenure security through the planning and management of land registration and rational land use, soil and water conservation, reforestation, preservation of biological diversity and

adaptation and mitigation against the impact of climate change. One of the key bottlenecks that still affects Rwanda is the high population growth which is a major challenge facing Rwanda. Slowing down population growth requires innovative measures, including the strengthening of reproductive health services and family planning and ensuring free access to information, education and contraceptive services.

The eradication of poverty in rural Rwanda will succeed if there is a deliberate effort by the government. These deliberate efforts will include; putting in place appropriate policies, ensuring that the policies are implemented, especially those that refer to agriculture that is the largest employer in Rwanda.

5.2.3 Learning from the effects of rural poverty

Poverty has a direct impact on the household size and composition. Almost in every part of the world and in every kind of culture, the poorest people have a high number of children. This is one of the factors influencing the poverty status of these households. It has been discovered trough this study that the big number of children is a result of poverty. The people are poor and idle and have nothing important to, do thus, they spend most of the time in sexual activity leading to producing of more children. Secondly it has also been discovered that the poor think children are wealth or source of wealth.

Similarly, composition of the household is also a result of poverty. As a result of poverty men have abandoned their wives and children and left the women to head families. This has led to the situation commonly known as female headed families. The steady rise in female-headed households and in the number of children living in female-headed households (Casper and Bianchi 2002) has important life course implications for recent cohorts of women and children. About half of all women will experience single motherhood at some point in their lifetimes (Moffitt and Rendall 1995), and a majority of children will live in a female-headed household (Graefe and Lichter 1999).

In Rwanda, the 1994 genocide is still being blamed for poverty. People still think that the effects of the 1994 genocide is haunting them and keeping them in poverty. Other researchers have agreed with this discovery by reasoning that the genocide led to: change in the demographic structure resulting in an increased number of women headed households and minor (child headed) headed households: incidence of high traumatization, high prison population, and a large number of internally displaced persons who lack shelter. There is also increased incidence of poverty due to widespread loss of capital stock and labour, further decimation of human resources, weakened social network, and an urgent need for unity and reconciliation. Other researchers have also agreed that indeed the 1994 genocide still has a role it plays in the current poverty situation. The argument is that in the 1960s and 1970s, Rwanda's prudent financial policies, coupled with generous external aid and relatively favorable terms of trade, resulted in sustained growth in per capita income and low inflation rates. However, when world coffee prices fell sharply in the 1980s, growth fall considerably.

Compared to an annual GDP growth rate of 6.5% from 1973 to 1980, growth slowed to an average of 2.9% a year from 1980 through 1985 and was stagnant from 1986 to 1990. The crisis peaked in 1990 when the first measures of an IMF structural adjustment program were carried out. While the program was not fully implemented before the war, key measures such as two large devaluations and the removal of official prices were enacted. The consequences on salaries and purchasing power were rapid and dramatic. This crisis particularly affected the educated elite, most of who were employed in civil service or state-owned enterprises.

The 1994 genocide destroyed Rwanda's fragile economic base, severely impoverished the population, particularly women, and eroded the country's ability to attract private and external investment. However, Rwanda has made significant progress in stabilising and rehabilitating its economy. In June 1998, Rwanda signed an Enhanced Structural Adjustment Facility with the International Monetary Fund. Rwanda has also embarked upon an ambitious privatisation program with the World Bank.

In the immediate postwar period—mid-1994 through 1995—emergency humanitarian assistance of more than $307.4 million was largely directed to relief efforts in Rwanda and in the refugee camps in neighboring countries where Rwandans fled during the war. In 1996, during the 5 years of civil war that culminated into the 1994 genocide, GDP declined in 3 out of 5 years, posting a dramatic decline at more than 40% in 1994, the year of the genocide. The 9% increase in real GDP for 1995, the first postwar year, signaled the resurgence of economic activity. It is therefore understandable that the 1994 genocide is still to blame for the prevalent rural poverty.

Poverty has led to many rural inhabitants to sell off their assets like land and end they up landless. This is especially in the interest of other basic needs of the individuals and in order to survive the daily demands of life. Related to this is the fact that the government of Rwanda reported that close to 14 per cent of rural dwellers have become landless peasants living in conditions of extreme poverty.

Related to this discovery is also the research finding by microcon research (2008), on Poverty Dynamics, Violent Conflict and Convergence in Rwanda, Households that owned large land holdings (> 1 hectare) in 1990 were more likely to fall into poverty in 2000, but not households owning between 0.66 and 1 hectare in 1990. André and Platteau (1998) and Verwimp (2003) have demonstrated that land-rich households had a higher probability to fall

victim to deadly violence (murder) compared to land poor households. This led to the discrimination based on poverty still is prevalent in Rwanda. The rural poor are often discriminated against. Discrimination based on ethnicity or gender directly influences economic opportunity through a complex set of institutional effects in families, schools, and work settings. At the same time, the poor are routinely targets of discrimination, frequently viewed with contempt for circumstances beyond their personal control. Greater democratic participation in the economic sphere would lead to investments that meet real human needs first, starting with the poorest of the world's poor, the one billion who live on less that $1 a day (http://www.psysr.org/issues/discrimination.

In reference to the Human Rights Watch Report on Discrimination, Inequality and Poverty of 2011, despite recognition of the Millennium Declaration of the importance of human rights, equality, and non-discrimination for development, the Millennium Development Goals (MDGs) largely bypassed these key principles. The fundamental human rights guarantees of equality and non-discrimination are legally binding obligations and do not need instrumental justifications. That said there is a growing body of evidence that human rights-based approaches, and these key guarantees in particular, can lead to more sustainable and inclusive development results. Discrimination can both cause poverty and be a hurdle in alleviating poverty. Even in countries where there have been significant gains toward achieving the MDGs, inequalities have grown. The MDGs have supported aggregate progress—often without acknowledging the importance of investing in the most marginalised and excluded, or giving due credit to governments and institutions which do ensure that development benefits these populations. Recognition of this shortcomings in the MDGs has brought an increasing awareness of the importance of working to reverse growing economic inequalities through the post-2015 framework, and a key element of this must be actively working to dismantle discrimination

The most frequent crime in the rural Rwanda is caused by poverty. One respondent during the study said that “If you struggle to pay your bills and don't know where your next meal is coming from how will you survive other than stealing to get quick solution”, some studies agree with the statement by concluding that if people fail to survive, they are most likely to commit crime to survive.

Findings from this study have agreed with findings from other new research that the personal insecurity associated with income inequality is a major reason that some rural poor and even countries, and even wealthy ones, are more religious than others. A study by an independent researcher, Dr Tom Rees (Journal of Religion and Society, Vol 11) analyses data from over 50 countries representing a wide range of religions, wealth, and social structures. It uses income inequality as a measure of how much personal insecurity people in those wealthy countries face.

The finding may explain why conventional theories about the causes of religion have always fallen short. Conventional theories on why religion varies from place to place claim either that modernisation leads to loss of faith, or that states that interfere with religion actually make people disenchanted with it. However, neither of these theories can explain the differences between the wealthy and the poor countries. The new analysis shows a high correlation between personal insecurity and countries which are more religious than others. Indeed, personal insecurity is the single most important factor in predicting national variations in religiosity. Tom Rees suggests:

“This is because inequality is associated with a range of social problems that combine to make people feel insecure and in need of the comfort offered by religion,”

Poverty still has a high influence on education. Poor people often lack sufficient income to afford appropriate education. The universal primary education only offers basic literacy and numeracy skills yet the skills cannot lead to creation of employment opportunity. The UPE therefore cannot be used to justify whether people are educated or not.

Poverty is one of the main contributors to infant mortality. People do not have access to resources that would guarantee them opportunities to access comfortable medical attention. Infant mortality rate among the rural children is very high as a result of poverty. The higher infant death rate among Rwanda’s infant mortality rate; infant (per 1;000 live births) this data in Rwanda was last reported at 59.10 in 2010, according to a World Bank report published in 2012.

Findings also explain that while poverty is mostly blamed for causing the deaths of babies, other issues also came into play, such as premature births, teenage motherhood, smoking, alcohol and drug abuse.

The study findings also discovered that generally Rwanda’s poverty is estimated to be 44.9% nationally, with 22.1% poor in urban areas and 48.7% poor in rural areas. This is an indication that the rural poor that the researcher focused on in this study are more affected by the effects of poverty than the urban poor. However, since 2005/06, the poverty headcount has fallen by some 4% in Kigali City and by 10% or more in all other provinces, with the fall highest by far in the Northern Province. Poverty is highest in the Southern Province and lowest by far in Kigali City. The

Eastern Province is the second least poor province – the third integrated household living conditions survey by National Institute of statistics of Rwanda – 2010/11

The poorest people from the two study villages of Nyabigoma and Kamanyana are mainly in paid agricultural work as their main job, while the better off are in paid non-farm jobs or working as self-employed in non-agricultural businesses. Small-scale farmers and their family workers are slightly more likely to be poor, in contrast to persons in the public sector who are more likely to be in the richest quintile.

5.2.4 Positive effects of rural poverty

Much as rural poverty has been found out to be so disadvantageous, the rural poor gave new information on how rural poverty has influenced their livelihood positively. This is something new to be learnt from these villages of Kamanyana and Nyabigoma. The positive attributes of rural poverty can be picked from the following responses which the respondents stated in the various questionnaires. Each respondent was asked to state at least only two advantages of rural poverty in their livelihoods. Without repeating the same answers, the box below shows what respondents in Kamanyana village had to state.

Boxe 1: Poor People's views about the advantages of rural poverty in Kamanyana village.

"Rural poverty has made us humble Rural poverty has made us to learn how to respect people".
"To be humble and seek God. We pray so much more than the urban rich or urban poor people."
"To make family planning; to economise my income, I have now learnt to save and spend less".
"Poverty has taught me to start working hard and have my own property and my children will begin from there."
"I will not produce many children so that I van be able to send them to school."
"To be a self-entrepreneur by creating your own job. I have looked for jobs from place to place but I have failed. Let me now struggle to make my own job"

Source: Field data, 2013

The above answers all show how in some way or another, poverty in Kamanyana village, has contributed to seeking God more than ever, learning form past generational mistakes of producing very many children and aspiring to have need for self reliant.

Similarly, the positive attributes of rural poverty can be picked from the following responses which the respondents stated in the various questionnaires rural Nyabigoma. Each respondent was also asked to state at least only two advantages of rural poverty in their livelihoods. Without repeating the same answers, the box below shows what respondents of Nyabigoma village had to state.

Boxe 2: Poor People's views about the advantages of rural poverty in Nyabigoma village.

"That is why I do a multiple of jobs".
"To work so hard by force and to be clever in school and make sure I perform very well." Answer by a student who was one of the participants.
"Creation of my own job. Today I do other jobs like shoe repair, Jerrican welding or repairing of Jerricans and Saucepans. I have learnt all this because of poverty."
"Poverty has taught me to work hard for my children, take all of them to school, so that they do not lead a life of suffering like mine.
"To know that God exists."
"Poverty here in our village has taught us to increase our solidarity amongst ourselves."

Source: Field data, 2013

As seen from the above sampled answers and though they seem to be chorus answers, the rural poor seem to be doing some things positively due to the nature of the life they find themselves in.

5.2.5 Learning from the Coping strategies the rural poor have adopted to survive in rural areas

Government remains the main body that needs to lead the process for poverty reduction in the rural areas. Its within the powers of the government to ensure good governance, democratisation; national reconciliation, national political stability and security. Grassroot participation in development and decision making in an all-inclusive economic system, allows effective participation of all social and economic groups in the population and creates an economy of stakeholders. Policies to increase productivity and incomes of the poor, the measures to increase incomes focus on

employment and labour productivity, agricultural modernisation provision of rural credit and financial services, and support to micro and small scale enterprises. Actions to improve the provision and accessibility to information and social services so as to improve the quality of life of the poor, The priorities include primary health care, primary education, water and sanitation, energy and housing, They also include assertive public action to address the high rate of population growth. Addressing the problems of vulnerable groups on a sustainable basis, replacing transfers with sustainable livelihoods and establishing safety nets. Strategies that the government has already put in place like the Poverty Reduction Strategy Paper (PRSP), a document has been developed and serves as the platform for sector policy-setting in each ministry since late 2003.

The government published its PRSP in June 2002. Broadly speaking, it calls for high economic growth accompanied by measures to increase export earnings and agricultural production and diversify the economy by developing information technology and communications.

Priority is placed on education as a means of creating a competitive, highly qualified and trilingual labour force (speaking Kinyarwanda, French and English) that is responsive to the needs of the marketplace.

Such a broad strategy will lead to the reduction of rural poverty. Agriculture still employs over 80% of the labour force in Rwanda and accounts for about 33% of GDP, these create a demand for modernising agriculture and make it more productive. The plan for modernisation of agriculture is therefore vital if some relevant results will be expected from agriculture. Normally, the Plan for Modernisation of Agriculture (PMA) is a holistic, strategic framework for eradicating poverty through multi-sectoral interventions enabling the people to improve their livelihoods in a sustainable manner. “Eradicating poverty by transforming subsistence agriculture to commercial agriculture” It is an outcome-focused set of principles upon which sectoral and inter-sectoral policies and investment plans can be developed at both the central and local Government levels. Furthermore, poverty reduction strategies that focus on agriculture modernisation are the strategies that would be considered pro-poor.

Cooperatives are needed as a strategy for overcoming poverty in rural Rwanda. "Cooperatives are at work in almost every country and economic sector, providing insurance and postal services to its members, a cooperative can play a significant role in fulfilling development objectives." It is generally recognised that cooperatives respond effectively to the ever-changing needs of people. For example, in response to the effects of globalisation, people continue to choose cooperatives to address their needs. In a number of countries, people are starting new cooperative enterprises in such areas as social care and information technology.

Women and youth are also choosing the cooperative form to start enterprises of their own, thus creating new jobs and opportunities. The colonial governments promoted the formation of agricultural marketing cooperatives particularly for cash crops mainly coffee, cotton and tobacco. The Nationalist post-colonial government saw cooperatives as an important vehicle which could be harnessed to spread the benefits of development to a wide section of the Rwandan population. Currently, the cooperative movement is increasingly being promoted by international development organisations as a means for participatory development in Rwanda.

People in rural Rwanda, as a way of coping with poverty, are actually involved in multiple economic activities. An individual will be a teacher but at the same time a farmer. What is important to note here is the fact that almost all people have agriculture as their second economic activity. This is not only because agriculture provides the extra income needed but also because agriculture provides the food that they need for home consumption. If government supports agriculture then many Rwandese will benefit from this worthwhile involvement.

5.3 Models advanced from the study on uplifting the rural poor so as to enable them escape from rural poverty

This is a second section of the chapter about its contribution to existing knowledge. This section also attempts to show the contribution the study makes to new knowledge. It is noted that this study has resulted into a number of lessons learnt from the rural poor; the significant understanding of rural poverty by the rural poor, the definition and perception of rural poverty, causes of rural poverty, and effects of rural poverty and how the rural inhabitants cope with rural poverty.

Basing on all the revelations of this study by participatory approach and focus group discussions, it is now important to advance some new ideas and choices subject for consideration and application by various researchers, policy makers, government agencies, nongovernmental organisations and different stakeholders. This implies that with the right strategies the rural poor can be able to cope better with rural poverty.

The models advanced by the study on uplifting the rural poor and aid them to escape from rural poverty have been discussed in this section and are of three fold;

(i) Putting the bottom poor high on the agenda” and the “ours is ours as it is our own” Model
(ii) Bridging social capital and cultural value Model

The Mbabazize Rurality' Atitudes Model (2013)

The models as discussed herein have been built from what other authors have written and also based on what the researcher himself is saying in terms of contributing to new knowledge given the existing theories and models. Some revelations in this section have been presented in form of boxes so as to easily quote and base on a few suggestions and recommendations of what the rural poor feel should be done to them as their own self-initiated ideas. This avoids the commonly behaviors of policy makers who always like superimposing their own ideas (which they applied somewhere else) on to the rural poor even when they cannot be applied in that particular area.

It is the greatest hope of the researcher that this study will greatly contribute to new knowledge about the new realities and new choices for uplifting rural growth among the rural poor households. This is because, the study's starting point was about the rural poor's analysis.

It established in this study that the priorities of the rural poor differ by group and context. It is these differences which underscore the importance of participatory analysis by diverse groups of the rural poor so as to advance decentralized actions to fit in their priorities. This study has discovered however, that the rural poor have much in common as they pointed to more widely applicable policies and practises on which the study was based to advance different appropriate models and theories to help the rural poor have a fulfilling livelihood once adopted. Basing on all the arguments discussed above, the following are the models that have been advanced by the study.

5.3.1 "Putting the bottom poor high on the agenda" and the "ours is ours as it is our own" Model.

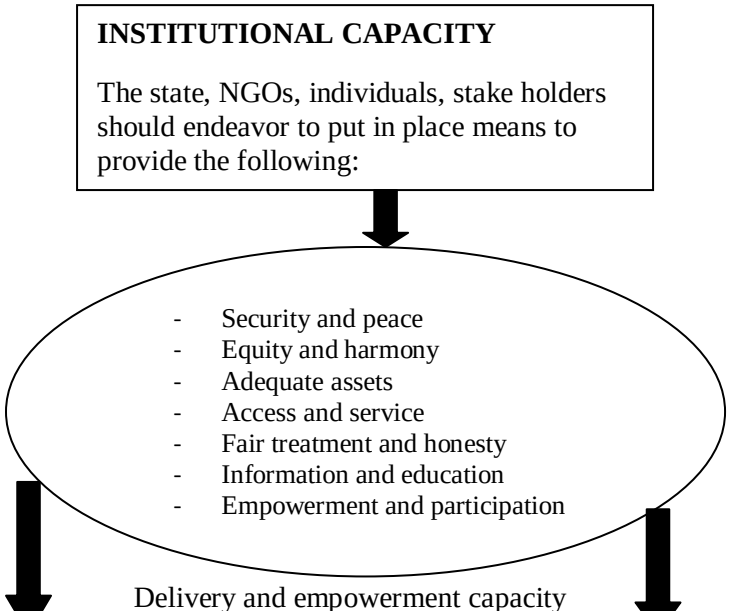
In this model, it is hoped that once the following arguments are adopted, there is likely to be higher chances of rural growth and the rural poor can have an improved lifestyle.

The various participants in both rural Kamanyana and rural Nyabigoma were asked on how they thought could be the right way to improve on their lives so as to cope with the difficulties of rural poverty and at least have an improved lifestyle. It surprising that the rural poor have some good ideas which can surely uplift their living standards in the rural areas once adopted. Their views are presented herein (in various boxes) and many of them advocate for having a possibility of the policy implementers to have the courage to first of all recognize the rural poor's own suggestions.

This model advances the argument that in order to help the rural poor grow from rural poverty to a somehow better livelihood, the state, the policy makers, the NGO'S, the stakeholders, and individuals must first of all consider what exactly the rural poor need as a priority depending on where they are living. This is because development is relative to the minds of the rural poor and it differs a lot. So it is imperative to put the bottom poor high on the agenda as Chambers (1997), once stated, "putting the last first."

The model attempts to give a voice and priority to the rural poor. It is to enable poor women and men to achieve what they perceive as a better life, achieve basic necessities and underpin efforts to transform the conditions they experience, empowering them with freedom to choose and act. The illustration below of the model shows the multiple dimensions of deprivation which also need multiple interventions on the various challenges of rurality and rural poverty.

Figure 10. 1: Developed model on how the rural poor can be helped to cope up with rural lifestyle



Source: Researcher's own impression (2013)

As illustrated above, the model shows that if the responsible organization or policy makers want to improve the livelihoods of the rural poor, they must first of all understand and reflect on how to fight the two most important challenges; thus,

(a) Who has the power to decide and influence?
(b) What is the meaning of development in the minds of the rural poor?

Now, the model shows that the basic challenges of the rural poor need to be tackled with serious plans of action. These plans of action must rotate around the following areas;

(i) Lack of material poverty should be counteracted with policies that can help the rural poor access adequate assets.
(ii) Isolation and poor infrastructure should be counteracted with programmes that can bring nearer services to the rural poor.
(iii) Exclusion should be counteracted with empowerment and participation.
(iv) Gender inequality should be minimized with policies that bring up equity and harmony among the rural poor.
(v) Illness and ill health should be solved by policies that can lead the rural poor to sensitize the rural poor with relevant information and education.
(vi) Corruption which is a very big scourge can be minimized by putting up programmes for commitment to honesty and fair treatment of the rural poor so as to avoid discrimination and segregation.
(vii) Insecurity and fear among the rural poor rotates around their other key asset which is land. So policies which can help protect the rural poor's land like giving them the right ownership to the land they have, can lead to peace of mind and security in rural areas.

5.3.1.1 Build up of the model using reflections from the rural poor

It should be noted that all the above challenges and their respective interventions have been arrived at partly basing on the rural poor's recommendations and the study's own observations and analysis. Because this study was an in-depth inquiry into the nature and lifestyle of the rural poor's living standards sing participatory methods, it has been very surprising to find that, the usually neglected poor people in deep rural areas had useful information which was partly borrowed to build up this model.

5.3.1.2 Reflections of the rural poor on Development.

The rural poor in both Kamanyana and Nyabigoma villages had good ideas about the meaning of development. To many of the participants, development meant being able to have a change of lifestyle, from a bad way of life to a better way of life. Some described development as a situation of being able to have more than one meal, a situation of starting to use a mattress if you were using a mat and a situation of being able to read if you were initially illiterate.

This means that Reflecting on the experiences of rural poor men and women has driven this study to revisit the meaning of development. What is significant change, and what is good? And which changes and for whom do they matter most? Answers to these questions involve material, physical, social, psychological and spiritual dimensions. Historically many development professionals have given priority to the material aspect of people's lives. Important as this is, the rural poor's views of wellbeing, as we have seen, span wide and varied experiences and meanings. To encompass multiple dimensions of development and to make space for the rural poor' own ideas of development mean working toward wellbeing for all. The bottom poor, in all their diversity, are excluded, impotent, ignored and neglected; the bottom poor are a blind spot in development (Narayan 2000).

In these two villages of Kamanyana and Nyabigoma, and other places of the Northern Province of Rwanda, their numbers are seen to be increasing, they are often difficult to reach and help. They find it difficult to help themselves. They are not creditworthy. They do not have documents. They are frequently sick. They cannot afford medical treatment. They are chronically short of food. They are exceptionally vulnerable and insecure. If the poor in urban areas can hide from the police because of fear, what about in rural areas? The fear of the police in rural areas is definitely worse. They subsist or die on the fringes of society.

Therefore, a key measure of development becomes the enhanced wellbeing of those who have it least. Defined in their own terms, poor people have shown us how much a small change can mean to those who have very little. The increments in wellbeing would mean much to the poor window in Kamanyana- a full stomach, time for prayer, and a mat to sleep on. These revelations challenged this research study, to change how development should be measured. Development should be based on equity and wellbeing demands giving heavy emphasis to the bottom end of rural poverty. This therefore argues for a reorientation of development of priorities, practice and thinking. It reinforces the case for making the wellbeing of those who are worse off the cornerstone for policy and practice.

5.3.1.3 Reflections of the rural poor on who owns power.

Differences in power between women and men and between the poor and the non-poor affect opportunities and outcomes in countless interactions. Basing on the various discussion groups in Kamanyana and Nyabigoma villages, it was noticed that the rural poor lack voice and power. They do exercise agency but in very limited spheres of influence. In describing their plight and on this aspect of lack of power, the rural poor in both villages, especially women, often expressed powerlessness vis-à-vis employers, the state and the markets; their inability to get a fair deal; their inability to take a stand against abuse, lying and being cheated; their inability to access market opportunities for their crops.

"To stand up against those on whom you and your family depend is risky and can even be a matter of life and death. At times we have police coming here to interrogate about the existence of rebels, but can't know even what to tell them".

-A woman in one of the discussion group of Kamanyana village

"For us here, it is the rich who come from town and tell us what to do, what to decide on which crop to grow next season, when to start preparing our gardens and where to sell our product as at times most of our products are already attached to loans and subsidies we get from the government like, fertilizers, manures. So even when our crops are about to be ready for harvesting, they give some deposit money as if we have sold to them and the balance is given back to us after selling the whole crop to them at the different cooperatives".

-A woman of Nyabigoma village describing her plight over lack of power to determine what to grow.

In deep rural areas, the voices that count most are those of the powerful and wealthy. It is they who make, influence and implement policy. To make a difference, poor people must be able to make their voices hard in policy and have representation in decision making forums. This change in power relations and behaviour. This organisation of the poor become very important means to changing poor relations. Investing in poor people's organizations requires shifts of mind-set and orientation among professionals and institutions. The spring examples of champions who serve that the interests of the poor show what individuals can do to ensure that the voices of the poor are heard and acted upon. Coalitions representing poor people's organisations are needed to ensure that the voices of the poor are heard and reflected in decision making at the village level.

5.3.1.4 Reflections of the rural poor on accessing assets, services and infrastructure.

The rural poor know very well that they lack opportunities to access big loans, they know do not have material assets, and they cannot cope with various shock. They, therefore, cannot raise enough capital to start profitable ventures. In order to avoid isolation and exclusion, coupled with the lack of adequate materials to use, the rural poor in Nyabigoma and Kamanyana had the following views as put in the boxes below.

Boxe 3: Poor people's recommendation for improving Livelihood, assets and employment.

Participants from Nyabigoma Village, had many suggestions for bringing jobs into their areas including rice milling and packaging, Irish potato processing centres sorghum milling plants; and loan schemes for minibuses so that the village can be connected to urban centres more readily. They say that such changes would mean that they might; "at least be employed as guards, cleaners or moppers."

"I want to be helped to start business in mat making and other reed handicrafts, and for repair shops for radios, bicycles, shoes, tailoring, motorcycles."

-A woman in group A asserts her views about what she thinks can be able to help her.

" We want to form our own cooperative, our own association as widows; which will be of our own efforts protecting our own rights"

-A widowed woman speaks out from group B

"Offering easy and suitable ways of accessing a bank loan may be could have helped us in this village. I have seven children and 4 of them are now in secondary school. But I can't pay their fees using income from Irish potatoes only. Let the banks give us loans basing on social security as our mortgage. We can loans in groups and our group members can guarantee us just as they do in the Democratic Republic of Congo."

-A Woman in group C suggests to the panel members.

In this environment, the rural poor's livelihood strategies are largely in the informal economy and frequently consist of a patchwork of low-paying, risk-prone and often back-breaking work. The informal sector is cut-throat, fragmented and extremely diverse. In rural economies, poor farmers are often isolated from each other. Membership-based organizations of the poor that build solidarity among informal workers, small farmers and other producers may improve condition for her poor. By working together, poor people's associations can obtain better prices for goods, buy in bulk, share information, and organize to influence municipal and state regulations affecting vending, public transport and so forth. Examples of people organizing themselves include, self help project groups, farmer's groups, fishermen's groups, tailor's associations, marketing cooperatives and credit associations. The rural poor offer many recommendations specific to their contexts. Many participants felt that economic opportunities have by passed them.

Boxe 4: Poor People's Recommendations for improving Places where they live.

"We don't have roads to the market especially in times when it is raining. Floods from the crater lake up there on mountain Virunga is a very big problem to us. Floods destroy our crops, floods destroy our houses and at times kill our livestock.

-A man in discussion group A

"We do not have what to give the credit saccos in terms of security. So our living is based on patience and prayer. No crop to sell, no money. Some people today have stopped digging as it takes a long time to harvest and sell crops. they have now gone for quick ventures like charcoal burning and brick making.

-Participant, in men discussion group B

"The government started the programme of Ginka Munyarwanda (giving one cow per family).It has helped us but during the dry season, there is a problem of grass and this affects the milk. They tell us to use the cow dung for bios gas for lighting our homes and cooking but the cow dung is so little to ignite the any light or any source of fuel. At least of they could offer us electricity at subsidized prices, or solar power"

-Participant from group C

"If we received government assistance in the areas of water and electricity, it would created a great deal of opportunity for water and electricity, it would have created a great deal of opportunity for us to improve our lives".

-A lame man in group D suggests his view on emancipation

Source: Focus group discussions

While much has been learned about microcredit lending systems, they still do not reach many poor people. Access to credit can be difficult due to collateral requirements, rigid repayment schedules, loan amounts that are too small, and corruption among lenders. Shopkeepers and money lenders, despite their high interest rates, are greatly valued for giving loans for consumption, not for having bothersome procedures, and for allowing payments to be made in kind, including in labour. Poor people often point out that they lack access to capital to start new business ventures. There is a need for venture capital funds for the rural poor.

The rural poor people are frequently disadvantaged in where they live and work and in access to basic services. Often they are geographically isolated in remote rural areas, with roads, transport, telecommunications, lightings, access to information and markets that are inadequate or lacking altogether. Schools, clinics and hospitals are far away and of low quality. Shelter, water, sanitation and fuel are inadequate and unsafe. Many farm families seek livelihoods on marginal lands. Most of them are insecure in their tenure of land and the plots on which they live. And they are exposed to environmental hazards, such as floods, droughts, fires, pollution and epidemics.

These conditions exacerbate rural poverty. It takes the rural poor longer than others, and often very much more energy, to fetch water, wash, find and collect fuel, maintain their shelter, get to market to buy and sell, get information, gain access to government offices, contact friends and relatives, get information, and gain access to governments, Conversely, reliable, convenient and accessible infrastructure reduces time and energy required. Those who benefit are likely to be disproportionately female because of gender responsibilities of running households and, increasingly, meeting household expenses as well. That is why many rural participants concentrated on suggesting a need of improving their physical environment.

5.3.1.5 Reflections of the rural poor on accessing Health services, information, and empowerment

The rural poor have in common the problems of ill-health, hunger and weakness. These greatly lead to "time poverty" as discussed earlier on in this study. The body is a poor person's main asset. Yet it is those who most need strong bodies for work who are most exposed to sickness and accidents and least able obtain or afford treatment. Illness, injury and death stand out as causes of "time poverty." Physical incapabilities include hunger, weakness, illness, exhaustion and disabilities, and they exacerbate poverty of time and energy. Other incapabilities, are lack of

information, education, literacy and skills, on the positive side, wellbeing includes health, strength, education and skills, all of which empower people.

In addition to information dissemination through mass media, poor people's connectivity to each other and to sources of information can be greatly enhanced through access to communication and information technology. Rural information technology centres, cellular telephones and internet access can change poor people's negotiating power even while deep structural inequities exist.

Boxe 5: Poor People's recommendations for Health Services, Education and Empowerment

"We go in hospitals, we don't get any doctor. We sit from morning up to evening with no food to eat, and even come back without seeing any doctor. Some people in our village who go to hospital after selling their goats decide to visit private clinics; but in private clinics, I have been told that you pay 5000 Rwanda francs as consultation fee.

-A discussion group of men and women, in Kamanyana and Nyabigoma

"It would better if the Government could provide these clinics to rural areas and also allow us to use our traditional healers as doctors in these clinics"

-Discussion group, in Kamanyana and Nyabigoma

"Since many of us are farmers, let the govermnet provide us with farmers health insurance,
health examination free of charge for poor and elderly people, health care and free family planning services. People also express a need for more sufficient stocks at community health stations."

-A participant in Goup D in Kamanyana village

Most men in this village have no jobs and get a lot of worries. So to avoid that, men spend most of their time in hidden village corners taking village local brews like ikigage. Should men go hope early, they end up beating their wives and children. There is need of sensitising our men to stop beating their wives.

-A participant in Goup C in Nyabigoma village

"Most of our problems in this village can be solved by ourselves. If we could have our own person to be trained and posted back here to work as an agronomist and veterinary doctors, we could catch up with the rest of the villages."

-Discussion group, in Kamanyana and Nyabigoma

"It is good for us to be left free to air out our own views on radio and television programmes. But then you will never see the rural poor on radio discussing our problems and solutions."

-A participant in Goup B in Kamanyana village

Source: Focus group discussions

5.3.1.5 Reflections of the rural poor's achievement to a fundamental Institutional change

In order to have a complete social metamorphosis, the biggest challenge should be on the mind-set shifts of the rural poor. The mindset shifts discussed here include all those situations which have led to having great deals of bias of the poor people, living deep in isolated rural areas. It is the study's obligation to point out these areas of total bias, thus;

(i) Professionals not reaching the real isolated areas.
(ii) Mistreatment and not listening to the voices of the poor.

The first area of mind set shift is directed at the elites like researchers, government policy implementers, development practitioners and all other categories of stakeholders associated with rural community development. It is these groups of individuals who should begin by changing all the negative thinking they have about the rural poor. They make fake reports with impressive figures aimed at attracting attention to their funders and also aimed at executing accountability obligations. This is what was called rural development, tourism as mentioned earlier in this study. When it comes to the real situation on the ground, it is often surprising that they don't know some of the villages they have mentioned in their reports because they did not reach there. Many professionals just move to the trading centres and stay there for very few hours, rush back to town and take up a palatial guest house and start writing reports about the rural people. This research recommends, therefore, that it would be better for the intending parties who wants to uplift rural lifestyle, they need to get some time and stay with the real isolated poor people.

The second area of concern which requires a complete shift in mindset is that of mistreating the rural poor. It was reported by various participants in this study that, officials from the district, hospital officials, bank officials and agricultural extension officials are all not receptive. This implies that the rural poor are always not motivated to visit these institutions for any service they require. The officials on the other hand are all biased with the thinking that the rural poor do not understand; they are dirty and insensitive to new ideas. Poor people are often badly treated by officials, by services providers, particularly those of the state, and by traders, with behaviour that is crushing, cruel, humiliating, taunting, angering and frustrating. Corrupt and bad behaviour comes in many guises, even in the

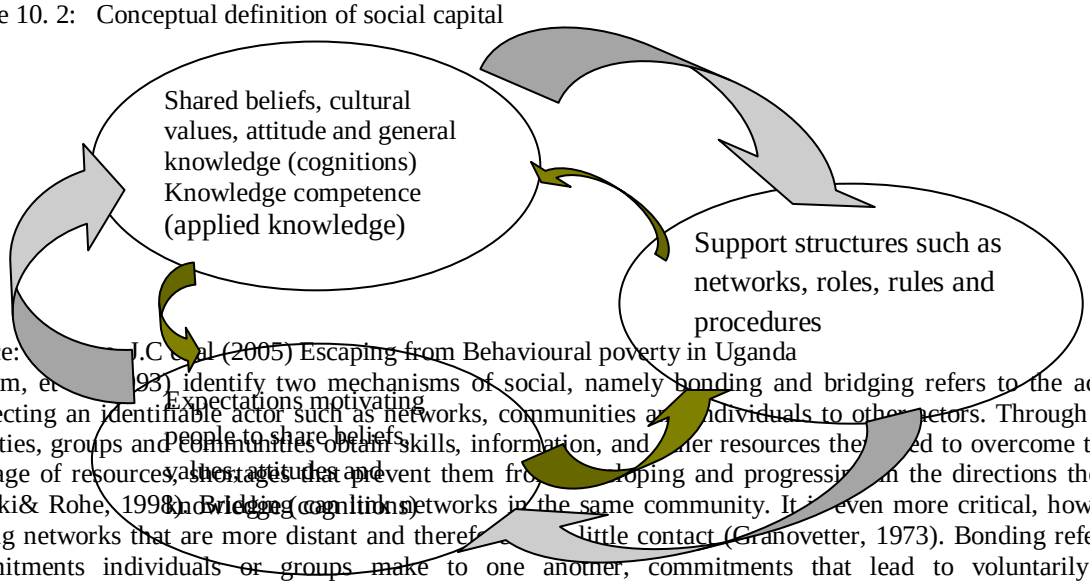
extreme forms of violence, imprisonment and extortion. Pervasively poor people report rudeness, arrogance, insensitivity and lack of respect from those in authority. Together these deter poor people from contact with outsiders and in seeking services. Institutional design efforts must include defining the character, qualities and the behavior desired of all those who are affiliated with the institutions.

What the poor people want are staff who are accessible, who listen, and who are patient, polite, sensitive and committed. They indicate the huge difference it means to be treated with respect, not to be kept waiting longer than others and not to be looked down on because of old clothes and a shabby appearance. A little additional cost, the wellbeing of poor people can be dramatically improved by changes in service providers' attitudes and behavior. An attitude of service, respect and caring even when help is not available is profoundly appreciated (Narayan, 2002)

5.3.2 Bonding and bridging social capital and cultural value model

Social capital is a cultural interface that can promote development. The concept of social capital has become increasingly central in development literature (Woolcock & Narayan, 2000). The strength of social capital as a construct for understanding development lies in its interpersonal or inter-group character. This is also the character that qualifies it to be treated as an interface. In this study, social capital is taken as the coming together of compatible institutions.

Figure 10. 2: Conceptual definition of social capital

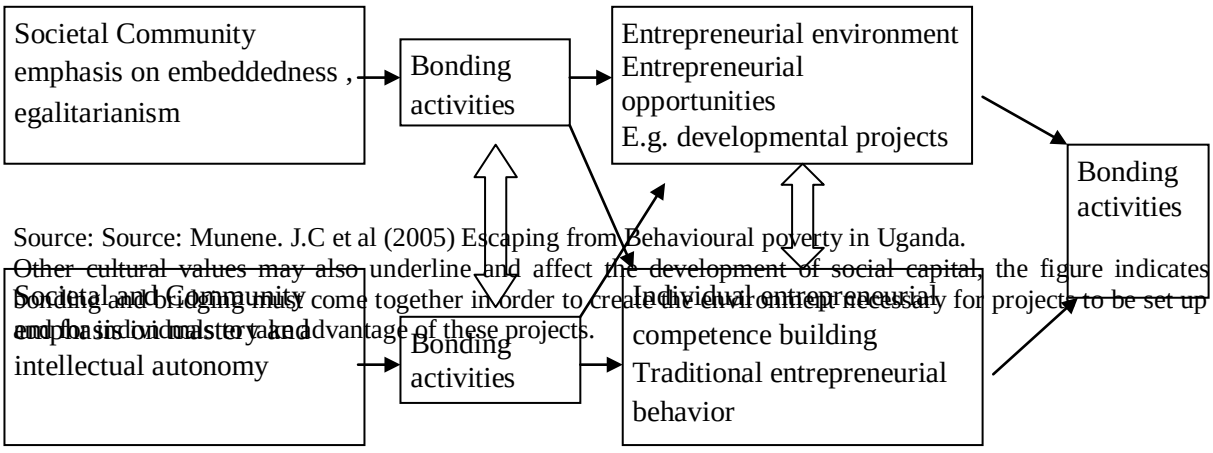


Source: Munene. J.C et al (2005) Escaping from Behavioural poverty in Uganda

Putnam, et al (1993) identify two mechanisms of social, namely bonding and bridging refers to the activity of connecting an identifiable actor such as networks, communities and individuals to other actors. Through bridging activities, groups and communities obtain skills, information, and other resources they need to overcome their own shortage of resources, shortages that prevent them from developing and progressing in the directions they desire (Temki& Rohe, 1998). Bridging can link networks in the same community. It is even more critical, however, for linking networks that are more distant and therefore have little contact (Granovetter, 1973). Bonding refers to the commitments individuals or groups make to one another, commitments that lead to voluntarily helping acquaintances or the community. Bonding is grounded in trust and reciprocity. On the other hand, different cultural value orientation underline rationalism of the two mechanism of social capital. Cultural embeddedness can serve as the grounding for bonding expressed in close attachment to other members of one's community. In societies whose culture emphasise, embeddedness values (for instance forgiving, security, social order, reciprocation of favours), solidarity with others in the community, trust and tolerance of in-group members are normal states of affairs. It is crucial for people to get along smoothly and to maintain stable relationships within their group.

The figure below indicates the role social capital plays in development. It also proposes that bonding and ridging mechanisms are both grounded in cultural values. This study draws upon the seven cultural values orientation in the Schwarts (1999, 2004) model.

Figure 10. 3: Culture, social and development

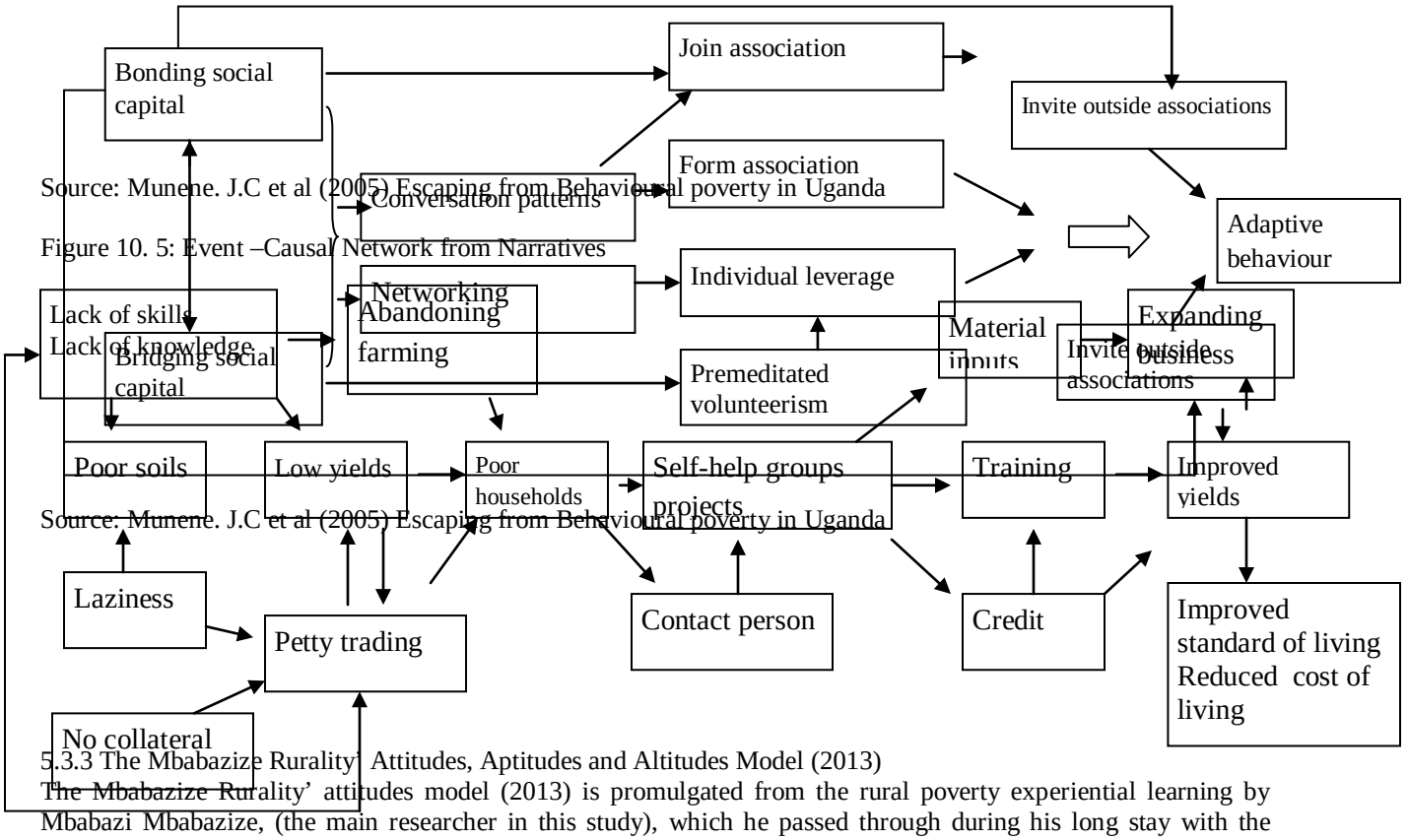


Source: Source: Munene. J.C et al (2005) Escaping from Behavioural poverty in Uganda.

Other cultural values may also underline and affect the development of social capital, the figure indicates that bonding and bridging may come together in order to create the environment necessary for projects to be set up well and for individuals to take advantage of these projects.

As seen from the above figure, culture plays a very important role in the development of rural areas. Marris (1968) describes how extended families in North Africa are parasites on the entrepreneur, thereby preventing entrenuership. Many poor rural entrepreneurs who come with some small idea of setting up a business, they are faced with this kind of problem and the businesses don't last long before they close.

Figure 10. 4: Social capital causal-event network in the projects.



Source: Munene. J.C et al (2005) Escaping from Behavioural poverty in Uganda

Figure 10. 5: Event –Causal Network from Narratives

Source: Munene. J.C et al (2005) Escaping from Behavioural poverty in Uganda

5.3.3 The Mbabazize Rurality' Attitudes, Aptitudes and Altitudes Model (2013)

The Mbabazize Rurality' attitudes model (2013) is promulgated from the rural poverty experiential learning by Mbabazi Mbabazize, (the main researcher in this study), which he passed through during his long stay with the poorest of the rural poor in the villages of Kamanyana and Nyabigoma of Rwanda's Northern province, Burera district and Musanze district respectively. This study involved its research assistants in rural poverty immersions and participatory appraisals. This provided opportunities from open ended learning from the rural poor people who took part on behalf of hundreds of others who live like them.

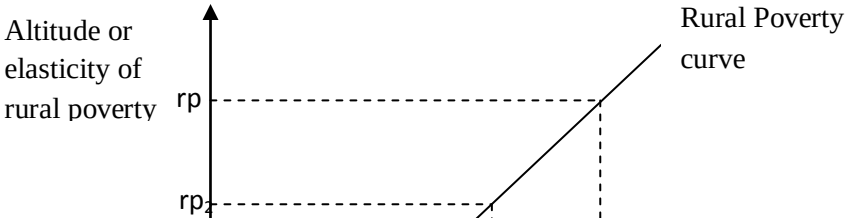
This study eventually brought up a potential of having a direct experiential learning by listening to the voices of the poor as they cry out for change and hope. The demands and ways for having hope and change command a lot of commitment. It is from this commitment and experiential learning from the rural dwellers, that new knowledge here-in explained is being forwarded to contribute to existing knowledge as put forward by this new model; the Rurality attitudes model.

The Rurality attitudes model attempts to explain the vision, courage and will which this study managed to lead the researcher to as many participants who wondered and feared whether anything they said would make a difference in their lives.

The Rurality attitudes model is built from the idea that it's our attitude not aptitude that determines our altitude of poverty, riches and success. The beginning point in this theory is about the attitude, role of fear and worries as being majorly responsible for poverty mostly common with the rural people. As the study's key theme was about the need to discover more about the relationship between rurality and rural poverty, it is straight on the wall that, the more the rural people migrate further and further in deep rural areas, the more the degree or altitude of rural poverty.

This means that, the deeper the village, the higher the degree of rural poverty. If the place is so far away from the main trading or urban centres, the more the altitude of rural poverty. The graph illustrated below shows this relationship of rurality and rural poverty.

Figure 10. 6: The Mbabazize Rurality' Attitudes model. A graphical exposition of rurality and rural poverty



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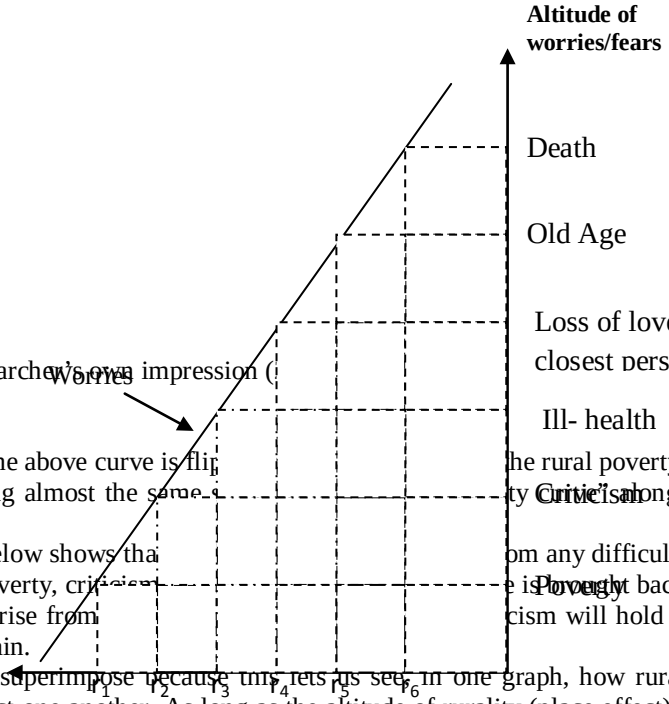
Source: Researcher's own impression (2013)

The altitude of rurality and rural poverty can be superimposed on the altitude of the basic fears of the rural poor. Basing on the findings of this study, it was found out that, the rural poor have got common fears in both the villages of Kamanyana and Nyabigoma. The basic fears include poverty itself, ill health, non-recognition and criticism, loss of relatives, old age, and death. These fears occupy much of their worries and predetermine their future so much. This is partly why the rural poor, keep on shifting from one village to another distant village in search of arable land for cultivation.

The rural poor are mostly always worried of the little pieces of land they own and their minds are always preoccupied with what land they will be able to leave to their children in case they were to die. Even the children and grandchildren of the rural poor are also brought up with that type of attitude and this passes on from generation to generation.

If these basic worries and fears of the rural poor people are illustrated on a graph against the altitude or extent of rurality, this is what can be exposed.

Figure 10. 7: The Mbabazize Rurality' Attitudes Model. A graphical exposition of rural fears and the degree or altitude of rurality



Source: Researcher's own impression (

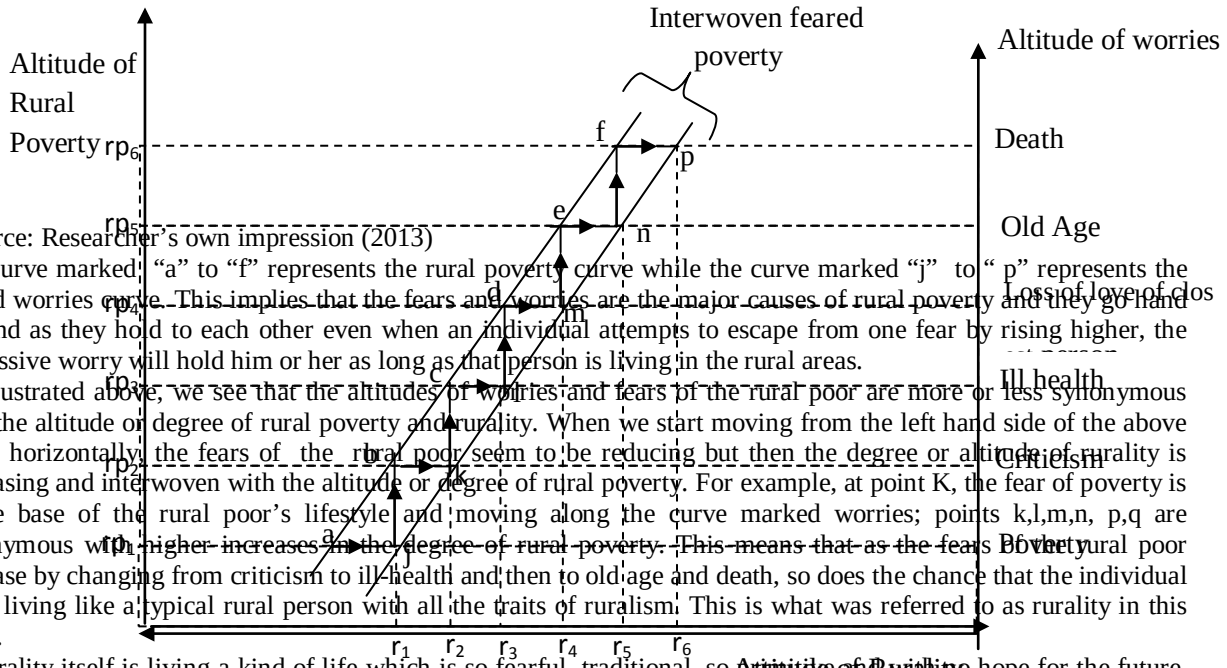
And then if the above curve is flip he rural poverty curve, we find that the "worries curve" will be having almost the same ty Curve" along the same rising axed angles as shown below.

The curve below shows tha om any difficulty like the ones on the right hand side of the curve (poverty, criticism e is brought back to square one, for example, if the rural poor tries to rise from cism will hold him or her back to be on the same axis again and again.

We flip and superimpose because this lets us see, in one graph, how rurality, rural poverty, fear of worries and attitudes affect one another. As long as the altitude of rurality (place effect) remains high, rural poverty will always increase. The increase of rural poverty from rp_1, rp_2,….. ….to rp_6, leads to the same level of increase in rurality from r_1, r_2,…….to r_6 as shown above.

If place of an area does not develop or change in terms of complete institutional (infrastructure) capacity then rurality and rural poverty will always grow simultaneously together or go hand in hand.

Figure 10. 8: The Mbabazize Rurality' Attitudes Model: Showing interwoven feared poverty



Source: Researcher's own impression (2013)

The curve marked "a" to "f" represents the rural poverty curve while the curve marked "j" to " p" represents the feared worries curve. This implies that the fears and worries are the major causes of rural poverty and they go hand in hand as they hold to each other even when an individual attempts to escape from one fear by rising higher, the successive worry will hold him or her as long as that person is living in the rural areas.

As illustrated above, we see that the attitudes of worries and fears of the rural poor are more or less synonymous with the altitude or degree of rural poverty and rurality. When we start moving from the left hand side of the above graph horizontally, the fears of the rural poor seem to be reducing but then the degree or altitude of rurality is increasing and interwoven with the altitude or degree of rural poverty. For example, at point K, the fear of poverty is at the base of the rural poor's lifestyle and moving along the curve marked worries; points k,l,m,n, p,q are synonymous with higher increases in the degree of rural poverty. This means that as the fears of the rural poor increase by changing from criticism to ill-health and then to old age and death, so does the chance that the individual starts living like a typical rural person with all the traits of ruralism. This is what was referred to as rurality in this study.

So rurality itself is living a kind of life which is so fearful, traditional, so primitive and with no hope for the future. A mere fact that someone in the village is fearing to reach (old age, death, ill-health and criticism) before preparing something which he or she will leave to his or her children and grandchildren, this will force him to look for a new arable land, deep in the village far away from urban centers. These fears and worries preoccupy the minds of the rural poor and their attitudes drastically change to always start thinking in a rural way. This study termed it as "rural reasoning" or they acquire a faculty of "rural thinking" all the time. On the fear of criticism, exclusion and isolation, the rural poor tend to move deeper and deeper in the villages so as to avoid criticisms and non-recognition. Even in church or social functions like weddings and other related marriage ceremonies, the rural poor in both the villages of Kamanyana and Nyabigoma, were observed by this study as always fearing to take front seats as they have an attitude that the front sits are always reserved for the urban rich or urban poor.

It is this kind of attitude which is partly responsible for the rigid mindsets of the rural poor people. The center of these worries is interconnected with an interwoven related situation (a gap) from points k,l,m,n,o,p,q along worries as superimposed to the other opposite points of a,b,c,d,e,f,g; the interwoven gaps are the ones which have been referred to as the "Mbabazize Rurality Attitudes and Aptitudes' curve" or the interwoven feared poverty curve. Therefore, in most cases, it is the attitude and not the aptitude that determines our altitude of success; our altitude of escaping from rural poverty to live a fulfilling livelihood.

The Mbabazize Rurality Attitudes Model is laying a foundation of great importance of new knowledge to existing knowledge by exposing the reasons as to why- someone cannot understand why rural poor people or urban poor people appear to be "lucky" while others of equal or greater ability, training, experience, and brain capacity, seem destined to ride with misfortune.

Nevertheless, as stated earlier in this thesis, even a well-known verse in the book of Ecclesiastes (KJV, Bible) gives a natural critique that whether one is hard working or lazy and living in a rural area, he or she may one day be well off due to attitude, chance, luck, time and fate. The verse by King Solomon states that;

"I returned and saw under the sun that the race is not swift nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favor to men of skill, but time and chance happens to them all."

The highly celebrated Icon, George Orwell (1946) moderated the above version into modern English with a neutral critique; that,

"Objective considerations of contemporary phenomena compel the conclusion that success or failure in competitive activities exhibits no tendency to be commensurate with innate capacity, but that a considerable element of the unpredictable be taken into account."

This statement may be explained by the fact that every human being has the ability to completely control his own mind and admit only impulses of his own choice. This is all rotating around our attitude and not aptitudes.

Building from his classic 1937 theory on the basic fears of life, Napoleon Hill (1937) in his book, "Think and grow rich", also supports this argument of the same six most haunting ghosts of fear among human beings: fear of poverty, fear of criticism, fear of ill-health, fear of loss of love, fear of old age and the fear of death. The basic haunting ghosts of fear which have many people not to be well-off, not to be successful and remain in poverty, according to Napoleon Hill are illustrated in form of a pyramid as shown below;

Source: Napoleon Hill (1937), Think and Grow Rich

The fear of poverty

According to Napoleon Hill (1937), there can be no compromise between poverty and riches (financial, spiritual, mental and material estates); the two roads that can lead to material riches travel in opposite directions. One who wants riches, must refuse to accept any circumstance that leads towards poverty. The starting point that leads to riches or well-being is desire and attitude. The fear of poverty destroys ones chances of achievement in any undertaking. It paralyses the faculty of reason, destroys the faculty of imagination, kills off self-reliance and discourages initiatives.

The fear of criticism

This fear has effects which are fatal to personal achievement, mainly because this fear destroys individual initiatives, discourages the use of imagination and ambition. It leads to mental and physical laziness, lack of self-assertion, slowness in reaching decisions and being too easily influenced.

The fear of ill-health, old age and death

These three fears are almost related and do influence man's daily life at once. One fear leads closely to the other as they all lead to thinking of the "terrible worlds" which man does not know. In rural areas, the rural poor have been brought up and taught discomforting stories about health, old age and death. They have lots of imaginations that affect their daily thinking. And in general, man fears ill health because of the terrible picture which has been planted in his mind of what may happen if death should overtake him. Man fears it because of the economic toll which it may claim on his future off springs when he or she is away. The fear of death brings up all the terrible pictures about poverty especially when men start getting worried of who will be able to look after them in old age. This partly explains why men marry young ladies in their old age and resume producing children. According to Napoleon Hill, the fear of death, ill health and loss of love of someone, is more prevalent among the aged, but sometimes, the youthful are victims of it. It is therefore clear that the fear of death is closely associated with the fear of poverty, where one's death would leave loved ones poverty stricken. At the same time, the fear of death is caused by illness and the consequent breaking down of physical body resistance.

Other major causes of the fear of death are: ill-health, poverty, and disappointment over love, lack of occupation and religious fanaticism. In urban areas, lack of occupation can easily lead to the fear of death and early death.

For example, when civil servants or Professors retire early, there are high chances of early death due to lack of occupation which can make their minds busy. In 2011, the renowned premier league Manager of Manchester United football club; Sir Alex Ferguson was to retire at the age of 69 years, but he ended up postponing his retirement for fear of early death (www.telegraph.co.uk › Sport › Football › Teams › Manchester United Apr 5, 2011).

When he was put in a tight corner by journalists as to why he had postponed his retirement, he answered that he felt that should he retire early, he will have nothing to do, be bored in life and die early just as his father who died only after one year in retirement. He said that he had seen this happen to his own father dying as soon as he had retired. Ferguson maintained that his health would be the central factor in any decision on his managerial future.

"My father retired on his 65th birthday and one year later, he was dead," "The worst thing you can do is put on your slippers. People say things like, 'I've worked for 45 years, I have the right to rest'. Not at all, you have to keep

yourself active and in good shape. First of all, it will be my health which determines my situation. I will continue as long as I have the energy that I have enjoyed throughout my life.

Ferguson, who was to turn 70 in December, 2011, completely confirms this assertion in the current times.

5.3.3.1: Fighting rural poverty: An exposition and recommendation by The Mbabazize Rurality Attitudes Model.

From the discussions above, it is imperative that this study puts across the best suitable recommendations which were arrived at basing on the research findings on the livelihoods, attitudes and fears of the rural people as were discussed in chapter five, six and eight. This study came up with options of fighting rural poverty as far as the role of attitude and aptitudes are concerned as per this model which if adopted, the rural poor can have a wide range of choices and opportunities. This model identified three forms of analytical tools that can be applied on the six basic fears (poverty, ill health, old age, death, loss of love and criticism) of the rural people.

The analytical tools are in three fold;

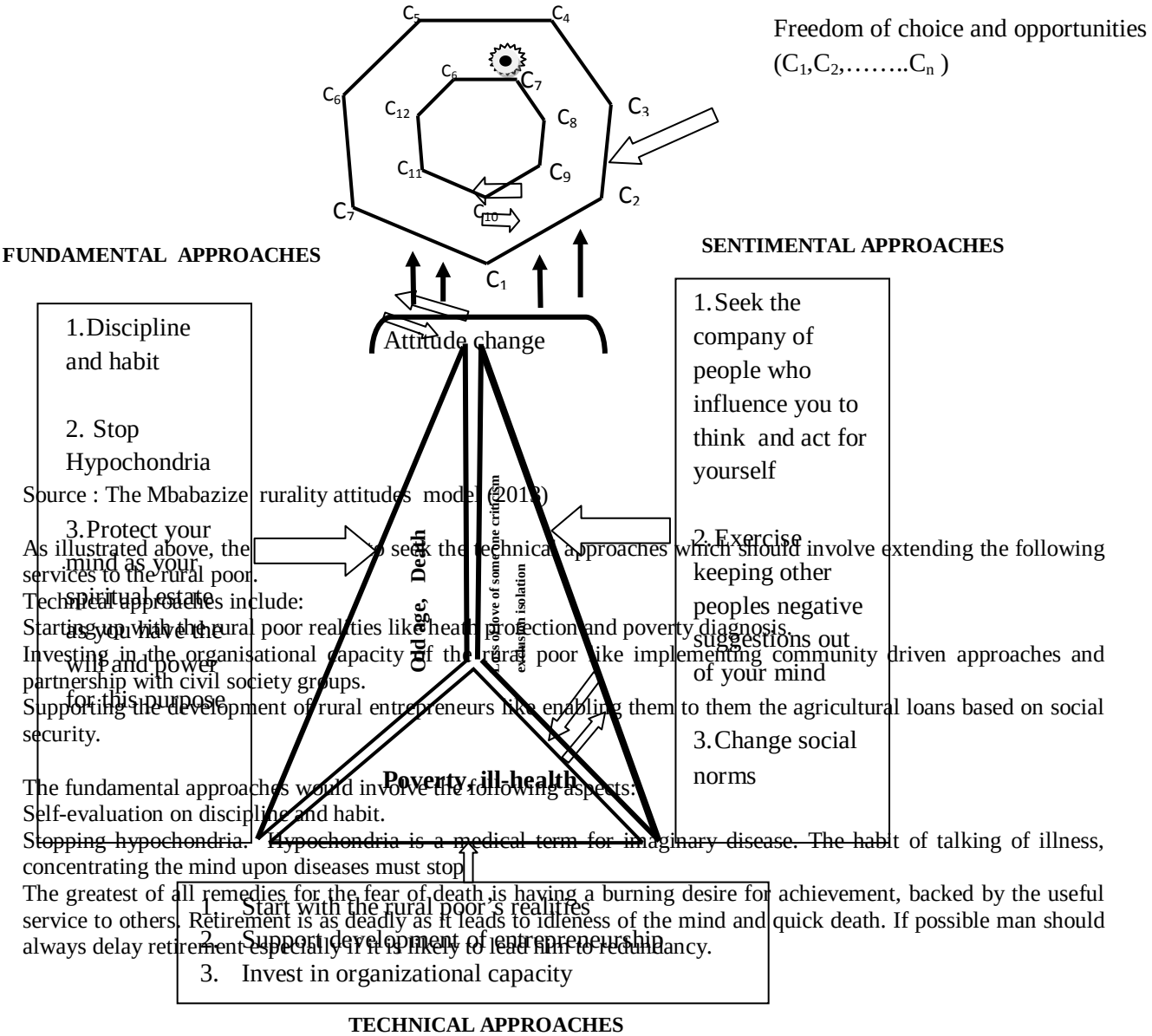
(i) Fundamental approaches to tackle the fear of poverty and ill health.

(ii) Technical approaches to tackle the fear of old age and death.

Sentiment approaches to tackle the fear of loss of love of someone and the fear of criticism.

These approaches are targeted on the fears of poverty which were grouped into two on a pyramid of worries as illustrated on the figure below.

Figure 10. 9: Fighting rural poverty: An exposition and recommendation by The Mbabazize Rurality' Attitudes Model.



Source : The Mbabazize rurality attitudes model (2013)

As illustrated above, the ... to seek the technical approaches which should involve extending the following services to the rural poor.

Technical approaches include:

Starting up with the rural poor realities like health protection and poverty diagnosis.

Investing in the organisational capacity of the rural poor like implementing community driven approaches and partnership with civil society groups.

Supporting the development of rural entrepreneurs like enabling them to them the agricultural loans based on social security.

The fundamental approaches would involve the following aspects:

Self-evaluation on discipline and habit.

Stopping hypochondria. Hypochondria is a medical term for imaginary disease. The habit of talking of illness, concentrating the mind upon diseases must stop.

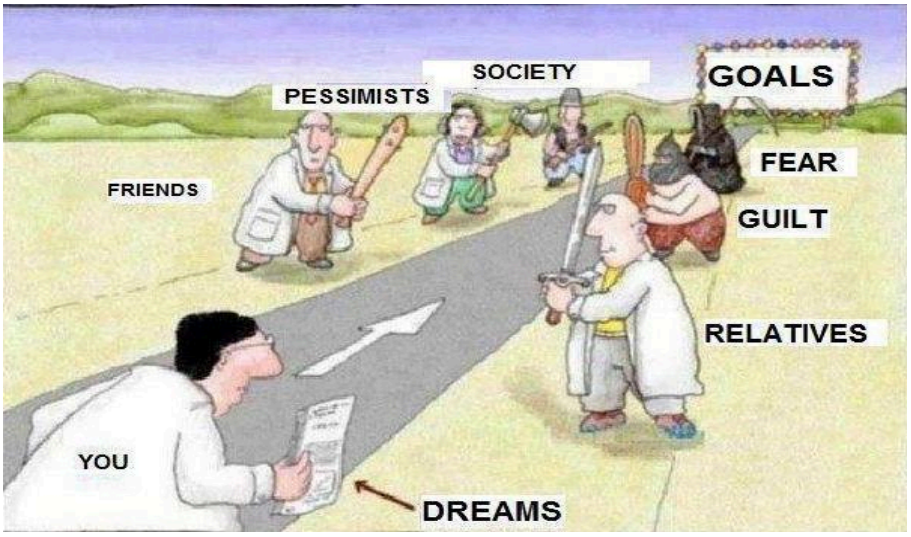
The greatest of all remedies for the fear of death is having a burning desire for achievement, backed by the useful service to others. Retirement is as deadly as it leads to idleness of the mind and quick death. If possible man should always delay retirement especially if it is likely to lead him to redundancy.

Protecting the mind as important spiritual estates since everybody has the will power for this purpose

The sentimental approaches include the following:
Seeking the company of people who influence you to think and act for yourself.
Changing social norms. Like changing the mindset, power of the personal combined with the power of the institutional action.
Keeping your minds closed against all people who discourage you all the way like pessimists, relatives, society.

In the rural society, when it comes to institutional change, attitude change and mindset change, serious actions and commitment are paramount. A norm is a shared expectation of behavior that connotes what is considered desirable and appropriate (Marshall 1994)
The rural poor's interactions with society like landlords, traders, local government officials at village level, the police, health workers and family members are governed by the social norms but not the laws of the land. These social norms dictate who has what value in each interaction and this is the root cause of the fear of criticism, love disappointment, exclusion and isolation.
Therefore changed social norms can lead to sustained change in behaviour. Change in social norms means changing mindsets, combining the power of the individual and the power of the institution, and facing up to pervasive gender inequalities.
Below is an artistic impression of what attitude and determination can be able to lead someone to achieve his goals and be able to succeed in life and escape from rural poverty as caused by the influence of fear, guilt, relatives, friends, pessimists and society.

Figure 10. 10: Artistic Impression of Attitude and Aptitude as the major blockades to succeed



Source: Researchers own impression (2013)

As above seen from the figure, attitude of one's self plays a very important role in achieving his or her goals. It is ones attitude that can be able to give him or her inside power to achieve the goals ahead. Whereas along the way someone aspiring to achieve more dreams is blocked by such blockades like, relatives, guilt, pessimists, friends, society and the role of inside fear, it is important to note that if ones attitude is oriented to counteracting the various blockades along the way, there is nothing else that can stop someone from fulfilling his or her goals.
To note however also is that as shown from the above artistic diagram, inborn fear among the human race is the greatest blockade as it is even in bold black on the right edge of one's path towards a goal. Marris(1968) describes how extended families in North Africa are parasites on the entrepreneur, thereby preventing entrenuership. Many rural poor entrepreneurs who come with some small idea of setting up a business are faced with this kind of problem and their businesses do not last long before they close.

5.3.3.2 The importance of Attitude: An Algebraic exposition of the Mbabazize Rurality' Attitudes Model.

If;	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Is											equal															to;
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Then,

H+A+R+D+W+O+R+K ;
8+1+18+4+23+15+18+11=98%

K+N+O+W+L+E+D+G+E ;
11+14+15+23+12+5+4+7+5=96%

L+O+V+E;
12+15+22+5 = 54%

L+U+C+K ;
12+21+3+11 =47%

Interestingly, none of these makes 100%. Then what makes 100%???

Is it EDUCATION? NO!!! EMPLOYMENT, BUSINEESS, INHERITANCE, BEING BORN EARLY? NO!!!!

It is ATTITUDE: Attitude can make 100%

A+T+T+I+T+U+D+E;
1+20+20+9+20+21+4+5 = 100%

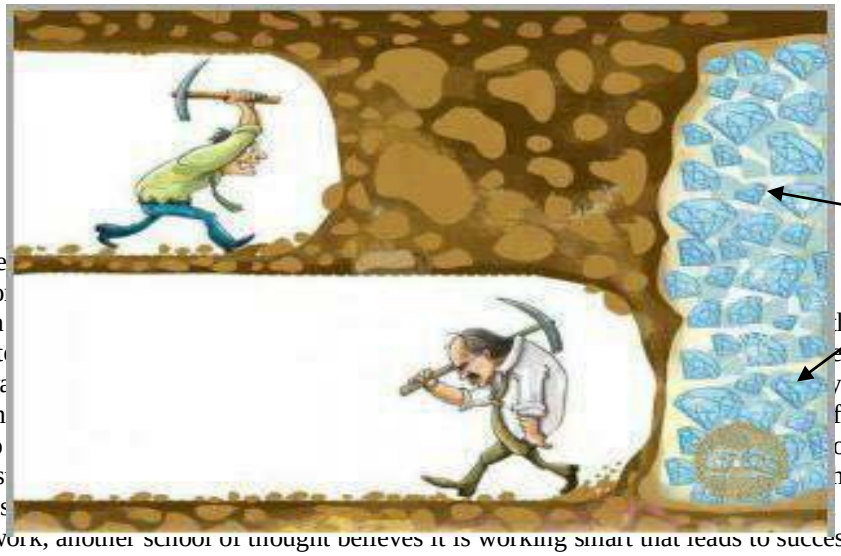
Therefore our very own ATTITUDE towards Life primarily determines how successful we can ever be. It is our attitude not aptitude that determines our altitude.

5.3.3.3 AH… There is no Diamond (riches) here.

The below figure shows how one never knows how close he or she is, so never give up on your dreams. The man in the first part of the chart shows that he is determined to dig diamond and he is using all his energy to succeed and get the usually desired diamond for riches in a life time.

But with time, it seems he lost the attitude and determination to continue digging. He ends up giving up without knowing that he was so close to getting it and become rich. He gave up and declared it in his minds that, ah there is no diamond "riches" here; and yet surely, he was about to fall into the real reaches had he not given up.

Figure 10. 11:Showing how close one may be but ends up giving up his dreams



Source

5.4 Co

Calvin his world can take the place of persist with talent. Genius will not; unrewa s will solve the problems of the human f human beings is the desire and will to of living.

Amids ny do some people realise their dreams yet a cross-section believe it is hard work, another school of thought believes it is working smart that leads to success, and being well off! It is from this puzzle of life to successfulness that this model was developed. Human pathologists believe that although there is no one sure way to success, there are a number of traits that all successful people possess. These are; the first factor that will determine success is what one thinks about most of the time. It is believed that all successful people think about what they want to achieve most of time. This is the biggest difference between successful people and ordinary ones. So it is imperative to narrow ones energies in life and focus on what one want to achieve.

The second critical success factor is to know what you want. Successful people know exactly what they want in life and work towards it. The third critical success factor that will determine ones success is the passion and desire.

Without the passion one will never create the burning desire that will push him or her into taking massive and consistent actions.

Successful people are willing to do whatever it takes because they have the burning desire and passion to keep them going. Taking action is another critical success factor that will determine one's success. If one is not trying anything, it is hard to achieve anything, you need to take action to produce the results you want in your life –do what you can, with what you have, and with where you are, success never comes automatically. Another, critical success factor is the knowledge base. You must commit to constant learning and never ending self-improvement. One must spend an hour to read any related book in his or her field to acquire and expand his or her knowledge base. One stops growing, the moment he or she stop reading and leaning!

The company of people you keep also determines what and who you become; the old saying that iron sharpens iron holds a lot of water in this regard. Keep away from the people who belittle your ambitions and tell you it is impossible. Samuel Glover (1987) once lamented "the world would stop if things were run by men who say, it can't happen".

Richard Nixon- the former US President once mused that "A man is not finished when he is defeated. He is finished when he quits."

Nobody and nothing should keep you down unless you decide not to rise again. Margret Thatcher understood the essence of resilience and persistence in life when she said that you may have to fight a battle more than once to win it! Similarly, successful people believe there are no hopeless situations; it is only people who grow hopeless about situations. The book of Proverbs (29:18) tells us that where there is no vision people perish; if you are to succeed you must bear a vision of your life.

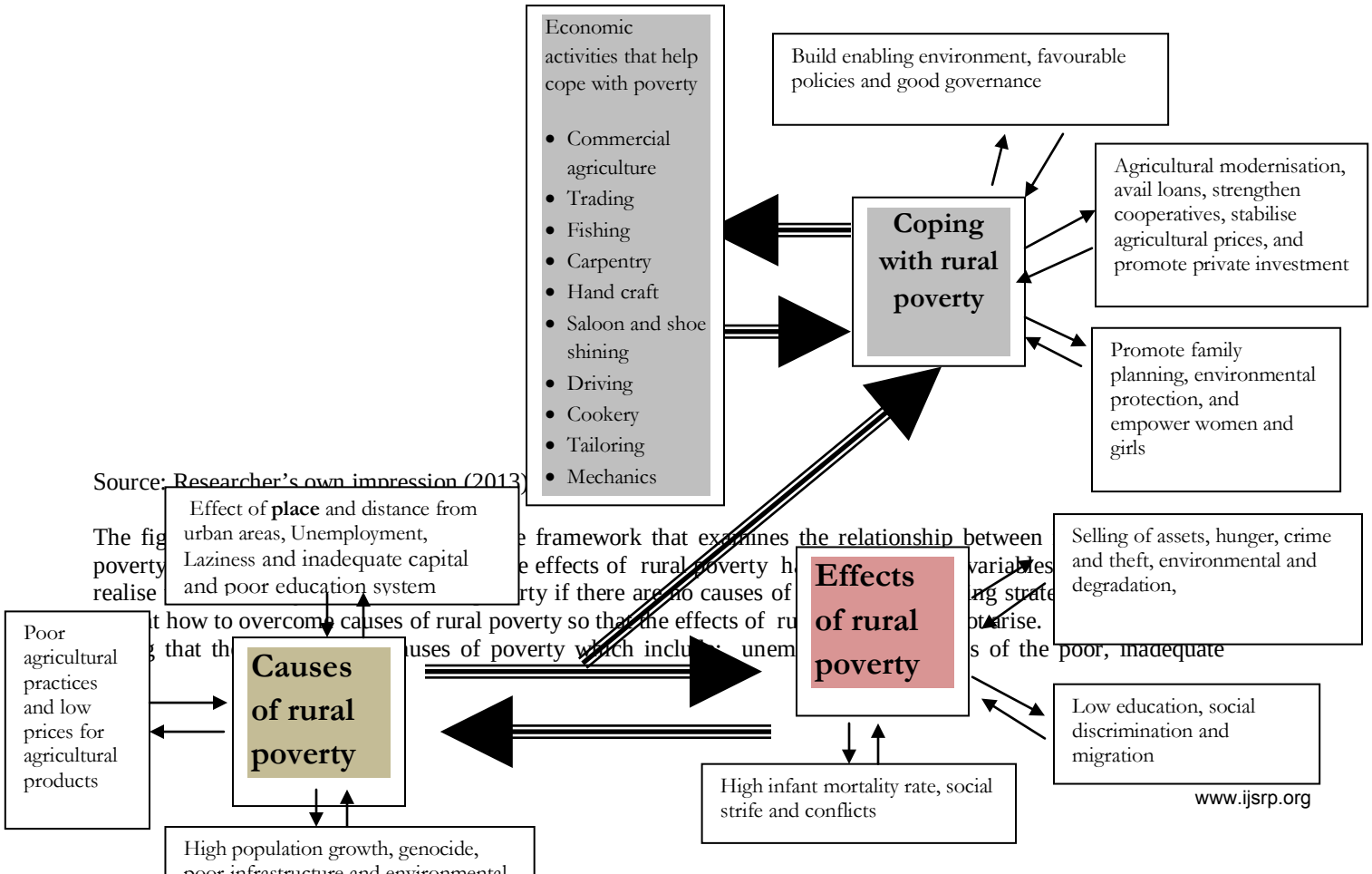
CHAPTER SIX: SUMMARY AND CONCLUSIONS

6.1 Introduction

This chapter summarises the findings of the study and gives general conclusions to the study. In this chapter the researcher focuses on all the findings of the study and development of general conclusions.

The purpose of this chapter is to give the reader a quick understanding about what the whole study was about, and the conclusions reached. It is worth noting that the whole study was based on the following theoretical frame work.

Figure 10. 12: Summary of the Theoretical Framework of the Study



Source: Researcher's own impression (2013)

The fig… framework that examines the relationship between poverty … effects of rural poverty h… variables realise … rty if there are no causes of … ng strate… t how to overcome causes of rural poverty so that the effects of ru… otarise. … that th… uses of poverty which inclu… unem… s of the poor, inadequate

capital, poor education system, high population growth, the genocide (like the one of 1994), poor infrastructure, environmental degradation, poor agricultural practices and low prices for agricultural products.
These causes of poverty lead to selling of assets, hunger, crime and theft, environmental degradation, low education, social discrimination, migration, high infant mortality rate, social strife and conflicts. It can be explained that these effects of poverty are a result of the causes of poverty already looked at above. Note that these are directly related to the causes of poverty.

The figure above further shows that the poor are coping with rural poverty. The strategies include; building an enabling political and economical environment, formulation of favorable policies that support of poverty eradication, good governance, agricultural modernisation, availability of loans, strengthening of cooperatives, stabilisation of agricultural prices, promotion of private investment, promotion of family planning, environmental protection, and empowering women and girls.
In coping with rural poverty, the poor have some economic activities that they can engage in. These include; Commercial agriculture, trading, fishing, carpentry, handcraft, salon and shoe shining, driving, cookery, tailoring, mechanics, local brewing, witchcraft, practising traditional medicine, and bee keeping. Basing on the fact that the rural poor are deep in the rural areas yet entangled in poverty, these economic activities end up being practised even when the rural poor do not wish to practice them. In one way or another, these related rural strategies have helped the rural poor have a fulfilling livelihood in their won localities.
According to the Poverty-Conservation Linkages by Dilys Roe and Joanna Elliott (2005), Poverty reduction is one of the international imperatives of the new millennium y stressed by the Millennium Development Goals (MDGs) and the 2002 World Summit on Sustainable Development. Most recently, it was echoed at the 2005 UN World Summit.The poverty reduction ambitions that have been articulated, while often simply restating development goals that have been set (and missed) over the last 30 years, are unusual in that they now have an unprecedented level of international commitment. As a consequence, all sectors of society are urged to contribute to their achievement. Conservation agencies find themselves among the many organisations struggling to determine how their work could – or indeed whether it should – fit into this international effort. They also observed a relationship between the causes of poverty and effects of poverty. They noted that there would be no effects of poverty without causes of poverty. The relationship between the causes and effects of poverty was also observed by the research for social and economic development organisation. They note that several issues like hunger, illness and thirst are both causes and effects of poverty - for instance: not having water means you are poor, but being poor also means you cannot afford water or food. http://www.poverties.org/effects-of-poverty.html#sthash.LlWULHtP.dpbs.

6.2 Summary of arguments
On the purpose of establishing how the rural inhabitants perceived and defined poverty, it was concluded that the rural inhabitants from both Nyabigoma and Kamanyana had a correct understanding and perceptions on poverty. Some rural respondents viewed poverty in the same way the international community viewed it. The rural poor inhabitants understand that if they do not have access to all basic needs they are described as poor.

The perceptions of the rural poor were clearly in line with the perception of the UN on poverty which states that: “Fundamentally, poverty is a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and cloth a family, not having a school or clinic to go to; not having the land on which to grow one’s food or a job to earn one’s living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation” (UN Statement, June 1998 –signed by the heads of all UN agencies)

On the causes of poverty, it can be concluded that all the respondents and the rural inhabitants appreciate that the main cause of rural poverty is laziness and people not working hard to combat poverty and poor lifestyles or poor habit in line with their attitude to life. Many people fail in life not because of lack of ability or brains or even courage but simply because they have never organised all their energies around a goal (Elbert Hubbard 1904). Respondents agree that if they work hard, they would be able to overcome poverty by overcoming the causes of poverty.

On the effects of poverty, it can be concluded that, failure to deal with the causes of rural poverty can lead to extreme poverty and the effects of poverty will come in. The renowned South African Archbishop, Desmond Tutu (1999) argued that if we hope to have peace, we must first of all commit ourselves to defeat poverty in our

communities. Respondents understand that certain situations are attributed to rural poverty and can best be defined as effects of rural poverty. It can also be concluded that, the, effects of rural poverty can be avoided if the right strategies are designed to overcome poverty.

On the coping strategies it can be concluded that the rural poor are actively working hard and trying to overcome poverty. The rural poor have developed and adopted different strategies including multi-tasking to cope with poverty. It can further be concluded that with the support of other stakeholders like the government and NGOs, the rural poor will have the opportunity of overcoming poverty. If the government can invest in agriculture which is the highest employer and is also an economic activity that all the respondents are engaged in, directly or indirectly, then through agriculture, the rural poor can be able to cope with poverty.

6.3 Conclusions

The researcher, basing on the study findings, concludes that if rural poverty is to be reduced, the following stakeholders have to work hand in hand.

It is within the means of Government to engage in massive work towards modernising agriculture. From the study, we clearly see that agriculture employs over 80% of the entire Rwandan population and so modernising it would be the best option towards eradication of rural poverty.

More so, it is important to create credit opportunities. The available opportunities are selective and carry high interest rates that do not favour the rural poor. Providing loans or credit to help the rural poor will, as a result, increase investment and will help the rural poor to eradicate their own poverty.

It is also important to encourage the rural poor to participate in developmental projects such that they earn more and provide the basic necessities for themselves and their families.

The government also should sensitise the rural inhabitants on family planning and contraceptive use. This will help the rural poor have manageable families. As a result the low incomes by the rural poor will be sustainable. Sexuality education among the youth will further instill the spirit of small families into the youth when they are still young.

According to studies, the current percentage of women using modern contraceptives increased from 10% in 2006 to 27% (mini DHS 2007/8) exceeding the target of 25% in 2008. This was further increased to 45.1% in 2009/10 against the target of 32%. The percentage of children fully immunized increased from 75% in 2006 to 80.4% (HMIS 2008), slightly exceeding the 2008 target of 80% and this has benefitted from all health facilities carrying out outreach services for immunization. In 2009/10, this further improved to 90.4% against a target of 85%. On the indicator measuring the percentage of children using Long Lasting Insecticide Treated Nets (LLITN) , significant progress was made, however, the target of 65% was not fully realized with the mini-DHS (2007/8) reporting a score of 60% from a baseline of 16% in 2006. The target for this indicator was largely achieved in 2009/10, with an outcome of 79% of children fully immunized against a target of 70%. The percentage of assisted births in an accredited facility exceeded the target of 35% with a performance of 62.8% (HMIS 2008) coming from a baseline of 28.2% (2006). This was already above the EDPRS target for 2012. The percentage of assisted births in an accredited facility further increased to more than 66.2%.

The utilisation rate of primary health care services also increased from 70% to 86% in advance of the 75% target that was set for 2008. This utilization rate moved from 86% to 95 % in advance of the 80% target that was set for 2009/10. The target for per capita allocation to Performance-Based Financing (PBF) was not met fully with a realization of $1.40 compared to a target of $1.45 in 2008 and a baseline of $1.2 in 2006. The target has been missed again in 2009/10 with an allocation of $1.65 compared to a target of $1.85. With regard to fighting HIV/AIDS, while there is no data yet available on condom utilization by youth (15-24 years), respectively 96.5% of children and 95.5% of adults are still alive 12 months after start of treatment compared to respective targets of 89% and 86% for 2009/10.

Government also needs to establish an effective agricultural, infrastructure (energy, transport, and market and price stabilization). There is also need for private sector development as well as environment and natural resources management. If such investments focus on the rural population then poverty in the rural areas will be handled effectively.

The private sector also needs to be promoted and supported to progress. This is on the basis that Rwanda was declared as the World's top reformer of business regulation in doing business in 2010, becoming the first sub-Saharan country to hold this position. The country has made the big strides in becoming business friendly by introducing favourable reforms: Rwanda made it easier to start a business, register property, protect investors, trade across borders, and access credit. This resulted in Rwanda moving up from position 141 to the 67th position out of 183 countries on the Doing Business rankings.

In the more recent Doing Business report 2011, Rwanda's position has further improved to 58th. As a consequence, the target of ranking in doing business has been exceeded. The World Economic Forum's recently released Global Competitiveness Report ranked Rwanda as the 6th most competitive market in sub-Saharan Africa, and among the world's best on indicators such as female participation in the labour force, staff training, and legal rights. These reforms need not only focus on the urban population but also need to address the needs of the rural population.

There is also need to build appropriate infrastructure in the rural Rwanda. The villages like Nyabigoma and Kamanyana need to benefit from infrastructure like power production which has generally increased and stabilised since the severe power shortages in 2004 and total installed capacity has increased from 45 MW in 2006 to 74.5MW in 2008 and 56MW generation capacity, exceeding the 2008 target of 50MW. The rural population would have capacity to free themselves from poverty had the government tried to extend such infrastructure to them as well.

There is need to promote environment conservation and encourage initiatives like tree planting to help address the enormous environmental problems that the rural poor have attributed poverty to. Currently, the surface land area coved by forest and agro-forest increased from 20, 2% to 21% (plantation of 31.327.410 trees on 19 579 ha) against a target of 21.4% for 2009/10 and the area of land protected to maintain biological diversity exceeded the target of 8.4% by an actual performance of 8.5% in 2008 and achieves exactly the target of 8.8% in 2009/10. These successes should be promoted further especially in the rural areas.

Water resources should also be a priority by the government. In fact water is important in the development of the agricultural sector, especially for irrigation and human consumption. The available water resources should comply with the water standards. Studies have shown that the percentage of water resources complying with water quality standards was attained at 30%. Good quality of water means that people will stay in good health and effectively do their work of producing goods and services.

Availability of land is also another factor that needs to be closely looked at if rural poverty will be addressed. Several poor rural inhabitants do not even have access to land where they can grow their crops and raise their animals. Although they may want to produce products for the market, inability of land disrupts their efforts. The rural poor need to be given loans to buy land or should be given land by the government. The government had targets in 2008 but they were not met. The targets which were not met in 2008 both relate to land; the percentage of area of privately owned land held under written title was 1.26% compared to a target of 3% and the proportion of issued land titles owned by Women was 0.02% compared to a target of 2%. One of them, on percentage of privately owned land held under written title was exceeded in 2009/10 as it reached 19.3% against a target of 10%. The other has not been measured.

Limited land hinders people's efforts towards poverty alleviation. Education needs to also focus on entrepreneurship and vocational education. This educational approach enables learners to have quick access and creation of jobs. The kind of education that leads to job seeking that currently is implemented does not lead to quick access to jobs and economic independence of individuals.

Furthermore in relation to the above, there is deliberate need to mobilise and secure funds for the creation of farmer field schools and village saving and loan associations as a local solution to local problems of poverty. There is also need to conduct massive capacity building and employment promotions for rural dwellers. Non-farm jobs need to be created for the rural poor that have no access to land and that cannot even concentrate on settled agriculture. Vocational skills need to be promoted in a bid to address unemployment for the rural poor that have no access to land.

The main objective of this study was to show rural poverty, deep causes that contributed to the inefficiency of strategies and actions in poverty alleviation, and also to suggest possible solutions. In Rwanda, the rural poverty issue remains a big problem. Strategies and actions to alleviate poverty are not new, but are presented under various aspects according to historical periods, approaches and used resources.

The outcomes of this research led us to the conclusion that Rwanda's development process has stagnated for a long time and left the majority of rural households in precarious living conditions. All identified factors in this research favouring and/or hampering the country's rural development are closely interlinked. Their combination explains the current development level especially the rural inhabitants.

The economy cannot be separated from the political context because the capacity to ensure a sustainable peace, the protection of goods and people in accordance with the principles of equity and credibility of the mediation system and conflicts management are important foundations to promote confidence, in order to attract investors that could focus on rural poverty. We therefore acknowledged that Rwanda's economic failure was a consequence of the past political environment that characterised the country at many levels on the one hand, and structural, conjectural and intrinsic constraints as well as intrinsic capability to change and/or transformation on the other.

The contribution of this study is to ensure that policies and committed actions are better rethought, more appropriate, integrated and sustainable. Our suggestions also invite development agents at all levels to better understand and

master the political, social and economic context in which the rural inhabitants work. They should also change their perception on a population considered to be vulnerable and beneficiary. A well trained and supervised population within a stable political and macroeconomic environment would be able to carry out its own development. Poorly-coordinated development facilitators bring about negative consequences and distortions in the development process. Harmonised approaches based on relevant and coherent actions are better. Though humanitarian and assistance actions are necessary in some circumstances and for some specific groups, they should also plan exit strategies and sustainable self-sufficiency development actions. Otherwise, they contribute to the intensification of dependence syndrome and the proliferation of passivity and chronic poverty that have been bequeathed from generation to generation.

This research showed us that we have to use the most pragmatic approaches, concrete and operational action to face the rural poverty issue. That is why we shall need competent structures at all levels (planning, research, standardisation, management, coordination, follow-up, evaluation) and mobilise all possible resources including workforce, savings and solidarity mechanisms.

The success of these strategies will require efficient implication and efficient participation of all stakeholders, that is the government, political parties, religious organisations, entrepreneurs, NGOs, international development stakeholders, private economic operators, researchers and academics.

6.4. Suggestions for further research

The study revealed the perceptions of the rural inhabitants on poverty, causes of rural poverty, effects of rural poverty and coping strategies. There is however need to study the most appropriate poverty alleviation strategies in rural areas. For example: Should the best strategy be government led or private sector led?

There is an overall report that Rwanda is growing at the highest rate. For example: In the 2010/11 fiscal year, the GDP per head was at Rwf 308,000 or US$ 541 at the nominal exchange rate of Rwf 569 to 1 US dollar. The GDP estimates calculated at constant 2006 prices show that in 2012/13 the GDP was 6.2% higher in real terms than it was in 2011/12 (NISR 2013, BNR 2012, MINECOFIN 2013).

This follows an increase of 9.8% from 2007/08 to 2008/09. This growth rate is mainly attributed to growth of 5.9% in agriculture (mainly driven by a 7% increase in the food crop production), and 7.6% for services (in which public administration grew by 10% and business services by 13%). The industry sector registered a modest growth of 0.6% as the sector that was most affected by the global recession and the domestic liquidity crunch.

Further study needs to investigate if this growth is having an impact on the rural areas: or is the growth only focused on the urban areas? The rural areas seem not to have the same access to services like the urban areas why is this so? Therefore an independent study needs to be conducted to ascertain this.

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Vertical Integration: A Teaching Tool of Anaemia in Pregnancy

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***Abstract*- Background :**A medical student has more than just academic needs . A medical student needs to understand the basic preclinical subjects and in a short span of one year translate it into patient care. A problem based learning method was initiated in the final year curriculum of medical students to integrate the basic knowledge of anaemia in pregnancy with the final outcome of reducing maternal deaths due to anaemia in pregnancy.

Methods: All the basic sciences and their translation into clinical skills was explained pertaining to the problem of anaemia in pregnancy .Plenary discussion of each clinical case of anaemia in pregnancy was done in a galaxy of experts from each department.

The teaching faculty of the Department of physiology, biochemistry, pathology, community medicine, Haematology. General Medicine,Anaesthesia and Obstetrics and Gynaecology . provided a learning module in the Web forum of University website for the final year medical undergraduate students. The students were able to comprehend anaemia in pregnancy from its basics and decide on the relevant clinical implications. A case based discussion was done the constellation of experts from all disciplines of Medicine. This was followed with Mind Mapping of concepts developed. Pretest and posttest helped the teaching faculty to assess the impact of knowledge generated. Feedback was obtained to improvise the existingteaching method sand develop new teaching tools.

Conclusion: Vertical Integration of medical disciplines helps medical students to understand a clinical problem in the light of basic sciences. The modules beginning with the biochemistry of iron metabolism help them to understand higher concepts of Haemoglobin dissociation curve dealt with in Anesthesia. An elaborate module helps to translate an understanding of social consequences of Anaemia in pregnancy. A well trained medical student can help to reduce maternal mortality due to anaemia in pregnancy.

***Index Terms*-** Vertical Integration, Teaching tool, Anaemia in pregnancy, Medical Student, maternal mortality , Medical Curriculum.

I. INTRODUCTION

Vertical Integration is a new teaching method(1) .The basic sciences of Anatomy ,Biochemistry ,Physiology are taught together with pathology of the disease. Pharmacology of the drugs used to treat the disease is discussed. Surgical and Anesthetic considerations are explained. Finally the disease burden in society and community implications are also high lighted.Thus major social problems like anaemia can be discussed elaborately leading to reduced maternal deaths.

There have been considerable advances in Teaching (2).Institutes However, maternal deaths as a direct and indirect result of anaemia in pregnancy remained to be high. Routine Teaching methods have to be modified for those community needs that need immediate attention.

This study was designed to study the teaching methods and develop a strategy best suited for teaching anaemia in pregnancy in our institute.

II. LEARNING PHASES

The learning in a medical profession can be classified as:

1) Preclinical Learning: In the basic science departments of anatomy ,physiology and biochemistry the normal Human body structure,function and biochemical balances are discussed. Having understood the normal mechanisms a medical student is taught about the etio-pathology, signs, symptoms. complications and sequelae of the various ailments affecting mankind. The microbiological basis of disease is discussed .The administration, digestion, metabolism and excretion of each theurapeutic drug is explained.
2) Clinical Learning: Finally a medical student is given clinical cases where the patient with disease is interrogated for symptoms and examined for various signs .A list of investigations to be ordered need to be prepared.A disease process or a list of alternative disease processes has to be detected . The treatment has to outlined and patient prognosticated.

A medical student is in a quandary of application of basic principals to therapeutic needs of his clinical cases. The amount of knowledge is enormous while the case basics and treatment options relatively less.

III. VERTICAL INTEGRATION OF BASIC SCIENCES WITH CLINICAL CASES OF ANAEMIA IN PREGNANCY

Preparation of learning module

Induction and Orientation programme was conducted A team of of experts from the Departments of Biochemistry, Physiology, Pathogy, Transfusion Medicine, Pharmacology, commumity Medicine, General Medicine ,Obstetrics and Anesthesia was briefed on the teaching principl e of vertical integration. Each discipline provided the clinically relevant

points to reduce maternal anaemia .The final module comprised of

1. Iron and its Metabolism : Dietry absorption, storage, transport and utilisation of iron .
2. Physiology of Iron metabolism : Dietry sources of iron and laboratory investigations of physiological anaemia of pregnancy
3. Investigations done to diferentiate physiological from pathological anaemia and type the anaemia
4. Disseminated Intravascular Coagulation following abruption of placenta
5. Management of mild ,moderate and severe anaemia in each trimester of pregnancy
6. Management of severe anaemia in intrapartum and post partum periods
7. Congestive Heart Failure during pregnancy
8. Community Diagnosis of Anaemia and National Nutritional Anaemia Controll Programme.

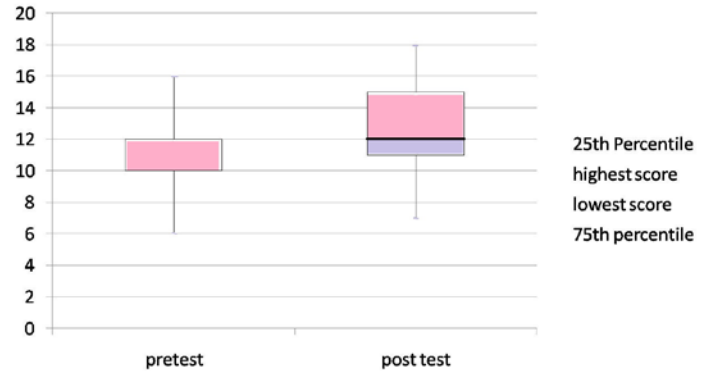
Students were given the learning module in PDF format in Web forum a fortnight before the actual clinical problems were given to them. The medical students were divided in groups to fascilititate participatory group based activity. The final module was comprehended in batches of 6 students together in the presence of a teaching faculty.

vIt was inferred that istudents were more interested and alert when the module was read as a group(3) .A teaching faculty was available to clear doubts in the module.

Figure 1:Group Based participatory comprehension of Module on Anaemia in pregnancy

Pretest and post test

A set of twenty mutiple response multiple choice questions were used for pre plennary assessment. The same Questionaire was assessed after the case based plenary session was over. The scores obtained were plotted using Box charts for pretest and posttest. The median. the 25th percentile,the 75th percentile and extreme values in pretest and post test group were plotted using Sigmaplot (.Figure 2)



Case Based Discussion

Twelve case scenarios of anaemia in pregnancy were given for problem solving to the medical students .Students were divide in six groups Each group of nineteen students was given two cases for Problem Based Learning. The students presented the cases to a galaxy of experts from each department.

The cases given for problem solving provided the first and second triggers to fascilitate problem solving

1. A case of severe anaemia at term
2. Parturient with severe anaemia
3. Congestive heart failure at term pregnancy
4. Abruptio placenta with multiple blood transfusions
5. Disseminated intra vascular coagulation
6. Anencephaly baby of a folic deficiency mother
7. Severe anaemia with food faddism
8. Severe anaemia for Caesarean section under general anaesthesia
9. Peurperal sepsis with severe anaemia
10. Intrapartum therapeutic forceps application in severe anaemia
11. A case of thalessemia with iron deficiency
12. Moderate Anaemia in Second trimester treated with parenteral Iron sucrose.

Plenary Session

The cases were also presented to professors of the disciplines integrated. The experts highlighted that the forceps applied in severe anaemia is therapeutic and not prophylactic as the mother is already in distress. Propped up position and Oxygen inhalation is mandatory during labour .Severe anaemia in any trimester requires blood transfusion .Parenteral Iron sucrose is a useful drug in moderate anemia .Active Management of Third stage of Labour can prevent post partum haemorrhage .Injectable antibiotics use can treat puerperal sepsis with anaemia.

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Mind Mapping

The medical students of each group charted the concepts gained collectively .This was aparticipatory activity as the students of each group took one chart paper to outline their ideas. They signed their names below each chart . They were able to solve the clinical cases with the basic science preclinical knowledge with only a very little help from clinicians .It was also found as in that participation increased concept comprehension (4,5)

IV. Conclusion

Participatory learning activities keep students alert and interested. A thorough knowledge of basic sciences is essential for patient dealing .A firm foundation of clinical sciences is already established in the preclinical disciplines.

V. Competing interests

We do not have any commercial association that might pose a conflict of interest in connection with the manuscript. We certify that neither this manuscript nor one with substantially similar content under our authorship has been published or is being considered for publication elsewhere.

VI. Acknowledgement

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A Comparative Study on Medical Image Denoising in Hybrid domain

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Abstract- The key to medical image denoising technique is to remove the noise while preserving important features. Non-local mean filtering and bilateral filtering are commonly used procedures for medical image denoising. In this paper analysis and comparison of spatial as well as frequency domain methods including bilateral filtering , non-local mean filtering, wavelet thresholding, contourlet thresholding and non-subsampled contourlet transform are done. The non-subsampled contourlet transform applied prior to bilateral and non-local mean filtering gives improved PSNR and perceptual quality. From the results it is also found that introducing transform domain method prior to spatial domain method does not increase the processing time to a much extend.

Index Terms- Bilateral filtering, Contourlet transform, Image denoising, Non-local mean filtering, Non-subsampled contourlet.

I. INTRODUCTION

In past years various denoising methods have been introduced for removal of noises from medical images , noises that are mostly occurring in medical images are Gaussian noise, salt and pepper noise[3] and speckle noise [2,4,5]. Many researchers continue to focus attention on it to better the current state of the denoising art and converge to the so called "efficient denoising method". The two main image denoising methods are spatial domain denoising and transform domain denoising. Spatial domain filters relies on low pass filtering on a group of pixels with the assumption that noise occupies mostly in regions of high frequency spectrum. In the most of spatial filters it has only low pass characteristics hence edges, lines and other fine details will be completely lost due to filtering. While in the case of transform domain denoising the image to be processed must be transformed into the frequency domain using a 2-D image transform.Among the spatial domain methods bilateral filter overcomes the conventional drawbacks of spatial domain methods. It combines gray levels based on both geometric closeness and photometric similarity and prefers near values to distant values in both domain and range and finely preserves the edge information. However it does not give satisfactory results for medical images since real gray levels are polluted seriously and the range filter cannot work properly. This would lead to bring side effect to the denoising results like a polishing look to denoised image, a phenomenon referred as propagation of noise (PoN) and also Implementation of bilateral filter turns out to be rather computationally intensive far real time application. An extension of this bilateral filter which has been proposed by Baudes et al. had put forward Non-Local means image denoising[14,15] which utilizes structural similarity. This denoising method takes full advantage of image redundancy. Though it is an efficient denoising method with the ability to result in proper restoration of the slowly varying signals in homogeneous tissue regions and strongly preserving the tissue boundaries, the accuracy of the similarity weights will be affected by noise and also computation time required is very high. The spatial domain filters if combined can deteriorate the denoising efficiency so we have to move for transform domain methods to cop up with the drawbacks in the above mentioned methods. An effective non-linear denoising technique in transform domain is vishushrink which is proposed by Donoho and Johnstone[27]. Though vishushrink can outperform other denoising techniques it can causes smoothening of images due to the large threshold that is chosen due to its dependence on the number of samples. Therefore it is not a suitable threshold which causes performance variation. The contourlet transform proposed by Do and Vetterli[27] is a geometrical image based transform. It combines the principle of sub-band decomposition and the decomposition of the directional transform. MinhN.Do et al. [33] introduced the non-subsampled contourlet transform (NSCT) which is a fully shift invariant multiscale and multidirectional expansion of the contourlet transform.Since NSCT is not an orthogonal transform the noise variance of sub bands in each directional and each level are different in the NSCT domain. So, the noise variance of every sub band is estimated independently. Thus it provides an effective performance than other denoising schemes.

The main aim of this study is to investigate the performance of denoising methods. The paper is structured as follows: Section II explains the various spatial and transforms domain methods. In section III proposed method is discussed. Simulation results are covered in section IV. Paper concludes in section V.

II. THEORETICAL BACKGROUND

A. *Spatial domain methods*

1) Bilateral Filter

Bilateral filter is very similar to Gaussian convolution. Bilateral filter combines range and domain filtering. It combines gray levels based on both geometric closeness and photometric similarity and prefers near values to distant values in both domain and range. Domain filtering enforces closeness by weighting pixel values with coefficients that fall off with distance. Similarly range filter averages image values with

weights that decay with dissimilarity. Bilateral filtering for two gray level images can be described as follows:

$$h(x) = k^{-1}(x)\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f(\xi)c(\xi,x)s(f(\xi)).f(x)d\xi \qquad (1)$$

where

$$k(x) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} c(\xi,x)f(f(\xi).f(x))d\xi \qquad (2)$$

$$c(\xi,x) = \exp\left(\frac{-1}{2}\left(\frac{\|\xi - x\|^2}{\sigma_d}\right)^2\right) \qquad (3)$$

measures the geometric closeness between the neighborhood center x and a nearby point ξ and the geometric spread σ_d is chosen based on the desired amount of low pass filtering.

$$s(f(\xi)f(x)) = \exp\left(\frac{-1}{2}\left(\frac{\|f(\xi) - f(x)\|^2}{\sigma_r}\right)^2\right) \qquad (4)$$

meaures the photometric similarity between the pixel at the neighborhood center x and a nearby pixel ξ and the photometric speed $\sigma_s$is set to achieve the desired amount of combination of pixel values.Implementation of bilateral filter turns out to be rather computationally intensive for real time application. Different numerical scheme have been proposed in the past for implementing the filter in real time [11]-[14]. One of recent algorithm is formulated by Choudhary et al. [30].

2) Non-local mean filtering

Non-local mean filter developed is based on a non-local averaging of all pixels in the image. Non-local mean filter takes a mean of all pixels in the image weighted by how similar these pixels are to the target pixel. This results in greater filtering clarity and less loss of detail in the image. Given a noisy image y-{y (i)| iϵI}, the non-local mean filter compute weighted average of all pixels in the image for a pixel i.

$$NL[y](i) = \sum_{j\in I} w(i,j)v(j) \qquad (5)$$

where the family of weights {w(i,j)} depends on the similarity between the pixels i and j and satisfy the usual conditions $0 \leq w(i,j) \leq 1$ and

$$\sum_j w(i,j) = 1. \qquad (6)$$

Similarity is computed between equally sized patches as they captured the local structures around the sites in consideration. The pixels outside neighboring sites do not contribute to the value of noisy image. To make averaging more robust, the searching window size should be made as large as possible. This would lead to excessively long computation times. Therefore large numbers of fast methods have been developed [32].

B. *Transform Domain methods*

1) Discrete wavelet transform

In a discrete domain, wavelet theory is combined with a filtering theory of signal processing. The coefficients in the wavelet domain have the property that a large number of small coefficients express less important details in an image and a small number of large coefficients keep the information of significance. Therefore denoising in the wavelet domain could be achieved by killing the small coefficients which represent the details as well as the noise. Since noise does not generate exceptions, additive white Gaussian noise after applying wavelet transform is still AWGN.

Wavelet thresholding which is a signal estimation technique that exploits the compatibilities of wavelet transform for signal denoising removes noise by killing coefficients that are insignificant relative to some threshold. The universal thresholding T is an estimate which is asymptotically optimal in the minimax sense and universal threshold is 100% effective only when number of pixels in an image tends to infinity [25], which is an impractical situation.

$$T = \sigma\sqrt{2\log_e L} \qquad (7)$$

where L is the number of random data with zero mean and variance σ/2.

2) Contourlettransform

The contourlet transform combines the principle of subband decomposition and the decomposition and the directional transform. At the first stage, Laplacian pyramid [28] is used to capture the point discontinuities into linear structure. The directional filter bank (DFB) was used to capture the high frequency of the input image; the low frequency content is poorly handled. Therefore low frequencies are removed before applying the DFB. Fig.1shows multi-scale and directional decomposition using a combination of Laplacian pyramid and directional filter bank. Discrete contourlet transform is a composition of perfect reconstruction block.

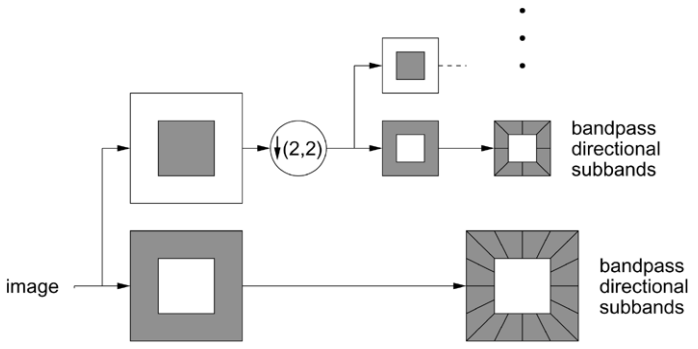

Fig.1.Contourletfilter bank using directional filter and pyramidal filter bank

Simple thresholding scheme applied on the contourlet transform is more effective in removing the noise than it is for the wavelet transform. In contourlet transform the pyramidal filter band has very little redundancy causing aliasing effect.

3) Non-subsampled contourlet transform

Non-subsampled contourlet transform (NSCT) which is a fully shift invariant multiscale and multidirectional expansion of the contourlet transform. In order to avoid frequency aliasing of the contourlet transform and to achieve shift invariance, non-subsampled pyramid filter bank (NSPFB) and non-subsampled

directional filter bank (NSDFB) is used. The resulting filter structure approximates the ideal partition of the frequency plane displayed in Fig.2.

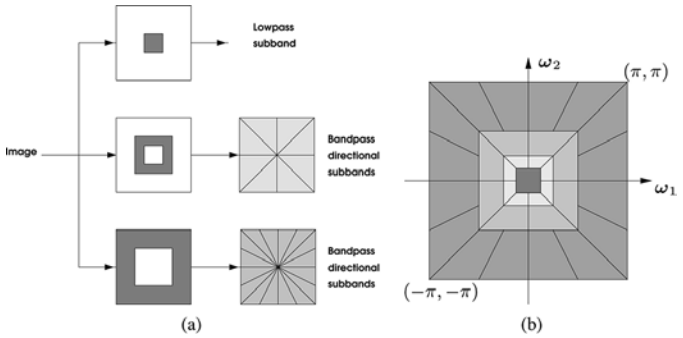

Fig. 2. Non-subsampled contourlet transform a) NSFB structure that implements NSCT. b) Idealized frequency partitioning obtained with the proposed structure

NSCT is not an orthogonal transform the noise variance of sub bands in each directional and each level are different in the NSCT domain. So, the noise variance of every sub band is estimated independently.

III. PROPOSED METHOD

Bilateral filter fails to efficiently remove noise in region of homogeneous physical properties. When noise strikes in homogeneous region the spatial filter used in bilateral filtering most likely perform much lesser than range filters. Therefore noise is retained in the edge information of the image. In the case of non-local mean filter the accuracy of the similarity weigh to will be affected by noise. This also gives the similar phenomenon as bilateral filtering to medical images especially image's tissue region and brain grooves may be weakened by noise. When transform domain methods like wavelet thresholding, contourlet thresholding and NSCT is performed as a preprocessing step denoising becomes much efficient in retaining edges and texture information. Judging from the results NSCT performed as preprocessingstep preserves edge components. So considering NSCT and NLM filtering as a single entity, it is highly suitable for medical image denoising where texture and edge features are for the medical image denoising. The medical denoising entity in hybrid domain is shown in Fig. 3.

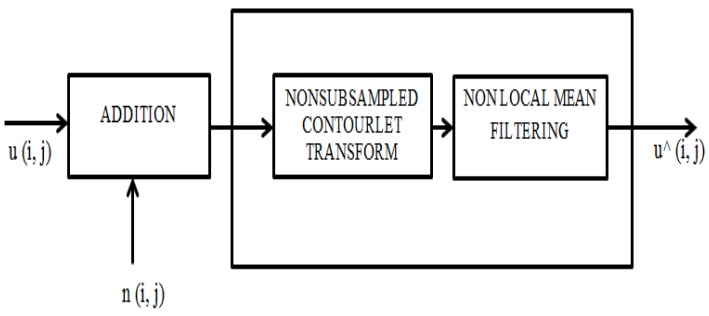

Fig. 3. Medical denoising entity in hybrid domain

where u(i,j) is the original signal n(i,j) denotes the noise introduced into the signal to produce the corrupted image v(i,j) and (i,j) represents the pixel location and u^(i,j) is the denoised image.

IV. SIMULATION RESULTS

CT image of abdomen is shown in Fig.4.is used for simulation. Image has a size of 1024 x 1024 with 256 shades of gray. In denoising method, peak signal to noise ratio (PSNR) is chosen to compare the processed image. But PSNR do not represent human perception of the images. Thus we apply both PSNR measure and the image is also viewed for visual acceptance. The performance of spatial as well as transform domain methods is compared. Then transform domain methods are applied as a preprocessing method in order to improve the performance of bilateral filtering and non-local mean filtering.

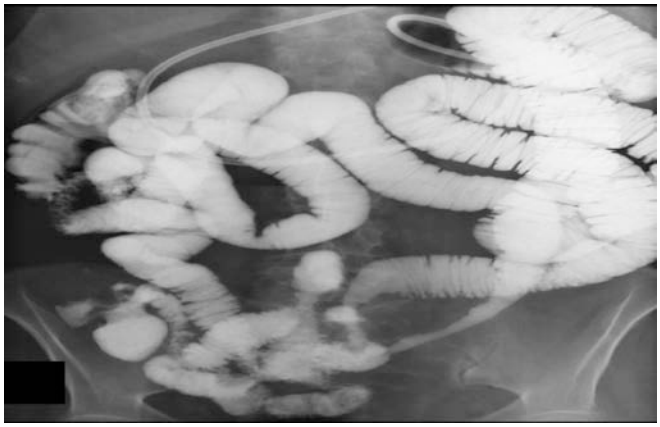

Fig.4. CT image of abdomen

In order to compare the effects of these methods to different additive Gaussian white noise, the original image is corrupted with Gaussian noise with standard deviation varying from 20 to 40. Transform and spatial domain methods are applied to the noise images and PSNR values are recorded.

TABLE I. PSNR COMPARISON OF SPATIAL DOMAIN METHODS

Methods	***Noise***	***Bilateral filtering***	***NLM filtering***
σ = 30	18.9535	23.5869	24.0978
σ = 40	16.6847	20.8988	23.5637

TABLE II. PSNR COMPARISON OF TRANSFORM DOMAIN METHODS

Methods	***Noise***	***Wavelet transform***	***Contourlet transform***	***NSCT***
σ = 30	18.9535	22.9526	24.0978	28.1724
σ = 40	16.6847	20.0023	23.5637	26.9898

TABLE III. PSNRAND PROCESSING TIME COMPARISON OF IMAGE DENOISING METHODS IN HYBRID DOMAIN

Methods	*PSNR (dB) σ = 30*	*Processing Time (sec)*	*PSNR (dB) σ = 40*	*Processing Time (sec)*
Wavelet + Bilateral	23.8569	2.3565	21.6452	2.3655
Contourlet + Bilateral	29.4568	2.4341	26.9524	2.4556
NSCT + Bilateral	31.5698	4.6598	29.6538	4.7698
Wavelet + NLM	23.9525	2.9655	22.9235	3.0127
Contourlet + NLM	29.8684	3.0183	25.2527	3.1235
NSCT + NLM	32.5698	4.7955	31.0864	4.9875

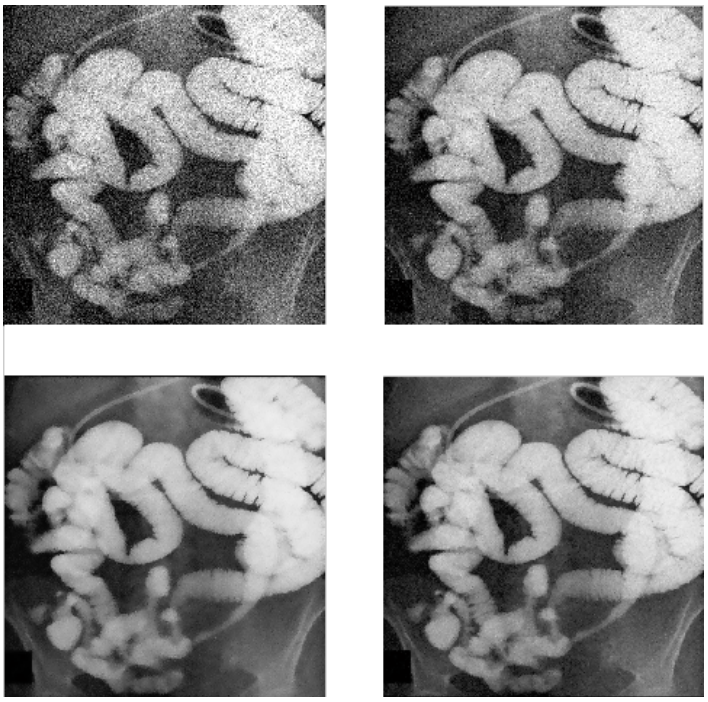

Fig. 5. a) Noisy image (σ = 30) b) Wavelet and NLM
c) Bilateral and contourlet d) NLM and contourlet

From the above tables it is found that among the spatial domain methods non-local mean filter removes more noise than bilateral filter due to its greater filtering clarity. By incorporating NSCT prior to bilateral filtering and non-local mean filtering gives much more visual information. The reason is that bilateral filtering incorporates a spatial filter apart from range filter which gives a smoothing effect. From Table III it is evident that preprocessing with transform domain method does not increase the processing time to much extent.

V. CONCLUSION

In this paper spatial domain, transform domain and hybrid domain methods for medical image denoising are compared. It was found that transform domain method used as a preprocessing step prior to bilateral filtering (hybrid domain) can effectively denoise the image. There is a significant improvement in PSNR and perceptual quality. Also the hybrid domain method requires lesser processing time.

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Analysis of Image Retrieval Using Linear Transformation Techniques

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Abstract- Every of us will have a large set of stored images such as scanned copies, multimedia files. Image retrieval is a process of finding similar images to that of query image or to find out to which database the query image belongs. Here we are using two linear transformation techniques Gabor-Walsh Wavelet pyramid technique and Curvelet transform 7method Feature vectors of each of the database images are extracted by applying these techniques, then by calculating Euclidian distance we find that to which database the query image belongs. The comparative analysis is done based on the FAR, FRR & TSR parameters.

Index Terms- CBIR (content based image retrieval)FAR (False Acceptance Rate), FRR (False Rejection Rate), GWWP (Gabor Walsh & Wavelet Pyramid), TSR (True Success Rate).

I. INTRODUCTION

With the growing technology throughout the society, the digitized images, visual objects multimedia files are also increasing. These huge amounts of images require novel methods to search and access the images. Advances in medical and other technologies have provided extensive storage, image generation, and transmission abilities. Because of increase in the usage of these digital images in various fields, researchers are focusing on new methods by which images can be easily, quickly and precisely retrieved and accessed from large databases. Technology is improving with the age and the usage of digital images is increasing in various fields like science, geography, engineering, architecture, advertising, design, publishing, and medicine. Hence the retrieval mechanism and processing of the desired image from the database has become important. Since many years researchers are working on different image retrieval processes. The two basic methods which are used for image retrieval are Text based image retrieval and Content based image retrieval [6].

Content Based image retrieval is a process in which the similar images are retrieved from huge databases. Various visual features like shape, color, texture, and spatial layout which are extracted using different techniques are used to prepare different databases. With increase in the volume of databases, researchers are trying to find faster method of retrieving similar images. Hence the research focus has been shifted from low-level feature extraction algorithms to the high level visual feature extraction mechanism. To develop better content based image retrieval system, it is important to work on various processes involved in retrieval like feature extraction, image segmentation, image decomposition and similarity matching techniques[6]. Sometimes it is very difficult and time consuming to give a proper name to an image, and sometimes a lot of information is needed to properly describe an image. It means people manually need to number the images and this is very time consuming and inefficient. To avoid this traditional manual work, a CBIR system performs retrieval based on feature vectors extracted from each of the database image and the query image. Most CBIR systems work in the same way. These feature vectors are then stored. The feature vector of query image is matched against each of the database feature vectors and then the similar images are retrieved.

Content based image retrieval system is an emerging field in image retrieval from a large database. Even though this area has been explored for decades, there is still a very huge scope for achieving the accuracy of human visual perception in distinguishing images. The CBIR system can be improved by working more on the indexing, retrieval design and feature extraction mechanism and to reduce the time better clustering approach with image decomposition and feature extraction can be used. To achieve more accurate and fast result better methods of image decomposition can be applied.

Linear transformation is the process of mapping between two modules that preserves the operation of addition and scalar multiplication. The linear transformation techniques are the fundamental of image processing field. Here we have used two of the linear transformation techniques GWWP and Curvelet transform to perform image retrieval process.

II. LITERATURE SURVEY

The basic fundamentals of content based image retrieval (CBIR) are divided into three parts, multidimensional indexing, feature extraction and retrieval systems design [1]. The proper grouping of the generated large amount of images by both military and civilian is needed, so as efficient browsing, searching and retrieval takes place. The two major approach of image retrieval, text based image retrieval and visual based image retrieval. The text based image retrieval is a very popular framework of image retrieval. There are two major difficulties. The first trouble is when there is huge set of image collection is present then large number of workers are required to manually number each image. The other trouble is resulted from the rich content present in the images and the subjectivity of human visual perception. That is, for the same image content different people may recognize it differently. The perception subjectivity and annotation impreciseness may cause unrecoverable mismatches in later retrieval processes. To overcome these difficulties, content-based image retrieval was established. Instead of being numbering annotated by text- based key words;

images would be indexed by their own visual content, such as texture color. The fundamental architecture of a CBIR system is shown in Figure1. the feature vectors of all database images are extracted and saved in the feature matrix. Then the test image is entered and it feature vector is extracted; then it is matched with all the database features using similarity measures. The similar images are retrieved.

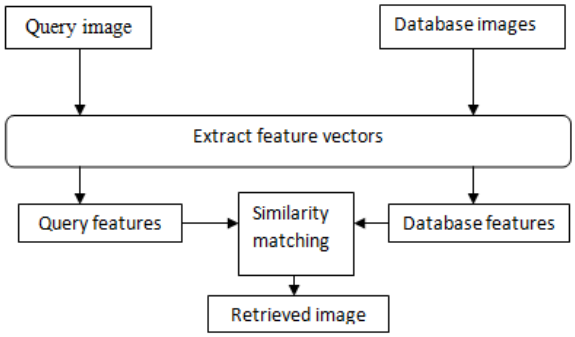

Fig 1: Image retrieval process

To make the content-based image retrieval truly scalable to large size image collections, efficient multidimensional indexing techniques need to be explored. Main challenge in such an exploration for image retrieval is high dimensionality. The best way to index is to reduce the dimensionality and then indexing the images. Clustering is a powerful tool in performing dimension reduction. The clustering technique is used in various disciplines such as pattern recognition, speech analysis and information retrieval. Normally it is used to cluster similar objects (patterns, signals, and documents) together to perform recognition or grouping. This type of clustering is called row-wise clustering. However, clustering can also be used column-wise to reduce the dimensionality of the feature space. But blind dimension reduction can be dangerous, since information can be lost if the reduction is below the embedded dimension. To avoid blind dimension reduction, a post-verification stage is needed. The Figure 2 shows the process of indexing of images. When a query is posed in the high level phrase, the data is retrieved from the database. Image indexing is done to improve the retrieval mechanism. The indexing helps retrieving the images when a query is posed by the user.

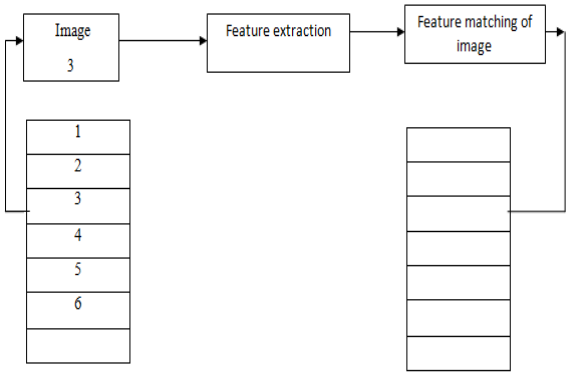

Fig 2: Indexing process

III. Brief Explanation of Proposed Methods

1) Gabor Walsh and Wavelet transform

Gabor filters are the bandpass filters which are used for feature extraction and stereo disparity estimation in image processing. Multiplication of Gaussian envelope function and complex oscillation gives impulse response of these filters. Gabor showed that these elementary functions minimize the space (time)-uncertainty product. By extending these functions to two dimensions it is possible to create filters which are selective for orientation. Under certain conditions the phase of the response of Gabor filters is approximately linear. This property is exploited by stereo approaches which use the phase-difference of the left and right filter responses to estimate the disparity in the stereo images. It was shown by several researchers that the profile of simple-cell receptive fields in the mammalian cortex can by described by oriented two-dimensional Gabor functions. Because of the multiplication-convolution property (Convolution theorem), the Fourier transform of a Gabor filter's impulse response is the convolution of the Fourier transform of the harmonic function and the Fourier transform of the Gaussian function. The filter has a real and an imaginary component representing orthogonal directions. The two components may be formed into a complex number or used individually.

Complex

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right) exp\left(i\left(2\pi\frac{x'}{\lambda}+\psi\right)\right)$$

Real

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right) cos\left(\left(2\pi\frac{x'}{\lambda}+\psi\right)\right)$$

Imaginary

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right) sin\left(\left(2\pi\frac{x'}{\lambda}+\psi\right)\right)$$

Where $x' = x\cos\theta + y\sin\theta$ & $y' = -x\sin\theta + y\cos\theta$

In this equation, λ represents the wavelength of the sinusoidal factor, θ represents the orientation of the normal to the parallel stripes of a Gabor function, ψ is the phase offset, σ is the sigma/standard deviation of the Gaussian envelope and γ is the spatial aspect ratio, and specifies the ellipticity of the support of the Gabor function.

The size of the feature vector plays an important role in the retrieval of images. The Walsh matrix is a set of m number of rows and can be denoted by W_k for 0,1,…….,m-1.The Walsh matrix can have number of properties. Walsh transform matrix row is the row of the Hadamard matrix specified by the Walsh code index, which must be an integer in the range [0,..., m-1]. For the Walsh code index equal to an integer j, the respective Hadamard output code has exactly j zero crossings, for j = 0, 1,..., m-1.

The combination of Gabor-Walsh and the wavelet (Haar wavelet) helps us to extract features more efficiently and matching of query image with database will be more accurate than other available methods. This technique is implemented in this project.

2) Curvelet transform

Actually the ridgelet transform is the core spirit of the curvelet transform. In 1999, an anisotropic geometric wavelet transform, named ridgelet transform, was proposed by Candes and Donoho. The ridgelet transform is optimal at representing straight-line singularities. Unfortunately, global straight-line singularities are rarely observed in real applications. To analyze local line or curve singularities, a natural idea is to consider a partition of the image, and then to apply the ridgelet transform to the obtained sub-images. This block ridgelet-based transform, which is named curvelet transform, was first proposed by Candes and Donoho in 2000. Apart from the blocking effect, however, the application of this so-called first generation curvelet transform is limited because the geometry of ridgelets is itself unclear, as they are not ture ridge functions in digital images. Later, a considerably simpler second-generation curvelet transform based on frequency partition technique was proposed. The second-generation curvelet transform has been shown to be a very efficient tool for many different applications in image processing. The overview of the curvelet transform is shown below for four step.

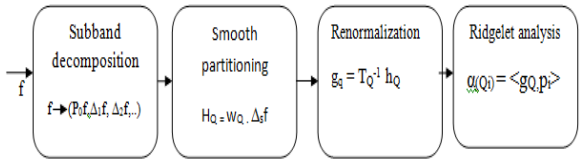

Fig 3: Curvelet transform

The Curvelet transform is a multiscale directional transform that allows an almost optimal nonadaptive sparse representation of the object with edges. The brief explanation of each steps is discussed below:

Subband decomposition step divide the image into several resolution layers. Each layer contains details of different frequencies. The object f is filter into subbands.

$$Q_{(s,k_1,k_2)} = \left[\frac{k_1}{2^s}, \frac{k_1+1}{2^s}\right] \times \left[\frac{k_2}{2^s}, \frac{k_2+1}{2^s}\right] \in \mathbf{Q}_s$$

Smooth Partitioning define a collection of smooth window $\mathbf{w_Q(x_1 , x_2)}$ localized around dyadic squares.

In Renormalization for a dyadic square Q, let $T_Q f(x_1, x_2) = 2^s f(2^s x_1 - k_1, 2^s x_2 - k_2)$ denote the operator which transports and renormalizes f so that the part of the input supported near Q becomes the part of the output supported near [0,1]×[0,1]. In this stage of the procedure, each 'square' resulting in the previous stage is renormalized to unit scale: $g_Q = T_Q^{-1} h_Q$ The ridgelet element has a formula in the frequency domain:

$$\hat{\rho}_\lambda(\xi) = \frac{1}{2}|\xi|^{-\frac{1}{2}}\left(\hat{\psi}_{j,k}(|\xi|)\cdot\omega_{i,l}(\theta) + \hat{\psi}_{j,k}(-|\xi|)\cdot\omega_{i,l}(\theta+\pi)\right)$$ where,

- $\omega_{i,l}$: periodic wavelets for $[-\pi, \pi)$.
- i : the angular scale , $l \in [0, 2^{i-1}-1]$: the angular location.
- $\psi_{j,k}$: Meyer wavelets for $\Re$.
- j : the ridgelet scale , k : the ridgelet location.

Each normalized square is analyzed in the ridgelet system:

- The ridge fragment has an aspect ratio of $2^{-2s}\times 2^{-s}$.
- After the renormalization, it has localized frequency in band $|\xi| \in [2^s, 2^{s+1}]$.
- A ridge fragment needs only a very few ridgelet coefficients to represent it.

The above steps are applied in sequence to get the curvelet transform of each data base images and also the test image. All the feature vectors are then saved and the Euclidian distance is measured between test and the database images and the least distance will indicate to which class it belongs to. Based upon this False Acceptance Rate and False Rejection Rate and TSR (True Success Rate) is calculated.

FRR= (True claims rejected/total true claims) X 100%

FAR= (Imposter claims accepted/total imposter claims) X 100%

TSR= (correct match / total images in database) X 100%

IV. Algorithm

i. Create a database of 2 set of images.
ii. Extract each image from first set of images in the database for the operation.
iii. Apply walsh transform for the extracted image and then apply gabor function and apply Haar transform for the first method. [for second method apply Curvelet transform steps at this stage]
iv. Extract each image from second set of images in the database for the operation and repeat the steps 3,4 and 5.
v. Obtain the query image for test.
vi. Repeat the steps 3, 4 and 5 on the obtained query image.
vii. Find the Euclidian distance between the query image and images in the database for both sets.
viii. The image set database which is having minimum Euclidian distance with the query image is the original database for the query image.

V. Results

1) FAR & FRR for GWWP method

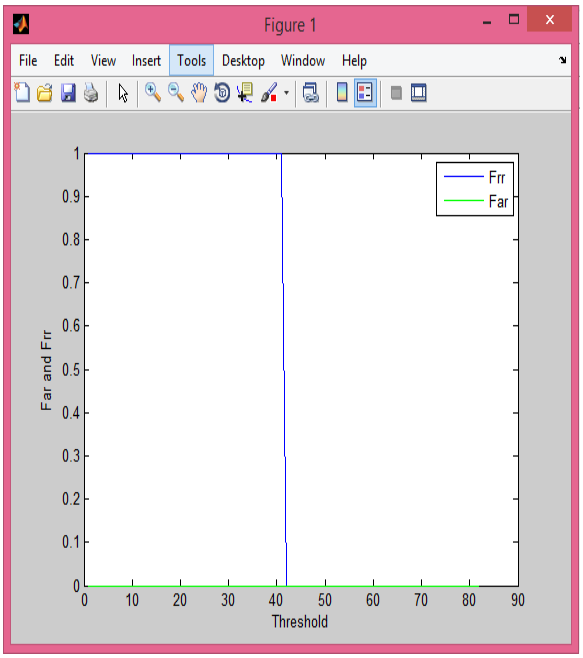

Fig 4: Graph of FAR & FRR values of GWWP

2) FAR & FRR for Curvelet transform

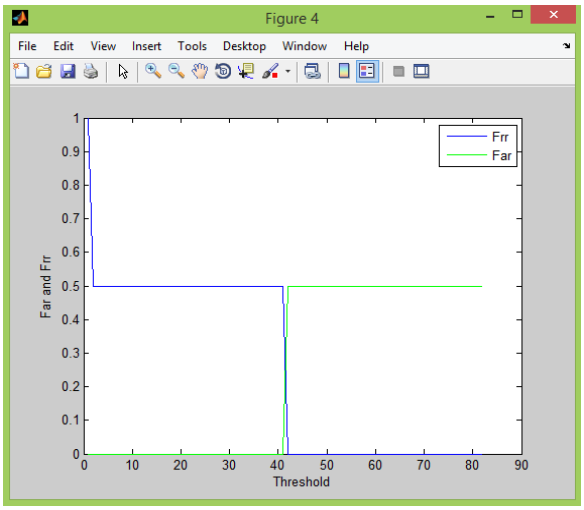

Fig 5: Graph of FAR & FRR values of Curvelet transform

3) Table for FAR, FRR & TSR values

i) Using GWWP method

Table I: FAR, FRR & TSR values of GWWP transform

Threshold	FAR	FRR	TSR (%)
1.0000	1.0000	0	11.8098
2.0000	1.0000	0	25.9003
3.0000	1.0000	0	58.8094
4.0000	1.0000	0	84.2387
5.0000	1.0000	0	89.0481
6.0000	1.0000	0	95.2800
7.0000	0.5844	0.0007	95.2800
8.0000	0.5773	0.0078	95.2800
9.0000	0.4941	0.0136	95.2800
10.0000	0.4175	0.0149	95.2800
11.0000	0.2935	0.0170	95.2800
12.0000	0	1.0000	95.2800
13.0000	0	1.0000	95.2800
14.0000	0	1.0000	95.2800
15.0000	0	1.0000	95.2800
16.0000	0	1.0000	95.2800
17.0000	0	1.0000	95.2800
18.0000	0	1.0000	95.2800
19.0000	0	1.0000	95.2800
20.0000	0	1.0000	95.2800

ii) Using Curvelet transform

Table II: FAR, FRR & TSR values of curvelet transform

Threshold	FAR	FRR	TSR (%)
1.0000	1.0000	0	12.8098
2.0000	1.0000	0	26.9003
3.0000	1.0000	0	59.8094
4.0000	1.0000	0	86.2387
5.0000	1.0000	0	90.0481
6.0000	1.0000	0	97.2800
7.0000	0.5785	0.0034	97.2800
8.0000	0.5553	0.0131	97.2800
9.0000	0.4899	0.0141	98.2800
10.0000	0.3272	0.0152	98.2800
11.0000	0.1452	0.0187	98.2800
12.0000	0	1.0000	98.2800
13.0000	0	1.0000	98.2800
14.0000	0	1.0000	98.2800
15.0000	0	1.0000	98.2800
16.0000	0	1.0000	98.2800
17.0000	0	1.0000	98.2800
18.0000	0	1.0000	98.2800
19.0000	0	1.0000	98.2800
20.0000	0	1.0000	98.2800

VI. Conclusion

The time taken to execute GWWG code in MATALB is 207.733sec and for Curvelet it is 2098.29566sec. The Curvelet takes a lot of time for execution but if we save the feature vectors extracted during the first execution; we can get the results within few seconds in the next run of the program. As we can see the values of FAR, FRR & TSR of each of the methods in the above tables; we can make out that there is no huge difference in FAR

& FRR values. But by looking at the TSR values we can see that for Curvelet True success rate (TSR) value is greater than GWWP. Curvelet TSR value is 98% which is 3% greater than that of GWWP. Hence we can say that Curvelet is better technique to map the image successfully. Curvelet is very good in detecting the smallest of the small curves in the image. Hence it is better to go for curvelet transform.

The application of these methods can be found in forensic sciences, military applications where the database of culprits are maintained and to match the evidences to these databases; we can use these methods effectively. The application is also found in textile industry, medical diagnosis, art collection and many more.

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Sound levels assessment in an ecotourism destination: A case study on Binsar Wildlife Sanctuary of Indian Himalayan Region

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Abstract- Travelling to relatively pristine or natural areas is rapidly growing among visitors worldwide, which not only stimulates impacts on landscape and its wildlife but affects the visitors' experience -as well. Considering sound associated with anthropogenic activities as an impact causing indicator, the present study reports and discusses the result of monitoring sound levels in Binsar Wildlife Sanctuary, an ecotourism destination situated in mid of Kumaon Himalayas. The equivalent sound pressure level (Leq) was determined both in presence and absence of visitors, at key locations within high usage tourism sites of different zones of Binsar. The results indicated that the ambient noise level remains within the prescribed standard limit being stable around 50 dB in the absence of visitors, which increases up to 70dB in the presence of visitors. Using L_N statistics five sites reported to exceed 50 dB of sound level for 10% of the recorded time. The outcome suggests non-violation of standard limits within sanctuary; however, it necessitates control of visitor activities by sanctuary management at locations where animal habitats exist, considering increasing visitation.

Index Terms- Ecotourism; Himalayan region; impacts; noise-monitoring; visitors; wildlife

I. Introduction

Ecotourism stands on the cornerstones of communities, conservation and interpretations (TIES, 2015) and is practiced mainly to minimize the realised consequences of conventional tourism. Travelling as an activity to explore new places has become a major interest of people worldwide. However, with any human activity, also come several other by-products that can affect the local environment of the place. Even in case of eco-friendly tourism, frequent visitation by visitors including their activities is often seemed to endanger the biodiversity of environmentally fragile areas. Such disturbances when occur constantly may affect destinations integrity and subsequently visitors own experience.

Ecotourism impacts

Locations where impacts are most obvious include alpine areas, coastlines, islands, lakes, and habitat areas (Farrell and Runyan, 1991). Ecotourism acts in both ways as an agent of increasing disturbances on natural ecosystems if not happening responsibly and the same time as a medium of salvation for the conservation of these regions (Lowman, 2004). According to Boo (1999) the theoretical impacts of ecotourism include potential costs (environmental degradation, economic inequity and instability, and negative socio-cultural changes) and potential benefits (generation of funds for protected areas, creation of jobs for people who live near protected areas, and promotion of environmental education and conservation awareness) as a result of which "on one side the opportunities in ecotourism advance our efforts and on the other side, problems with ecotourism hinder our work". Ecotourism can have direct and indirect effects on the environment and biodiversity of any ecosystem. Direct effects have a negative impact directly on the floral and faunal species, communities and populations by influencing their feeding, reproductive and social behaviours (Medina, 2005) whereas, ecologically significant indirect effects are not as conceivable as the direct effects but can result in secondary impacts including long-term damage to terrestrial and aquatic wildlife habitat and ultimately their survival. For example a study on whale watching by boat along the coast of North America identified the disruptive effects on feeding and separation of calves from mothers, interference with the sound-communication systems of whales (Edington and Edington, 1986), similarly, decreased feeding time and increased alert behaviour in response to the tour boats (Galicia et al. 1997) were observed with American flamingos in Yucatan, Mexico. Impact of human visitation to nesting sites of Megallanic penguins at Punta Tombo, Chubut, Argentina causes changes in behaviour in both adults and chicks, such as higher predation of nests, lower hatching rates of eggs, increased abandonment of nests, retarded chick growth and higher mortality rates (Fowler, 1999).A study on water bird communities in the Ding Darling National Park identified the difference between behaviour of water birds that used the reserve as a feeding and breeding ground to those species that used it as an over-wintering site. The migratory birds were clearly unaccustomed to the humans and fled at the mere site of humans and cars (Klein et al. 1995). One of the well-designed experimental studies is conducted on the mountain sheep at Sheep River Wildlife Sanctuary, south-western Alberta (MacArthur, 1982). Such studies highlight the role and impact anthropogenic sound and activities have on animal behaviour, suggesting that ecotourism is often one component of conservation and development programs, but it is unknown that where does it actually intersects with conservation and development work.

Factors influencing the impact of noise on wildlife

The physical properties of sound and the environment, in which it is generated and perceived; the threat-response characteristics of faunal species and the situational factors such as habitat type, lifecycle stage and previous exposure to noise or

disturbance as reported by Harbrow et al. (2011) form important factors controlling the responses of wildlife to noise. Also, the sensitivity of animals to sound differs from that of humans in both the level of sound and the range of frequencies that they can detect (Bowles 1995). It indicates that animals can potentially be sensitive to and impacted by sounds that seem quiet to human ears or to which humans are unaware.

Need for monitoring impacts

According to Drumm and Moore (2005) 'careful planning and management steps' are crucial before designating a site as an ecotourism destination. But according to Rome (1999) while initiating such projects 'impacts are rare or minimal and initial symptoms of negative impacts become difficult to perceive, especially when there is little or no data on baseline conditions to compare to'. He further comments, that "in developing countries, comprehensive baseline surveys are rarely conducted at the outset because time, budgets and technical resources are limited and the needs are not perceived. Often, it is only when severe impacts are manifested that questions are asked and management actions are deemed necessary". Buckley (1999) further argues that "reducing visitor number, limiting their activities, 'hardening' the environment, or making it more resistant to impacts, is difficult and requires increased budgets for infrastructure and subsequent maintenance", suggesting that 'if impacts are measured progressively from the start and actions taken early on to reduce them, less or no harm might occur". Also, with 'the establishment of a monitoring program at the outset of project development and the gathering of baseline information allows for early warning of impending changes, enabling timely management programs to be put into place'.

Simultaneously, intensity of use, highly related to impact, forms a primary factor in management (Farrell and Runyan, 1991). Following such background, the present paper focuses on determining the sound pressure levels generated due to visitor noise within an ecotourism destination, in order to strengthen the existing baseline data for future long term monitoring of the impacts of sound on wildlife, conducted in one of the protected areas of the Indian Himalayan Region (IHR).

II. STUDY AREA

Binsar Wildlife Sanctuary (hereafter Binsar) lies in the Kumaon administrative division of Uttarakhand, India, at an altitude varying between 1500 – 2500 metres and offers the view of the great Indian Himalayan peaks namely - Nanda Devi, Trishul and Panchachuli, presenting a unique nature experience to its visitors. The geographic location of Binsar is 29° 39′ N–29° 44′ N latitudes and 79° 41′ E–79° 49′ E longitudes and covers an area about 47 km², with a core area of about 4km^2 (Figure 1). Mean monthly temperatures range from 2.2° C to 15.5° C during winter and from 17.2° C to 26.6° C during summer. Average rainfall was reported approximately 1,200 mm by Sharma et al. (1999). It was declared as a Reserve Forest in 1880 and was upgraded as Wildlife sanctuary on 25th May 1988. Throughout the sanctuary, the terrain is hilly and characterized by deep ravines, crevices and elevated ridges. Binsar represents the Himalayan Moist Temperate Forest of India (Champion and Seth, 1968). The forested hilltops and slopes are covered by chir pine (*Pinus roxburghii*), banj oak (*Quercus leucotrichophora*) and rhododendron (*Rhododendron arboreum*) as pure or mixed stands (Majila et al.2005; Kala and Majila 2013).

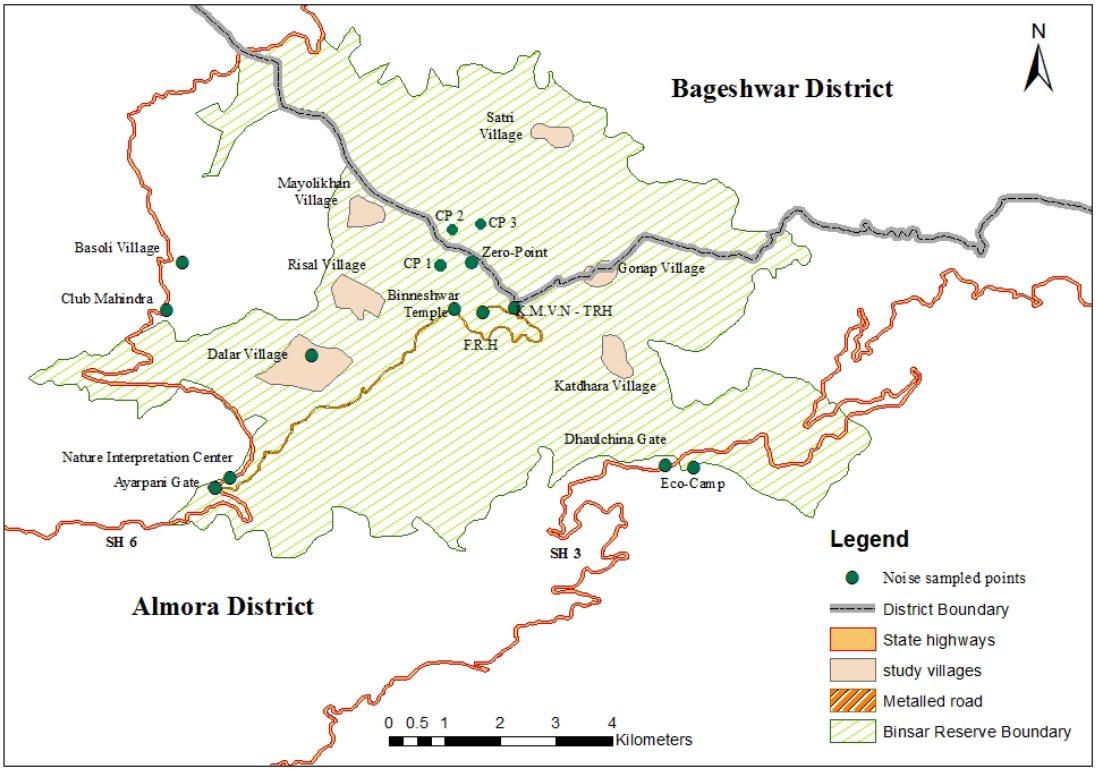

Figure 1: Location map for Binsar WLS showing sampling sites for sound levels assessment

The charismatic wildlife species inhabiting Binsar is the Leopard (*Panthera pardus)* and is the top predator here. Other predators reported by Khan et al. (2000) and Majila and Kala (2010) include jungle cats (*Felis chaus*), major ungulate species include gorals (Nemorhaedus goral), barking deer (*Muntiacus muntijak*), serows (*Capricornis sumatrensis*), and wild boar (*Sus scrofa*), other mammal species in the sanctuary are common langurs (*Presbytus entellus*), rhesus macaques (monkey; *Macaca mulatta*), Himalayan black bears (*Selenarctos thibetanus*), and jackals (*Canis aureus*). The sanctuary also harbors 166 species of birds (Uttarakhand Forest Department, 2014), including black francolins (*Francolinus francolinus*), koklass pheasants (*Pucrasia macrolopha*), kaleej pheasants (*Lophura leucomelana*), hill partridges (*Arborophilla torqueola*), great barbets (*Megalaima virens*), hawk eagles (*Spizaetus nipalensis*), Himalayan griffons (*Gyps himalayensis*), lammergeiers (*Gypaetus barbatus*), and yellow-billed magpies (*Cissa flavirostris*).

III. RESEARCH DESIGN AND METHODS

Approach to measure sound

Sound measurement without response measurement, referred to as 'acoustical approach' (Gramann, 1999) is common in environmental and workplace monitoring and have several advantages. Such measurement using scientific instruments is a recent development in recreational settings where the area of concern usually relates to short-term exposure and reduction in the quality of visitor experience, rather than health effects from ongoing sound exposure. 'Percentage of time audible' acts as a useful metric to describe how long sounds are heard, particularly at the extremes of recording duration (Miller, 2008). Use of such metric however makes interpretations on sound simple. For example, if human-produced sounds are audible for 5% of the time, it is likely that most people will judge such a soundscape as relatively pristine or natural. Conversely, if human-produced sounds are audible 50–90% of the time at some location, then people would probably decide that it is not a place to expect solitude or escape from the sounds of civilization.

The present study aims to determine the sound levels prevailing in high visitor usage sites through a control impact design and check whether the ambient noise level remains within the prescribed day time noise level standard limit, as decided by the Noise Pollution (Regulation and Control) Rules, 2000, Government of India. According to which the forest area would fall under (D) Silence Zone as mandated by Law. To address this, first we determined the visitor attraction sites within the different zones of Binsar, where there is maximum visitor footfall thereafter we recorded the sound levels in different seasons with and without the presence of visitors in these zone specific sites. Preliminary field observation followed by quantitative measurement in key locations, accessed through snow-ball sampling was employed to determine the aforementioned objectives.

Data collection

Binsar remains open to its tourists throughout the year and consists of peak and non-peak seasons. Firstly, these seasons were identified and confirmed from the visitor record books present at the main sanctuary gate and months decided for conducting measurements. Secondly, the entire sanctuary was explored to mark the most commonly visited sites (high-use zone) within the sanctuary using GPS. Personal observations supported by sanctuary staff interaction yielded the selection of study sites. Identification of visitor attractions and accompanying activities within the sanctuary supported in determining visitor usage pattern within the sanctuary, based on snowball sampling method. Priority was given to sites that were observed to be occupied at most during peak season. Thus field observations for identifying visitors' usage pattern assisted for choosing representative sites within each zone, wherein the presence and absence of visitor factor was addressed, as control and impact, while making acoustic measurements. Thirdly, at these sites measurements were made using a basic type 1 Integrating Sound level meter with free-field microphone supplied by the parent university. The Cirrus Research plc, basic unit, CR:811A integrating averaging sound level meter was placed away from facades and obstacles at 1.5 meter above the ground level using the tripod (Bruel and Kjaer, 2000) and run for one hour duration each (anytime during day between 6am to 7pm, as per the availability and activity of visitors at the key locations). Sound monitoring at each site, both in the presence and in the absence of visitors were made for summer peak and non-peak seasons for the year 2014.

Sampled Sites in each zone

The summer peak-season lasts from April to June month and winter peak-season from October to November month, with patches of both foreign and domestic tourists visiting throughout the year. The summer peak month decided for taking peak season readings was May whereas, in the month of July, non-peak season readings were obtained. Based on the preliminary observations 14 sites in four different zones of Binsar were selected for conducting sound measurements in presence and absence of visitors.

Data analysis

The responses were recorded in a fast mode, A-weighting and 30-90 range set-ups. Equivalent sound pressure level (L_{eq}) i.e. 'a preferred method to describe sound levels that vary over time, resulting in a single decibel value which takes into account the total sound energy over the period of time of interest' (EPA, 2003; Hansen, undated; Noise measurement manual, 2013 and Whitman, 2012) were recorded mainly besides determining L_N statistic readings. The L_N Statistics, which tells about the level exceeded for N% of the recorded time (Whitman, 2012), along with other standard measurements were downloaded using Deaf Defier 3.3 software for further analysis. Graphical representations showing trends and comparisons within and between different sites were prepared using MS Excel. Further, a number of limitations confined the study results i.e. i) only day time sampling was permitted within the sanctuary, as of the fear of wildlife during night time ii) instrument limitations; and iii) wind and natural sound interference.

IV. RESULTS

Preliminary Findings

Zoning within Binsar Wildlife Sanctuary

Zone permits focus on specific areas in order to accommodate different management needs as per the requirement of the area. Within Binsar WLS, different areas catered different needs and demands from diversified sections of the society. Therefore, to meet these requirements zonation of the sanctuary was framed legally (Binsar management plan, 2000-2010) in a most scientific, sustainable and logical manner by the regional forest department in consultation with the villagers and concerned stakeholders as follows:

I. Core zone – It is actually a mini core zone (4km^2) that comprise forest areas of strategic importance, mainly the different oak tree species along with its rich under-storey biodiversity. Extraction of forest produce in form of rights and concessions is seldom allowed.

II. Tourism zone – It comprise of the motor road passing through Binsar compartments, which terminates at the forest rest house (hereafter FRH). From here a nature trail is made upto Jhandi Dhar (Zero-point), highest point of Binsar WLS, from where a magnificent view of mighty Himalayas is seen. All resort accommodations and four villages lay within this zone, that provide as tourist attractions.

III. Buffer zone – Rest of the areas not covered in above two zones fall under the Buffer zone. These areas are open for regulated grazing and address the rights and concessions requirement of villagers. At present there are two entry gates for visitors into Binsar WLS, one at Ayarpani, and other at Dhaulchina, which lay within this zone along with two villages.

IV. Eco-development zone – Covers the area up to a 5 km from the boundary of Binsar WLS. It comprise of a several villages and few resorts for visitor accommodations.

Visitor attraction sites and visitor activities

Binsar attracts an increasing number and diversity of visitors based on its natural, cultural and historical assets. Starting from the Ayarpani Gate (Figure 1), i.e. where main sanctuary reception exists, both visitors and vehicular sounds are heard as a result of their registering process and their visit to the nature interpretation centre or the souvenir shop that are situated closely. From here, a single 13 km long, one-way, motor able road runs into the sanctuary up to a government run Forest Rest House. It forms the only road within the sanctuary and rest all paths are designated as trekking trails where no vehicular movement is permitted. The designated trekking trails are namely, Trishul trail, Nanda Devi trail, Panchchuli trail, Gailekh's trail and Dhaulchina trail along with many unnamed, created by villagers for short-cuts and other conveniences. At the Dhaulchina Gate, there is a comparatively smaller reception without a nature interpretation centre and the trail starts from the gate itself. Also, vehicular safaris are not practiced within this sanctuary.

There are five privately owned estates in Binsar, one forest rest house, an eco-lodge and Kumaon Mandal Vikas Nigam (KMVN-tourist rest house) that offer visitor accommodation. The five privately owned Estates are i) Khali estate; ii) Mary Budden estate; iii) Nanda Devi; iv) Binsar Retreat and v) The Grand Oak Manor. At present there are six villages within sanctuary, which are not the revenue villages but small hamlets namely Dalar, Risal, Mayolikhan, Satri, Gonap and Katdhara. There are eight home-stays distributed within five villages out of which five home-stays are a part of Village Ways Company, community-based tourism initiative and three are privately owned home-stays. There is an above 100 years old Shiv Temple called as Binneshwar Mahadev Temple, where both villagers and visitors come to worship and perform religious ceremonies. The ecotourism activities permitted within Binsar are nature trek, photography, sunrise and sunset views at specific view-points, wildlife sightings, bird-watching, Himalayan view, visiting nature interpretation centre and experiencing home-stay along with its related activities. It was observed that the 'zero-point' view-point was visited by nearly all Binsar visitors, as from this point the Greater Himalayan peaks can be observed. In order to arrive at this point, i.e. the highest point of Binsar called as the Jhandi Dhar Hill, visitors needs to trek two km approximately.

Visitor activities at these sites were observed to be accompanied by different intensities of sound ranging from a small whisper to a loud laughter. Clapping, shouting, screaming and conversations, from all age groups of visitors, were observed to prevail throughout their activity period, while on trail or standing at a view point. Through preliminary observations, it was observed that visitors arriving in groups or with family or friends seemed to make more sounds.

Visitor usage pattern

The high usage visitor sites found within the different zones of Binsar WLS are listed within Table 1.

Table 1: Visitor usage pattern and selected sites for sound level measurements

Zone (Site code)		Selected Visitor Usage Sites
Core (C1, C2, C3)		No visitor allowed
Tourism	(T1)	- Zero-point
	(T2)	- K.M.V.N-TRH
	(T3)	- F.R.H
	(T4)	- Binneshwar Temple
	(T5)	- Dalar Village
Buffer	(B1)	- Ayarpani Gate
	(B2)	- Interpretation Center
	(B3)	- Dhaulchina Gate
Eco-development	(ED1)	- Club Mahindra
	(ED2)	- Basoli village
	(ED3)	- Binsar Eco-camp

Out of the six within sanctuary villages, Dalar village was selected due to the following reasons, i) closely situated to the sanctuary road -that exists at trek of 1.5km, in comparison to

other villages; ii) wide and properly managed trail; and iii) it is the first village that comes on the way while entry from Ayarpani gate. Three sites frequently visited or crossed by visitors in the eco-development zone were selected for the study based on convenience.

Final Readings

Sound levels monitoring

Based on the preliminary visits to sanctuary and adjoining areas, it was decided to set-up the sound level meter at 30-90 dB range, fast and at 'A' weighting mode. As visitors are not allowed within the core zone, impact readings were not obtained, but using control readings Leq values were compared with other sites in different zones. The recorded day-time control readings (Figure 2) at sampled sites within all zones of Binsar lie between a Leq of 30 dB to 50 dB that are in compliance with the standard silence zone limits. Whereas, in presence of visitors Leq was observed to fluctuate between a range of 40 dB to 70 dB, which can be clearly considered as non-silence. Significantly large difference exists in Leq values in absence and presence of visitors except in both the sampled villages. Sound level in Dalar village recorded control Leq value of 38 dB in visitor absence and 40.2 dB in visitor presence (impact). Whereas in Basoli village though both control (48.9 dB) and impact (49.6 dB) readings were more than the Leq values for Dalar, the difference between them was quite low i.e. 0.7dB. Highest Leq in different zones were reported to be: at zero-point in tourism zone, at Ayarpani gate in buffer zone and near EDC1 in eco-development zone.

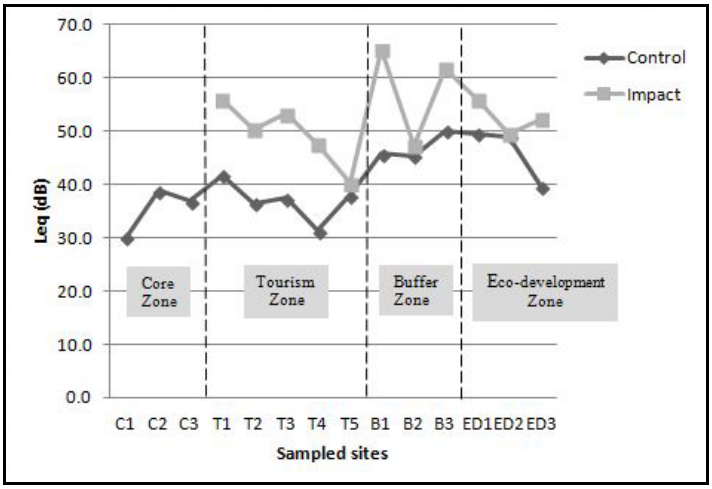

Figure 2: Leq (dB) in presence (impact) and absence (control) of visitors at sampled sites in four zones of Binsar WLS

Within tourism zone where most of the tourist activity concentrates showed variation in Leq values for 5 different sites, which when interpreted using trend line (Figure 3) yield a best fit line with a R^2 value of 0.9111; suggesting a good fit to line for the recorded data. Also, within this zone a positive correlation between the two variables – altitude and Leq was determined that suggests high impact activity concentrates at the zero-point (2406 m) in comparison to lower altitude visitor attraction sites.

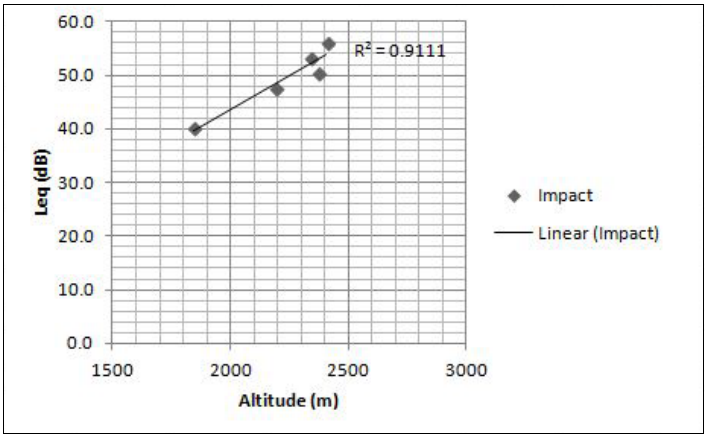

Figure 3: Trendline for equivalent sound levels (dB) within tourism zone of Binsar WLS

Further, on analysing L_{10} statistic for the recorded data (Figure 4), it was observed that at five sites, namely, zero-point, K.M.V.N-tourist rest house, Ayarpani gate, Dhaulchina gate, EDC 1 and at EDC 3, 50 dB of sound was exceeded for 10% of the recorded time (1 hour), while taking impact readings. The data also suggests that 40 dB of sound was exceeded for 10% of the recorded time while taking control measurements at both buffer and eco-development zones.

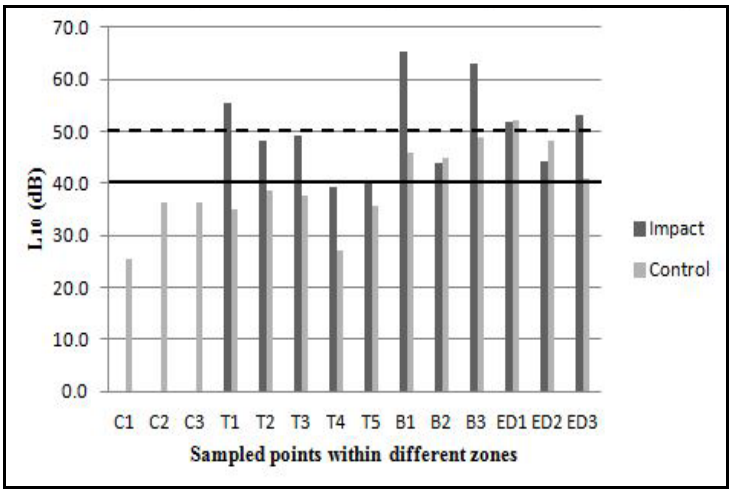

Figure 4: Sound Levels exceeding 10% of the time in presence (impact) and absence (control) of visitors at sampled sites in four zones of Binsar WLS

The reason for getting higher sound levels at buffer and eco-development zones even while taking control measurements owes to the presence of the State Highway 6 and State Highway 3 passing closely through the sanctuary both at the south-west and south-east direction to Binsar. However, the recorded sounds crossing 50dB of standard limit by CPCB, in which human-produced sounds are emphasised upon, are audible or exceeded for only 10% of the recorded time; making it likely that most people will judge such a soundscape as relatively pristine or natural.

V. DISCUSSION

Overall results convey that the ambient noise level remains within the prescribed day time noise level standard limit i.e. around 50 dB in Binsar WLS, in visitor absence. However the ambient sound level increases (up to 70dB) in presence of visitors owing to their different activities and its accompanying sounds, like making calls, whistling, laughter, screaming, clapping or any type of conversation. In support, according to Karp and Root (2009) an average noise level (50 db), the highest recorded noise level (60 db), a negative control (no noise), and a positive control (70 db) determined from five group of tourists, were further used to observe the Hoatzine bird response, where flight initiation distance and agitation initiation distance were used as metrics to quantify Hoatzins' responses to each noise level. The study reported ecotourist conversation as a negative stimulus to Hoatzins and suggested that in order to have the best chance of seeing birds (Hoatzins, in their case) at a short distance and minimizing potentially negative disturbances, ecotourists should cease all conversation and that, silence is probably the best strategy when looking for many wildlife species. Here, in case of Binsar, where bird-watching comprises of the main ecotourism activity, was observed to be performed with whistling and making calls, which may result in a similar outcome, but need to be tested experimentally.

Villages within or outside the sanctuary are occasionally visited by visitors mainly interested in experiencing village lifestyle, which forms a major attraction for foreign visitors especially. Altitude, natural surroundings and road network are responsible factors for inter-village sound value differences, whereas numbers of visitors affect the intra-village control and impact sound values in Binsar case. Vehicular sounds are comparatively not felt within the tourism and core zones, but impact greatly within the buffer and eco-development zones Lynch et al. (2011), in support state that 'a large percentage of the noise sources in national parks (such as highways or commercial jet traffic) originates outside park boundaries and beyond the management jurisdiction of national park services, indicating that opportunities to experience noise-free intervals are disappearing throughout in United States'. Remote location and no electricity positively impact the natural setting of Binsar. It can be supported by the fact that there are no generators within sanctuary that add to noise pollution. In support to this, a study conducted in Bandipur Tiger Reserve in Karnataka (Swarna, 2013) reported that due to generators a maximum of 82.2 dB of noise was generated, that significantly exceeds the permissible sound levels within a protected area. Further the noise pollution created by jeep safaris, ranged between 59 dB to 80 dB, an activity not present within Binsar currently. In total the visitor sounds were not the only sources responsible for significant differences between the control and impact values obtained at a specific site, but were subjected to other sounds like leaf rustling, nearby located natural spring water sources and vehicular sounds (honking and engine noise), which needs addressing while monitoring impacts. Several authors also report limitations of using acoustical approaches, like the equipment cost, lack of standards for preserving recreational experiences or the well-being of wildlife and instrument sensitivity to detect low levels of noise (Kariel, 1990). Besides this, failure of instrument to discriminate between natural and non-natural sounds, and wind interference at relatively low wind speeds also tends to affect the readings. Natural sounds, such as birds, frogs, insects, waterfalls, wind and rain, may be relatively loud and this can add complexity to monitoring (Miller 2008).

VI. CONCLUSION

Physical characteristics of a sound, when it reaches the listener, are only part of a wide range of factors that influence the response of humans or wildlife to that sound. Obtained results, however, do not violate the prescribed standard limits extremely but indicate priority high tourism usage sites that can impact the sensitive wildlife habitats of Binsar region; making it an important consideration for the sanctuary management staff. This particular study, a part of ongoing research to monitor environmental impacts of ecotourism in Binsar, can serve as pilot study to indicate the presence of some interesting sound level patterns, but cannot serve to show the full effects ecotourism has on the forest or wildlife. The study can be extended to know the consequences that noise can have on the environment, animal behaviour and reproduction. Impact monitoring conducted both longitudinally and cross-sectional, periodically, can only help ecotourism survive sustainably; otherwise will only add pressure on our existing pristine natural areas of ecological importance.

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Radiotherapy Induced Xerostomia in Head and Neck Cancer Patients

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***Abstract*- Introduction:** Head and neck cancers constitute 5% of all cancers worldwide with an annual incidence of about 5,00,000 cases of which two-thirds are locally advanced. Radiotherapy with or without chemotherapy forms an integral part of the multimodal management. Seven to eight weeks treatment is accompanied by its acute & late reactions, of which xerostomia is one of the major complications of Radiotherapy.

With concurrent chemo-radiation, there is an increased incidence of salivary gland dysfunction (by about 70%) when compared with radiation alone. Inadequate salivary function creates multiple complications, including dental caries, a propensity to oral infections, sleep disturbances, oral pain, and difficulty talking, chewing and swallowing. Xerostomia has a profound negative impact on quality of life.

Dose-Response: The degree of permanence and severity of xerostomia directly correlates with the amount of radiation dose delivered to the salivary glands.

Measurement of Xerostomia: The Visual Analogue Scale, Zimmerman Xerostomia Questionnaire, LENT SOMA (Late Effect of Normal Tissues Subjective Objective Management Analysis) Scale, Salivary Gland Secretory Ratio (SGSR), determined by dynamic salivary 99^{m}Tc scintigraphy are some of the methods to find and grade the severity of xerostomia.

Treatment: The goal of treatment is the provision of moisture and lubrication by stimulating functional glandular tissue or by salivary replacement with oral lubricating agents. Interventions include sialogogues, antibacterial mouthwashes, topical fluorides, oral buffering products, artificial saliva or moisturizing sprays or rinses, and remineralizing products.

Prevention: Newer radiotherapy techniques like IMRT are being used to minimize the xerostomia. Drugs like amifostine and pilocarpine have been shown to increase salivary flow when used concurrently with Radiation therapy. Surgical transfer of submandibular gland to submental space (Glandulopexy) is another strategy employed to prevent xerostomia.

Conclusion: Xerostomia is important acute and late sequelae of radiation therapy leading to lot of patient anxiety and morbidity. The long-term impact of the newer techniques of Radiotherapy like IMRT, IGRT or Adaptive RT, newer drugs, acupuncture, gene therapy and alternative treatments is yet to be discovered.

***Index Terms*-** Xerostomia, Radiotherapy, Head and neck cancer, Saliva, Amifostine, Pilocarpine

I. Introduction

Head and neck cancer mainly comprises squamous cell carcinoma of mucous membrane of upper aerodigestive tract. Head and neck cancers, among the 10 most frequent cancers in the world, constitute 5% of all cancers worldwide with an annual incidence of about 5,00,000 cases of which two-thirds are locally advanced. Radiation therapy forms an integral component of the multimodal management of the disease. A definitive course of radiation therapy in head and neck carcinoma extends for about 6-7 weeks and is accompanied by its acute & late reactions. [1]

Xerostomia describes both the subjective sensation of oral dryness and the objective reduction in salivary function. Xerostomia is one of the major complications of Radiotherapy. In fact, almost all head and neck cancer patients undergoing radiotherapy experience some degree of xersostomia. Its incidence varied in the range of 60 to 93% in the era of conventional radiotherapy. With concurrent chemo-radiation, there is an increased incidence of salivary gland dysfunction (by about 70%) when compared with radiation alone. [2, 3]

Pathophysiology: The major salivary glands are the parotid, submandibular, and sublingual. The parotid and the submandibular glands are the main contributors to salivary flow, contributing approximately 90% of salivary volume. The parotid gland produces purely serous secretions, creating watery saliva, while the submandibular and sublingual glands produce predominantly mucous secretions, which are more viscous.

The parotid and the submandibular glands are the main contributors to salivary flow, whereas several minor salivary glands present in the oral cavity and the pharynx are minor contributors, secreting less than 10% of the saliva. The parotid gland is a purely serous-secreting gland, whereas the submandibular is predominantly serous. In the unstimulated state, the submandibular gland produces most of the saliva, whereas in the stimulated state the parotid gland is responsible for most of the saliva produced. Total salivary flow can be up to 1.5 liter a day in healthy person.[4]

Radiation-induced damage to the salivary glands alters the volume, consistency and pH of secreted saliva. The secretions become more tenacious and acidic during radiotherapy.

Animal studies led us to believe that radiation damage occurs in four distinct phases. Phase I (0-10 days) in which there is depletion of the water component but no effect on the acinar cells or on amylase secretion. Phase II (10-120 days) in which the acini suffer membranous degradation and loose the ability to

secrete amylase. Phase III (120-240 days) this marks the phase of late toxicity which is characterized by loss of functional acinar cells due to loss of progenitor stem cells. Phase IV marks the regenerative phase but the functional deterioration continues due to the damage to ducts nerves and vessels. [5]

Leslie and Dische. showed that salivary amylase became undetectable by 10th day of radiation due to acinar damage.[6]

Saliva is comprised of 90% water and exerts antimicrobial, digestive, antacid, and lubricative properties. Inadequate salivary function creates multiple complications, including dental caries, a propensity to oral infections, sleep disturbances, oral pain, and difficulty talking, chewing and swallowing. Xerostomia has a profound negative impact on quality of life. Rydholm and associates conducted a study to explore the global effects of xerostomia, with a specific focus on psychological and social consequences. Four main categories were identified in the study: Subjective discomfort, e.g. dryness or burning sensation, Loss of function, e.g. articulation or swallowing, Increased infection, (oral thrush and ulcerations), Psychosocial effects, including shame, increased feelings of being a patient rather than a person and a tendency to avoid social contact, resulting in loneliness. Xerostomia and its associated symptoms have a considerable, negative global impact, resulting in shame, anxiety, disappointments and verbal communication difficulties. There should therefore be more focus on the management of xerostomia, which is often neglected in palliative care.[7]
Xerostomia patients exhibit reduced ability to process food. The observed decline in masticatory performance is probably due to reduced activity of the muscles of mastication.[8]

II. Dose-response

The degree of permanence and severity of xerostomia directly correlates with the amount of radiation dose delivered to the salivary glands. Salivary flow reduces to 50–70% of baseline after 10–16 Gy radiation and is undetectable after 40–42 Gy radiation. Some recovery of function occurs with time, with the tissue dose required for a 50% response (TD50) increasing (i.e. more dose needed for the same level of injury) at longer follow-up times.[9]

The effects of fraction size on xerostomia are limited and conflicting. The α/β ratio for parotid has been estimated to be close to 20 in rats.

Contrary to this it is believed from the continuous hyperfractionated accelerated radiotherapy. (CHART) experience that hyperfractionation is protective for late effects.[10]

This may lead us to believe that the α/β ratio should infact be much smaller. Thus, it is believed that fractionation may have an impact on xerostomia with the salivary gland having a differential α/β ratio.[11]

III. Measurement of Xerostomia

The assessment of severity of xerostomia is done by subjective and objective techniques. The Visual Analogue Scale, Zimmerman Xerostomia Questionnaire, LENT SOMA (Late Effect of Normal Tissues Subjective Objective Management Analysis) Scale are some of the methods to find and Grade the severity of xerostomia. The salivary gland secretory ratio (SGSR), determined by dynamic salivary 99mTc scintigraphy and measurement of salivary output flow are an objective measure of salivary gland function.[12]

Prevention: Radiotherapeutic management is a challenge in head and neck due to the close proximity of the tumor and avoidance structure (esp. salivary glands).

In patients receiving definitive conventional radiotherapy grade-2 xerostomia is seen in 80% of patients while in only 30% of patients receiving focused radiation treatment like definitive Intensity Modulated Radiation Therapy (IMRT). [13, 14]

At 24 months, grade 2 or worse xerostomia was significantly less common with IMRT than with conventional radiotherapy (20 [83%; 95% CI 63-95] of 24 patients given conventional radiotherapy vs nine [29%; 14-48] of 31 given IMRT; $p<0{\cdot}0001$). At 12 and 24 months, significant benefits were seen in recovery of saliva secretion with IMRT compared with conventional radiotherapy, as were clinically significant improvements in dry-mouth-specific and global quality of life scores. Severe chronic xerostomia, defined as a long-term salivary function of <25% of baseline, can be avoided if at least one parotid gland is spared to a mean dose of less than 20 Gy, or if both glands are spared to less than 25 Gy. Intensity-modulated radiotherapy has significantly better long term outcomes than conformal radiotherapy as it can spare parotid glands and thus improves quality of life.[15]

Amifostine works on the principle of radio-protection and has been to reduce acute and chronic xerostomia. Demonstration of a tumor protective effect by some and the lack of benefit in the setting of chemoradiation by others. This led to the recommendations of the American Society of Clinical Oncology which advised against its use in the setting of chemoradiation (standard of care in head and neck tumor). [16, 17]

Pilocarpine is a parasympathomimetic sialogogue and has been shown to increase salivary flow when used concurrently with Radiation therapy. Even though Fisher et al demonstrated some improvements in salivary flow at 3 to 6 months, both Warde and Fisher failed to demonstrate any improvements in quality of life of patients. [18, 19]

Surgical transfer of submandibular gland to submental space (Glandulopexy) is another strategy employed to (outside the radiation field) preserve its function and prevent the development of radiation-induced xerostomia.[20]

IV. Treatment

The goal of treatment is the provision of moisture and lubrication by stimulating functional glandular tissue or by salivary replacement with oral lubricating agents. The approach is palliative. The treatment of secondary conditions like infections, the prevention of oral and dental disease, and the provision of nutritional support are imperative to quality care. Strategies for treatment include combinations of gustatory and pharmacologic methods to increase salivary flow. Interventions include sialogogues, antibacterial mouthwashes, topical fluorides, oral buffering products, artificial saliva or moisturizing sprays or rinses, and remineralizing products. Acupuncture has been reported to significantly increase the stimulated and

unstimulated salivary flow rate. Gene therapy is still at an experimental stage.

V. Supportive Measures

Better oral hygiene

As the physical stimulation of salivary glands originate in taste buds. Mechanical debridment of dorsum of tongue with soft tooth brush and use of spray misters before and during meal assists in maintaining access to taste buds. Oral Hygiene also reduces incidence of oral candidiasis.

Dental check-up

Nieuw and associates recommended in a study that after the radiation therapy is ended, a dental check-up should be done every 3 months to allow control of any incipient oral inflammation and dental decay.[21]

Antifungal prophylaxis

Use of antifungal lozenges and oral hygiene also helps.

Vitamin supplements

Patients should be advised to maintain a balanced diet and avoid foods that irritate unprotected saliva Vitamin A and Nicotinic acid supplements are known to increase salivary flow.

VI. Salivary Substitutes

Most of the patients use water for their symptom relief. There are many types of salivary substitutes available in the market. Salivary substitutes give only temporary relief like, Mucin containing sprays, Biotene, Sugar-free chewing gum, Lactoperoxidase, and glucose oxidase (Oral Balance) gel, Hydroxy-Propyl-Methyl-Cellulose (HPMC) etc.[22]

VII. Salivary Stimulants

Pilocarpine has become the focus of most clinical trials investigating salivary stimulants for the treatment of radiation-induced xerostomia. The recommended dose of pilocarpine is 5 mg three times daily. There was a significant improvement of salivary flow rate and quality of life in pilocarpine. Most common side effect of pilocarpine is sweating. It is contraindicated in bronchospasm, congestive heart failure, chronic obstructive pulmonary disease and acute bronchial asthma and acute congestive glaucoma. The maximum therapeutic effect is normally observed after 4 to 8 weeks of therapy.[23]

In Head and neck cancer patients when given concomitant with RT tablet Pilocarpine (5mg) three to four times a day is usually started three days prior to RT and continued for three months. In a double blind, placebo controlled study Average xerostomia score for patients who received pilocarpine was 68 mm and in group, which was not treated with pilocarpine, was 34 mm. The pilocarpine group attained statistical superiority in all assessment comparisons individually and with the average of the combined assessments ($p<0.01$)[24]

Cevimeline is now being evaluated for radiation-induced xerostomia. It has no cardiorespiratory side affect as that of pilocarpine.[25]

Blom et al reported that stimulated and unstimulated salivary flow rates were significantly better after 12 to 24 weeks of acupuncture. With the use of codetron, There was a significant improvement in the reported xerostomia (using the visual analog scale) and stimulated and unstimulated salivary flow rates. There was, however, no improvement in the patients' QoL. [26, 27]

Animal experiments have attempted to improve post-radiation salivary function by attempting to transfer genes coding for water channels in the acinar cells and genes coding for enzymes that mop up the free radicals produced during radiation. The techniques promises hope for future. [28]

VIII. Conclusion

Xerostomia is an important acute and late sequelae of radiation therapy leading to lot of patient anxiety and morbidity. Treatment of resultant dry mouth is at present poor. Important advances have been made in the understanding of the dose response of salivary glands and prevention and treatment of xerostomia. However, the long-term impact of the newer techniques of Radiotherapy like IMRT, newer drugs, gene therapy and alternative treatments is yet to be discovered.

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A preliminary study on perception of Cervical cancer

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Abstract- An attempt has been made to study the correlates of knowledge of cervical cancer in a working women group. The survey undertaken is a part of Knowledge, Attitude and Practice study prior to initiation of cytological screening. Subjects for the present analysis consisted of a group of women who had never reported previous gynecological problems related to cervical cancer. The study brought out that younger women had better awareness and knowledge about cervical cancer and related information. Literacy status for education and exposure to family planning was influential in creating awareness about cervical cancer. Lastly, the earlier episodes of gynecological problems, and treatment seeking behavior lead to higher awareness (efforts may be made to innovate ways to reach older and illiterate women at risk of cervical cancer for better awareness in the group).

Index Terms- Cervical cancer, awareness, education, screening program, Pap smear test, smoking, social stigma, sexual intercourse.

I. Introduction

Cervical cancer is the term for a malignant neoplasm arising from cells originating in the cervix uteri. One of the most common symptoms of cervical cancer is abnormal vaginal bleeding, but in some cases there may be no obvious symptoms until the cancer has progressed to an advanced stage. Treatment usually consists of surgery (including *local excision*) in early stages, and chemotherapy and/or radiotherapy in more advanced stages of the disease, CDC, 2010; Castellsague et al, 2002; Ault et al, 2007; Solomon et al, 2002.

The cervix is the lower part of the uterus (womb).It is sometimes called the uterine cervix. The body of the uterus (the upperparts) is where a body grows. The cervix connects the body of the uterus to the vagina (birth canal).the part of the cervix closest to the body of the uterus is called the endo-cervix. The part next to the vagina is exo-cervix. The two main types of cells covering the cervix are squamous cells (on the endo-cervix). The place where these two cell types meet is called the transformation zone. Most cervical cancers start in the transformation zone, Jhingram et al, 2003; Appleby et al, 2007; Lu et al , 2009; Ghosh et al 2008.

Most cervical cancers begin in the cells linking the cervix. These cells do not suddenly change into cancer. Instead, the normal cells of the cervix first gradually develop pre-cancerous changes that turn into cancer. Doctors use several terms to describe these pre-cancerous changes that turn into cancer. Doctors use several terms to describe these pre-cancerous changes, including Cervical Interepithelial Lesion (CIL) and dysplasia. These changes can be detected by the PAP (named after George N. Papanicolaou, the inventer of the test) test and treated to prevent the development of cancer, Hatch et al, 2001; Gray et al, 2010; Gadducci et al, 2011.

There is main type of cervical cancers: squamous cell carcinoma and adenocarcinoma. About 80%-90% of cervical cancers are squamous cell carcinomous. These cancers are from the squamous cells that cover the surface of the exocervix. Under the microscope this type of cancer is made up of cells that are like squamous cells. Squamous all carcinomous most often begin where the exocervix joins the endocervix.

Most of the other cervical cancers are adenocarcinomous. Cervical adenocarcinomous seem to have becoming more common in the past 20-30 years.

Human papillomavirus (HPV) infection appears to be a necessary factor in the development of almost all cases (90+ %) of cervical cancer. It is the greatest risk factor for cervical cancer followed by smoking. Other risk factors for cervical cancer include: chlamydia infection, stress and stress-related disorders, dietary factors, hormonal contraception, multiple pregnancies, exposure to the hormonal drug diethylstilbestrol, and family history of cervical cancer. Early age at first intercourse and first pregnancy are also considered risk factors, magnified by early use of oral contraceptives. So, it is a great problem to the society. In India and especially in our society this disease now is showing the red eye, Jhingran et al, 2014; Nielson et al, 2009; Tobian et al, 2009; Walboomers et al, 1999; Winer et al, 2003. So Cervical cancer is now one of the great threats in our society and only the consciousness can prevent such kind of fatal disease. A number of scholars has tried to work on the cervical cancer and its societal impact, Trevor Howell Ward, and Bedford are the best example who studied the causes, symptoms, stages and treatments of cervical cancer. Julie Easley has focused her studies on Young Women's Health Awareness among High School and University Students of New Brunswick. A number of researchers aim to understand the importance of HPV screening for cervical cancer in rural India.

II. OBJECTIVE OF THE PRESENT STUDY

The main objective of the present study is to find out the awareness and consciousness of Cervical cancer among the working women of Kolkata.

III. Materials and Methods

The present study has been carried out among the 300 apparently healthy working women of Kolkata. Only the women have been considered for this cross-sectional study aged between

20 and 30 years living in the metropolitan area of Kolkata. Data for the present study has been collected by using specially prepared and pre-tested schedule. Short term interview has been taken on the cervical cancer knowledge and awareness among the participants of the study. Then data has been checked and computed accordingly. Analysis has been done by using the office, 2007 (excel) and SPSS (Version 10.0).

IV. Result

Among the participants 88% of them reported that they "had ever heard about cervical cancer ", but only 52.27% of them, knew that HPV is a sexually transmitted infection (STI) and that it can cause cervical cancer. Thirty-eight percent (38%) of interviewees mentioned the preventive character of vaccines. Age and education were the two variables that were statistically associated with the outcome. Younger and more educated women who participated in this study were more likely to know about the association between HPV infection and the risk of cervical cancer. 12% of the studied women are unaware about cervical cancer. Considering the cancer awareness all the participants are aware of cancer and they have reported that this is a fatal disease. Considering the cervical cancer 88% participants have the knowledge of cervical cancer but 12% don't know about it and they have never heard of the term. It is might be a hard truth.

The education seems to have been an impact on the awareness about cervical cancer. Most of the graduate women and the women who have done higher studies than graduate are aware about cervical cancer than others. And majority of H.S. passed women are unaware about this disease. It indicates that education also has a small impact on awareness about the disease.

The different types of occupation also have an impact on awareness about cervical cancer. It reveals that the occupations which are related with more global exposure has an impact on updating the respondents view about society and others don't have such impact. It is depicted from the present study that among all the unaware women 83.33%women involved in Government job.

The respondents who are aware about the term 'cervical cancer' also have different views about the place of infection. 91% of them are aware about the place but other 9% are unaware about the place of infection. Another thought provoking truth came out from the present study that among all the aware women 14 % do not know that only the women are affected by this disease, not males. The infection of Papilloma virus has been starts from the young age, the cancer has starts to show its symptoms at middle age or older age. But in reality only 12% of the women are concerned about it while 70% and 18% respectively, are not fully concern about the effected age group and are unaware about the effected age group. Regarding the contamination of the disease 28 % are unaware and 22% have a wrong knowledge regarding the contamination of the disease. It is very muc thought provoking that 50% f the participants have no knowledge or wrong knowledge.

The main way of contamination of this disease is related with sexual relation. It includes unprotected sex practice, multiple sex partners. 50% of the total respondents state that it is a contaminated disease. Among them, 59% respondents state the contamination occurs through unsafe sex practices and 3% give emphasis on other reasons. And 38% of the respondents don't know any way of contamination.

Men are the carrier of this disease. 52% of the respondents are concern about the fact. 16% of the respondents are unaware of the fact that only men are the carriers of this disease while 32% of the respondents can't give the answer.

Practicing safe sex, vaccination and regular check up and medication helps to prevent cervical cancer among the working women. 64% of the respondents are aware about the different ways of prevention of this disease while 4% are unaware about it. And 32% of the respondents can't give the answer. Balanced nutritional intake, Practicing safe sex, Avoiding multiple sex partners, Practicing safe sex & regular check-up, Regular check up & test, Vaccination may restrict the disease from contamination.

Sexual relations can induce cervical cancer in a woman and the Human Papilloma Virus carries through male from one woman to other. 48% of the respondents states the above ways of inducing cervical cancer in women. 10% of the respondents give emphasis on nutrition, genetically and environmental factors of inducing this type of cancer. It seems they are unaware about the actual fact. And 42% of the respondents don't know any cause of inducing cervical cancer in women. Unhealthy lifestyle, Genetic & environmental effect, Unsafe sex practices, Multiple partners, Viral attack, Nutritional imbalance might be the reason of contamination the disease.

Early vaccination in the age between 9 years to 23 years is effective in the prevention measure of this disease. And women of 26 years to 30 years also can have an effect of vaccination. 38% of the respondents are aware about the presence of vaccination in the prevention of this disease. And 28% of the respondents feel that there are no such vaccines which can prevent this disease. And 34% of respondents are unaware about the vaccination of this disease. 56.5% have no knowledge of vaccination.

46% of the respondents don't take vaccines because they think they didn't spend such a lifer that cervical cancer can occur to them. 4% of the respondents believe that they are going for regular check up so they don't need any such vaccines. While 28% and 18% of the respondents, respectively don't think that there is any vaccine to prevent the disease and don't know anything about vaccination. While 4% of the respondents have taken vaccine because they don't want to get effected by this disease as they are quite exposed to its inducing reasons. Another hard reality that the general medical practitioner do not have any knowledge of the disease so do not suggests the people for vaccination. Screening is the process of determining cervical cancer in a human body. It is a way to detect abnormal cervical cells, including precancerous cervical lesions, as well as early cervical cancers. 58% of the respondents are aware about the screening process while 30% of the aware respondents are unaware about the screening process and 12% are unaware about the disease itself. 29% respondents are aware about the term 'screening' but among them 41% respondents know the ways of screening and 59% of the respondents are unaware the ways behind this process. A Pap smear, also called a Pap test, is a procedure to test for cervical cancer in women. A Pap smear

involves collecting cells from your cervix — the lower, narrow end of the uterus that's at the top of the vagina. It can detect changes in the cervical cells that suggest cancer may develop in the future.62% of the aware respondents of the disease are aware about the PAP test but 26% of the aware respondents are unaware about the PAP test and 12% of the respondents who are unaware about the disease are also unaware about this test. 22% of the respondents have experienced the PAP test and 78% of the respondents don't have any such experiences. According to 76% respondents who are aware about the process of screening it is necessary to the adults. While 10% and 14% of the respondents, respectively, there is no necessity of screening to the adults and don't have any idea about the necessity. According to 59% respondents' fear of social stigmas are barriers for screening even if some feel the necessity. And 14% respondents say that there is no such thing to be a barrier in case of prevention or diagnosis of this disease. And 27% of the respondents have no idea about this topic. Gynecological problem also has direct relation with the effect of cervical cancer. As it is the cancer in the uterus, it also can increase gynecological problems. 78% of the respondents don't have any gynecological problem whereas 22% the respondents have gynecological problem. 10% of the respondents who have gynecological problem have faced PCOS and 12% of the respondents have menstrual problem. 28% of the respondents who are aware about screening have seen at least one cervical cancer patient but only 5% of the respondents who are unaware about screening have seen at least one cervical cancer patient. It means that awareness of this disease also depends on exposure of seen this disease. Smoking has an impact on inducing of cervical cancer. 32% of the respondents think that smoking has an impact on inducing cervical cancer in women whereas 22% of the respondents state that it has no effect. 46% of the respondents don't have any idea about the effect of smoking on cervical cancer. Considering the present study the majority of the respondents are against the presence of any socially prescribed way in prevention of the disease. A small percentage of respondents believe in such ways in the prevention of this disease and they are not highly educated. And some of the respondents have no idea about it. 20% of the respondents have experienced the pre-marital sexual relation and all of them are aware about the disease and 80% of the respondents don't have any pre-marital sexual relation and 85% among them are aware about the disease and other 15% are unaware about the disease.

V. Discussion

The present study has been conducted to evaluate the general awareness of cervical cancer risk factors, American Cancer Society, 2013; Saslow et al, 2012; Ronco et al, 2007; Paovonen et al, 2009; Massed et al, 2013. Women, who participated in this study, had the knowledge that they had been diagnosed with cervical cancer, in addition, the majority of them had stated that cervical cancer could be prevented; however, only 52.27% of them had accurately identified HPV as the primary risk factor for cervical cancer. Although, our finding concurs with previous reports that only a small fraction of women have knowledge accuracy about HPV and its association with cervical cancer, Massed et al, 2013; Lacer et al, 2003; Kumar et al, 2007; Hogewoning, 2003; Harnandaz, 2008; Anderson et al, 2014;Adam et al, 1985; Faculdade et al, 2011; Eifel et al, 2011; Erratum et al, 2010. Various models of disease prevention are proponent of the influencing role of physicians in effectively educating women and motivating them to take more active roles in their primary and secondary health care interventions. Similar to previous findings it can also found that younger and more educated women were more likely to know about the association between HPV infection and the risk of cervical cancer, Winer et al, 2006; Troisi et al, 2007; Tokudome et al, 2004; Schiffman et al, 2007. This is because now-a-days they are exposed more in the societal problems, internet, and other fields which helps to know about the current traditions of the society than older ones. 84% respondents who are aware about the disease have passed graduate or more than that. While 4% of H.S. passed are aware about the disease. And 6% H.S. passed and 6% graduate respondents are unaware about the disease. Majority of the aware respondents are worked at different educational institute or global fields whereas all unaware respondents are worked in different types of service. 86% women are aware about the effected group but 14 % are not at all aware of it. Only 12% of the women are concerned about the effected age group while 88% are unaware about it. Among the respondents 50% states that this is a contaminated disease while 22% states it as not contaminated disease. And 28% of respondents don't know the answer. 59% respondents state the contamination occurs through unsafe sex practices and 3% give emphasis on other reasons. It seems that majority of the aware respondents are aware about the contamination. Education also has an impact on cervical cancer awareness 90% of the respondents are avoiding socially prescribed ways to prevent this disease who are graduate and do higher studies than graduate study while 2% of H.S passed students believe in this kind of ways. In the modern society among the working women the awareness of cervical cancer is very less, it might be a great threat to us as well as in our society also.

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Online Medical History Repository System and Medical Insurance Cover

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Abstract- In India, the new generation is now a days understanding the need and importance of insurance of their assets, family-health, children's future plans, etc.

To give their family and himself/herself a secured cover of financial help in crisis, We plan to get insured for future. In mostly cases the insurance service provider's team will go through from various documentation analysis and processing phases to keep the company at a safe side from frauds and scams. In terms of "medical insurance policies" for a person required a thoroughly analyzed documents procedure, for providing that particular person a "medical insurance policy cover".

I. INTRODUCTION

Background:
As we all know very well that Person's medical insurance or family's medical insurance cover is a very needful thing that will play a major role at the time of crisis when there is a need of financial help to come up from the situation.

The "medical cover insurance policies" required to be thoroughly analyzed procedure of person's past medical history so based on that the team can conclude the person's health issues and possibilities of future health causes.

This procedure will provide a helpful deliverables for the best suitable policy plan to the person who needs an insurance cover..

II. DESCRIPTION

As we can find there is a paper already published, titled as "*Medical information registration and retrieval apparatus and method regular*", which stores a particular person's medical history in their respective registered account, on-Air cloud database.

So it's become a very easy task for physicians to track and go through with a particular person's medical history in emergency conditions to handle the situation on basis of previous treatments and medical practices.

As the above discussed system will be useful for physicians to study and analyze the patient's medical reports till the date. So if the medical condition of patient is at severe stage, in that case the physicians can cure him.

III. FIELD OF INVENTION

What we suggest based on this existing invention above discussed is that we can use the above system in insurance field. So that, in some kind of policies where a person's health plays a major role to pass the policy acceptance procedure to next level.

The insurance provider team can be able to access a centralized data repository system to study a particular person's medical history, instead of manually collecting each and every possible medical records of the person by interacting with him/her as many times as required to satisfy the study and analyzing procedure.

What we are suggesting is that N*ational Insurance Authorities* should provide a platform to the medical practitioners throughout the country so that they are able to access the centralized system as authorized personnel to create and feed information about person's medical history as and when he/she is consulted with the physicians about his/her health problems.

So that the centralized repository system will maintained by each medical practitioners who is authorized with the system and insurance & medical authorities. So in case of any fraud of data updating will track the physician at any moment.

IV. IMAGES

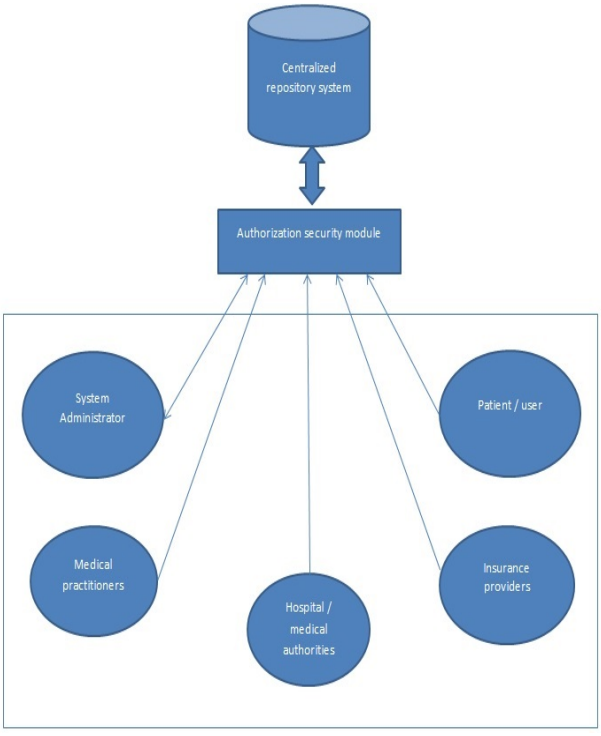

image1

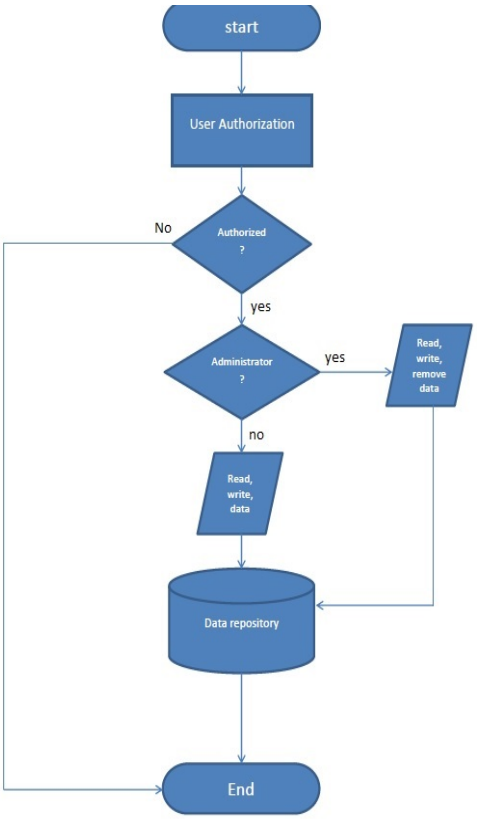

Image2

Image explanation

Image1: in this image a centralized repository system database module is there which can be accessed by any authorized user after passing to the security authentication test.

Users can be administrator, patient/ user, insurance provider, hospital/ medical/ insurance authorities, medical practitioners, etc.

Such users can access the system for monitoring and maintaining the system's data.

Image2: In this image a simple flowchart is there which shows a simple access flow of the system. User has to pass the security check to the system. After successfully authentication the administrator have all access rights on data but rest of the users will given access rights according to their role in the system so that data access protection can be maintained.

V. SUMMARY

After studied the existing systems, we feel that the insurance policy sector should also be connected with online medical history repository system. So that it would be easy for insurance provider' agencies to study the medical history of a particular person by accessing it from the centralized system.

the centralized system will be helpful for insurance providers to thoroughly study of the medical history of the person and come to the conclusion whether it will be beneficial for the organization to provide medical cover to the applicant.

For the medical practitioners it will provide a complete health causes and treatment to that particular cause to cure it. Physicians can study the treatments given to the patient. And which were suitable to the patient body. Based on that the practitioners can be able to come to the final conclusion for the next treatment to be provided that can be cure the health condition of the patient.

Also for user itself the repository will play a major role to track the medical care and cures he provided as his/ her growing. So that the patient also updated about his/her health causes and future possibilities of health problems , if any.

VI. CONCLUSION

Today's growing Insurance service providers and awareness in the new generation for various aspects of human life that can be covered with getting insurance policies, so even in the situation of any crisis there is one hope that policy holder's family can be able to survive as per the financial help provided by the policy.

And also to discover a fast and reliable procedure that will help to fast the process of providing insurance cover to the applicant with a secured and safe way so that none of the applicant and policy provider will become a victim of fraud and scams. The Information Technology can be implemented to establish a system that will be centralized and will be operated under Government security and supervision.

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Comparison of the accuracy and dimensional stability of interocclusal recording materials - An in- vitro study.

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Abstract- Purpose: The purpose of this in vitro study was to compare and correlate the accuracy and dimensional stability of commonly used interocclusal recording materials.

Materials and methods: A stainless steel die, made according to modified ADA specification no. 19, was loaded with different interocclusal recording materials. These materials were separated from die 3 min after their respective setting time, which resulted in disks of standard diameter with two parallel lines and three perpendicular lines (thin, medium and thick) on the surface.
These lines were observed under Nikon profile projector V-12 and graded for line and shape criteria to find out the accuracy of the material. The distance between two parallel lines was measured at different time intervals to find out the dimensional stability of the material.

Statistical analysis used: ANOVA followed by Mann-Whitney test for pair wise comparison

Results: There was significant difference found between accuracies of different interocclusal recording materials. Zinc oxide eugenol and polyether were more accurate than silicon and Aluwax. The comparison of dimensional stability showed that zinc oxide eugenol and polyether were more dimensionally stable followed by silicon. Aluwax was least dimensionally stable of all.

Conclusions: The zinc oxide eugenol is more accurate interocclusal recording material and which is followed by polyether, silicon and Aluwax respectively. Poly ether, zinc oxide eugenol and silicone possess good dimensional stability. No correlation exists between accuracy and dimensional stability of interocclusal recording materials.

Key-words: Interocclusal recording material; Bite registration material; Accuracy; Dimensional stability

INTRODUCTION:

Diagnosis and treatment of a patient for prosthetic rehabilitation requires the clinicians to fabricate diagnostic cast, as well as master cast and articulate. In some cases, the casts can be easily mounted in maximum intercuspation by stabilizing them with cast cement after hand articulation. While in others, it is necessary to record maxillomandibular relationship and accurately transfer it to the articulator by using appropriate interocclusal recording medium (1).

The use of ideal material and proper technique allows the placement of indirectly fabricated prosthesis in the patient's mouth with minimal occlusal adjustment.

Phillip Pfaff made the first interocclusal registration in 1756, since then many materials and techniques have been used for maxillomandibular relationship record. These materials are basically impression materials but that have been modified to give better handling characteristics(2). These include impression plaster, waxes, zinc oxide eugenol, acrylic resin, hydrocolloids, and newer ones include polyether and vinyl polysiloxane. Both waxes and zinc oxide eugenol are most commonly used interocclusal recording materials because of their ease of manipulation, economy, less time consuming and less skill dependent. These materials serve as base line for newer developments in the interocclusal recording materials.

Requirements for ideal interocclusal registration material include; a) It should have limited resistance before setting to avoid displacement of teeth or mandible during closure. b) It should become rigid and exhibit minimal dimensional change after setting. c) It should produce accurate record of the incisal and occlusal surface of the teeth d) It should be easy to manipulate. e) It should not produce adverse effects on the tissues involved in procedure and it should allow easy verification (1).

But no material has all the properties of the "ideal" interocclusal registration material. The inaccuracies attributed to the interocclusal records can be divided into three categories: the biologic characteristics of stomatognathic system, manipulation of the material, and the properties of the interocclusal recording materials (3).

Many studies have been conducted to find the accuracy and dimensional stability of several bite registration materials (2-10). In an experimental study on physical properties of interocclusal recording materials, the Polyether interocclusal recording material exhibited lesser linear change than Silicon and Zinc oxide eugenol, which was not associated with their respective weight loss (2).

In another study on differential accuracy of Silicon interocclusal recording materials, the authors found that a direct relationship exists between dimensional stability and percentage of weight loss (8), but no study has been done to correlate the accuracy and dimensional stability.

Hence, this study was planned to compare and correlate the accuracy and dimensional stability of four commonly used inter-occlusal recording materials.

MATERIALS AND METHODS:
Four commercially available interocclusal materials were evaluated.

1) Bite registration wax (Aluwax, Aluwax Dental Product Co., Michigan USA).

2) Polyether bite registration paste (Ramitec, 3M ESPE, AG Dental Products, Germany Lot 268467).

3) Vinylpolysiloxane bite registration cream (Exabite II NDS, GC America Inc, ALSIP, IL, Lot 0602061).

4) Zinc–oxide eugenol bite registration paste (Superbite, Bosworth Company, Skokie, IL lot 0608-395).

Materials and method followed in this study has been discussed under the following headings.

1) Preparation of mold.

2) Selection and manipulation of materials.

3) Preparation of samples.

4) Observation made for scoring the samples for accuracy.

   i) Observation of continuity of lines.

   ii)Observation of shape of the thick line.

5) Measurement of the distance between lines for determining dimensional stability.

1) **Preparation of mold: -**

A mold was prepared according to revised American Dental Association specification no. 19 for non-aqueous elastic dental impression materials (11).

It was consist of a ruled block AA, test material mold BB and a riser CC. All parts were made up of stainless steel except raiser, which was made up of brass.

The ruled block was having three horizontal lines of different widths; small Y -line (width-24mm), medium X-line (width-57 mm) and a thick Z line (width –83mm). And two vertical lines CD and C'D' of 82mm each. The lines CD and C'D' were separated from each other by 25mm approx. (24.740mm) (fig.1&2).

The test material mold was a cylinder of inner diameter 30mm and depth of 6mm.

The riser was a brass disc of diameter 29.9mm and thickness of 3mm.

2) **Selection and Manipulation of materials:-**

Four commonly used interocclusal recording materials were selected for the purpose of this study. All the materials were purchased from local market through regular commercial channels.

The materials used for the study were divided into four groups of 10 samples each.

Group 1: - Bite registration wax (Aluwax)

Group2: - Polyether registration paste (Ramitec)

Group 3: - Polyvinyl siloxane bite registration cream (Exabite II NDS)

Group 4: - Zinc oxide eugenol bite registration paste (Superbite)

Altogether, a total of forty samples were prepared. All the study materials were conditioned to ambient room temperature for at least 24 hrs before manipulation and the individual materials were manipulated following the manufacturers' instructions.

3) **Preparation of samples:-**

Each material was manipulated as mentioned above and the total force of 5.56 N (weight of glass plate 67g + external weight 500g = 567g) was applied. This is the average pressure required to compensate initial resistance of interocclusal material which may vary between 0.5 N to 13.8 N (12).

The whole assembly was then submerged in water bath of temperature 32 ± 1^0C resembling mouth temperature. Each assembly remained in the bath for the setting time suggested by manufacturer plus 3 min to ensure polymerization in case of elastomeric materials.

After removal from the water bath, the material was separated from the die by using the brass disk (riser). The excess flash was trimmed using a Bard Parker knife. Thus prepared specimens were measuring 30 mm in diameter, 3mm in thickness and had the lines X, Y, Z, CD and C^I D^I lines on it. Similarly, all the 40 bite registration record samples were obtained. (fig. 3)

In between days of observation, the samples were stored in a moisture free polyethylene bags at room temperature of 28 ± 2^0C. Dimensional changes of elastomers can be reduced by storage in a sealed dry container (12, 13) and at room temperature air (12).

4) **Observation made for scoring the samples for accuracy:**

- Accuracy of different interocclusal recording materials was determined by observing each sample under Nikon Profile Projector V-12 (Nikon inc., Japan) with the accuracy of 0.001mm. (fig 4) Observations for accuracy were made immediately after obtaining the samples only on the day 1.
- Each sample was graded group wise according to line criteria and shape criteria.

Following criteria were used for grading the samples.

(i) Observation for continuity of lines reproduced (line criteria):

Thinnest continuous line produced by each material was observed by using Nikon Profile Projector V-12 with 50 X magnification and the scores were noted.

Score	Observation
0	No continuous line
1	Continuous thick line (Z-line)
2	Continuous medium line (X-line)
3	Continuous thin line (Y- line)

(ii) Observation for the shape of the line reproduced (shape criteria):

The shape of 'Z' line reproduced on the surface of the sample was observed by using Nikon profile Projector V-12 with 50 X magnification, compared with V-shaped line on the master die and scores were noted to check the accuracy.

Score	Observation.
1	Rounded
2	Combination of rounded and V- shaped.
3	V-shaped.

The scores obtained for both continuity of lines (line criteria) and shape of the line reproduced (shape criteria) were subjected to statistical analysis for comparing the accuracy of four interocclusal recording materials.

1) OBSERVATION OF SAMPLES FOR DIMENSIONAL STABILITY :

The distance between the lines, CD and $C^{I}D^{I}$, reproduced on the samples, was measured at three different points PP^{I}, QQ^{I} and RR^{I} (i.e. at the intersections of these lines with the lines XYZ) (see fig 2) by using Nikon Profile projector V-12 with 10 X magnification. Three readings were obtained for each sample and the averages of these three values were noted. Likewise readings were made at different time intervals i.e.; immediately after removal of the material from the die, on second day, on eighth day and on fifteenth day respectively for each of the samples. All the readings thus obtained were tabulated and subjected to statistical analysis for the comparison and correlation of accuracy and dimensional stability of four interocclusal recording materials.

STATISTICAL ANALYSIS:

Results are expressed in mean ± SD, median , mode and sum of scores. One way ANOVA was used for inter group comparison and Mann- Whitney test for pair wise comparison of accuracy and dimensional stability of four interocclusal recording materials. A p- value of 0.05 or less was considered for statistical significance.

RESULTS:

Comparison of the accuracy of four interocclusal recording materials by line criteria and shape criteria was done. In the line criteria, the sum of the scores and mode of scores that Zinc oxide eugenol was more accurate followed by Polyether and Silicon, while Aluwax was the least accurate. The analysis of variance was significant in line criteria ($F=10.30$, $p<0.05$). (Table -1)

The pair wise comparison between the materials using Mann-Whitney test showed significant difference between accuracy of Aluwax & Polyether, Aluwax & Silicon bite registration paste, Silicon & Zinc oxide eugenol and between Aluwax & Zinc oxide eugenol bite registration pastes ($p<0.05$). The accuracy of Polyether & Silicon, Polyether & Zinc oxide eugenol did not differ significantly ($p>0.05$).

As per the shape criteria also the Aluwax was the least accurate material in reproducing the shape of lines. The analysis of variance was significant in shape criteria ($F=10.83$, $p<0.05$).(Table-1)

The pair wise comparison showed that there were significant differences seen between the accuracy of Aluwax & Polyether, Aluwax & Silicon and Aluwax & Zinc oxide eugenol ($p<0.05$). No significant changes were seen between Polyether & Silicon, Polyether & Zinc oxide eugenol bite registration pastes and Silicon & Zinc oxide bite registration pastes ($p>0.05$).

Together line and shape criteria suggest that Zinc oxide eugenol and Polyether interocclusal recording materials are equally accurate followed by Silicon and Aluwax respectively.

The comparison of distance between lines (dimensional stability) at different time interval for four interocclusal recording materials was done by using ANOVA. The analysis of variance showed no significant difference between all the materials on day1 ($F=0.93$, $p>0.05$). But, there was significant difference seen between these materials on 2^{nd} day ($F=3.42$, $p<0.05$), 8^{th} day ($F=6.35$, $p<0.05$) and 15^{th} day ($F=6.36$, $p<0.05$). The pair wise comparison of dimensional stability of four interocclusal recording materials on different days by using Mann Whitney test showed no significant difference between all materials on day 1 ($p>0.05$ for all). On day 2, significant difference was seen between Zinc oxide eugenol and Aluwax ($p<0.05$) and it was highly significant between Silicon and Aluwax ($p<0.001$). On the day 8, significant difference was seen between Polyether and Aluwax and highly significant between Silicon and Aluwax ($p<0.001$). On the 15^{th} day, Aluwax showed significant difference from all other materials. On all these days, there was no significant difference found between dimensional stability of Zinc oxide eugenol & Polyether, Zinc oxide eugenol & Silicon

and Silicon & Polyether bite registration materials ($p>0.05$). (Table 2).

From the statistical analysis of data, following results were obtained-

1. Among the four interocclusal recording materials tested for their accuracy the Zinc oxide eugenol bite registration paste was found to be more accurate which was followed by Polyether, Silicon and Aluwax respectively.

2. Within first 24 hrs, all the interocclusal materials were dimensionally stable.

3. Polyether, Silicon and Zinc oxide eugenol are equally dimensionally stable over the period of 15 days.

4. Further, the statistical analysis did not reveal any correlation between accuracy and dimensional stability of the four interocclusal recording materials (i.e. Zinc oxide eugenol, Polyether, Silicon and Aluwax). But from the present study, ZnOE was most accurate and dimensional stable material. While Polyether and Silicon did not reveal any significant changes and almost exhibited equal amount of accuracy and dimensional stability.

Discussion:

During restorative phase of any dental treatment, the precise articulation of patient's diagnostic or working casts is a prerequisite for fabrication of clinically acceptable prosthesis. Apart from the operator's clinical ability and the technique followed, the chosen material can affect the accuracy of the interocclusal registration and thereby final outcome of the restoration.
Interocclusal recording materials like wax and Zinc oxide eugenol are used for recording maxillomandibular relationship. The introduction of Polyether and Polyvinyl siloxane interocclusal recording materials has made clinicians unsure of which material they should use. These elastomeric materials are chemically similar to the impression materials that have been used for many years (14). Modifications have been made by adding plasticizers and catalyst to provide different handling characteristics (2) ; however, it remains unknown whether these modifications in the parent impression materials have altered their properties like accuracy and dimensional stability. Hence, present in-vitro study was planned to compare the accuracy and dimensional stability of four commonly used interocclusal recording materials and to find out any relation if it exists between them.

Since half of the samples made for the study were of elastomeric interocclusal recording material, the method chosen to compare the accuracy and dimensional stability was as per the testing methodology of ADA specification no.19 – for elastomeric impression materials (11) .

However dimensional stability can also be studied in all the three planes by using equipments like condymeter (3), computer axiotran (15) , Buhnergraph(5) and hydro-optic test & measurement system (7, 8) .

The time intervals used in the study were selected considering the time taken to carry interocclusal recording materials to distant laboratories or delay in articulation or remounting of the casts if required, simulating the clinical situation as mentioned in previous study (10).

Waxes are most commonly used interocclusal recording materials, because of their ease of manipulation and cost effectiveness. Considerable controversy exists regarding the accuracy, usefulness and manipulative skills required in obtaining accurate interocclusal records. The accuracy of an interocclusal recording wax must be considered in terms of the many variables responsible for dimensional changes. Even under the highly controlled conditions, the exact reproduction of the original wax recording was never achieved (6).

In this study, Aluwax was used. Aluwax is consisting of low viscosity wax with impregnated aluminum particles to evenly disperse the heat and to avoid excessive cooling contraction. Waxes were repeatedly shown to be most inaccurate interocclusal recording materials (3,12,16,17) . In this study also Aluwax was found to be least accurate to reproduce the surface details.

Waxes were found to be dimensionally unstable; this is because of their greater coefficient of thermal expansion. Also, they show distortion while removal (2) from mouth and considerable contraction on cooling.(12) This study, Aluwax was found to be least dimensionally stable. However the Aluwax exhibits good dimensional stability on 1st day, so can be used if the mounting procedures to be carried out immediately.

Zinc oxide eugenol is another commonly used interocclusal recording material. It is generally used to correct the interocclusal record made by wax. It is shown to reproduce accurate surface details mainly because of its low initial viscosity coupled with its pseudo elastic nature, which allows fine detail reproduction (18). It also exhibits greatest flow characteristics when compared with the polyether , polyvinyl siloxane and wax. More over, Zinc oxide eugenol offers no resistance to closure of mandible thus allowing a more accurate interocclusal relationship record to be formed.

In the present study, Zinc oxide eugenol was found to be more accurate material in terms of detail reproduction. This is because the surface detail reproduction depends mainly upon the flow characteristics of the materials. Zinc oxide eugenol was found to be dimensionally stable. It showed contraction over the period of 15 days but was not statistically significant.

Polyether bite registration paste is getting popularity because of its ease of manipulation and accuracy. Polyether exhibited greater flow characteristics than Addition Silicon and Waxes. Polyether is most accurate amongst the materials used. Polyether sets by polymerization reaction so there will be volumetric shrinkage of the material during the reaction. Polymerization

shrinkage was seen to be more in first 24-hrs i.e. on 2nd day. But afterwards, no significant shrinkage was noted. During the test period Polyether didn't show any significant change in dimensions ($p>0.05$).

Silicon has less flow due to high viscosity, very fast construction of polymer chains and fast transition from the plastic to the elastic phase. The flow Silicon bite registration paste was found to be lower than Polyether and Zinc oxide eugenol (1).

In the present study, polyvinylsiloxane (Silicon) was found to be inferior in accuracy when compared to Zinc oxide eugenol and Polyether. But there was no significant difference found between Polyether and Polyvinyl siloxane. It was significantly good in accuracy when compared with Aluwax. The loss of accuracy was mainly due to formation of air bubbles on the surface which might be because of hydrophobic nature of the material.

Polyvinyl siloxane displayed linear dimensional change and weight loss due release of hydrogen gas. Most manufacturers add platinum or palladium as scavenger in Polyvinyl siloxane impression paste. To date however, there is no published paper to support that there is also a scavenger in interocclusal registration material since there is no need for these materials to be poured with stone (2) .

Silicon has shown significant change in dimensional stability after 8 days ($p< 0.05$). The reason might be that Silicon has longer polymerization period than Polyether resulting in sustained contraction period with shrinkage period of over two weeks. This result confirms earlier experimental results, Silicon bite registration paste undergoes sustained contraction even after 168 hrs (10).

Statistical analysis of results does not reveal any correlation between accuracy and dimensional stability. Hence, it can be said that both of these properties should be considered differently while selecting material for making interocclusal records.

The limitation of this in-vitro study was that it considered only the linear measurement as a parameter for determining dimensional stability, but in routine clinical practice, dimensional errors in interocclusal registrations occurs in all three dimensions.

CONCLUSION

Within the limitations of this study, it was concluded that, among the four interocclusal recording materials tested for their accuracy the Zinc oxide eugenol bite registration paste was found to be more accurate interocclusal recording material and which was followed by Polyether, Silicon and Aluwax respectively. Polyether, Silicon and Zinc oxide eugenol were found to be the more dimensionally stable than Aluwax. No correlation exists between the accuracy and dimensional stability of the four tested interocclusal recording materials.

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Conflict of Interest: 'The authors declare no conflict of interests'.

Author contribution : I/we certify that I/we have participated sufficiently in the intellectual content, conception and design of this work or the analysis and interpretation of the data (when applicable), as well as the writing of the manuscript, to take public responsibility for it and have agreed to have my/our name

listed as a contributor. I/we believe the manuscript represents valid work.

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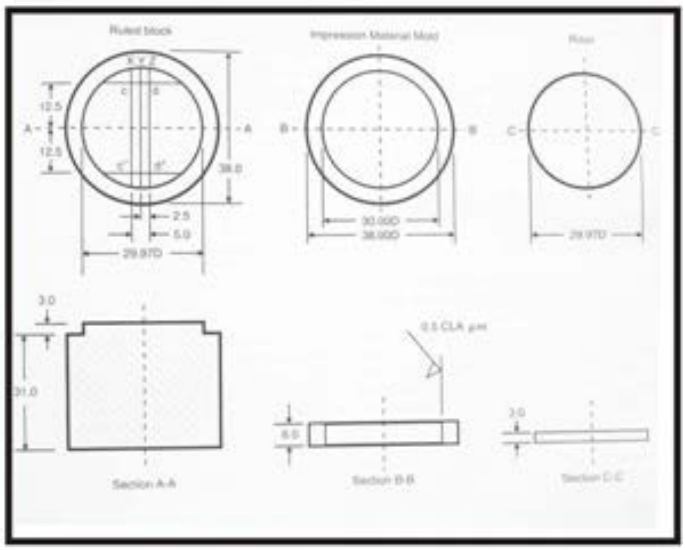
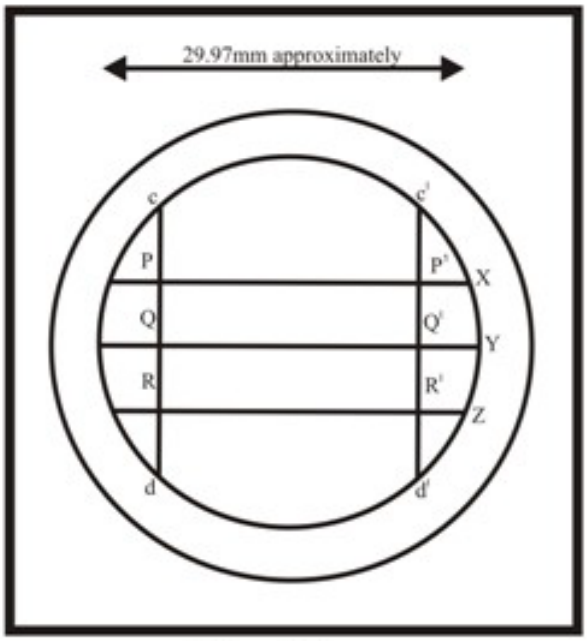


Section A-A: Ruled block
Section B-B: Impression material mold
Section C-C: Riser
(* all measurements in mm)

Fig. 1. Schematic diagram showing ADA specifications no 19 detail reproduction block



Line width

Line X:	50 +/- 8µm
Line Y:	20 +/- 4µm
Line Z:	75 +/- 8µm
Line CD:	75 +/- 8µm
Line C'D':	75 +/- 8µm

Distance between lines CD and C'D' = 25mm (approx.)

Fig. 2. Schematic diagram showing ruled surface of reproduction block

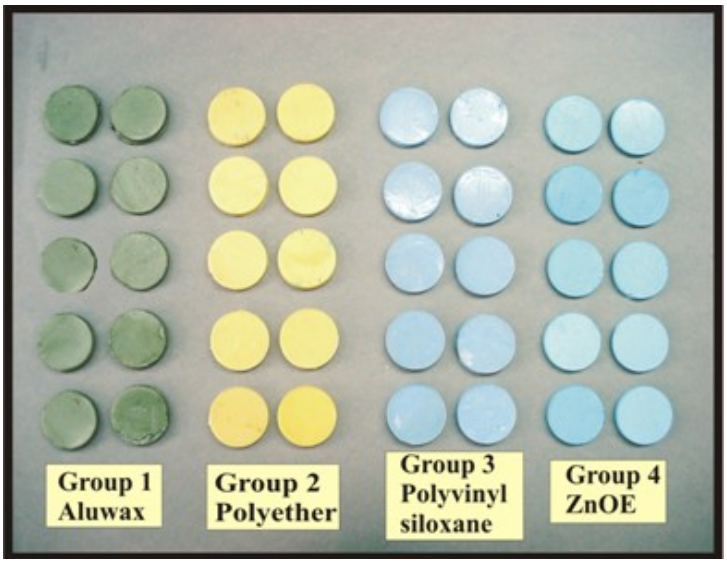


Fig 3: Samples produced from the die

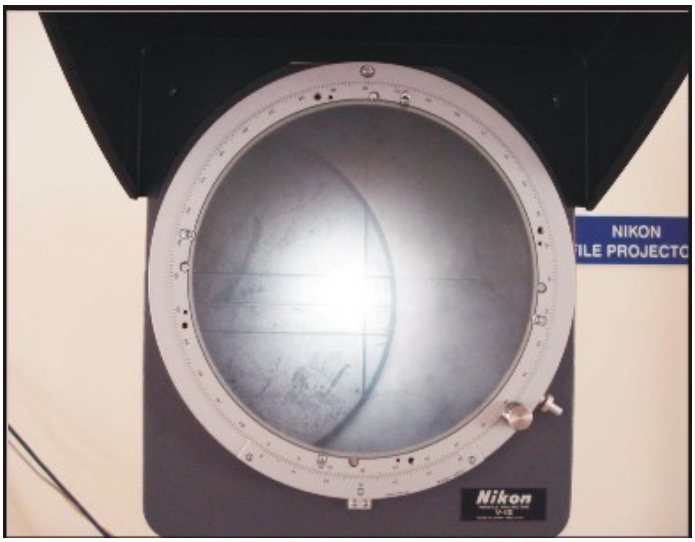
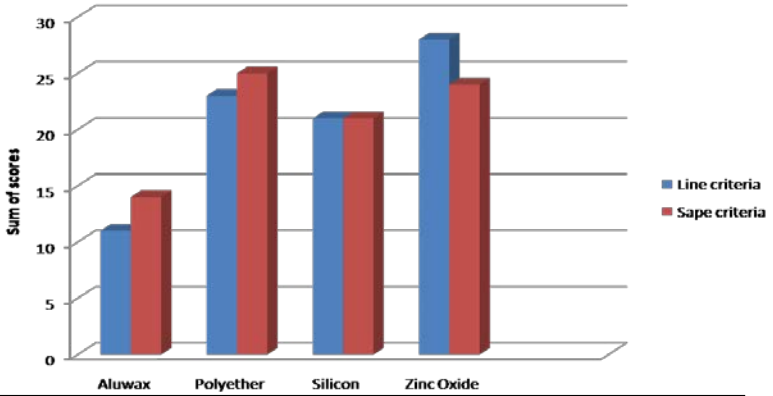
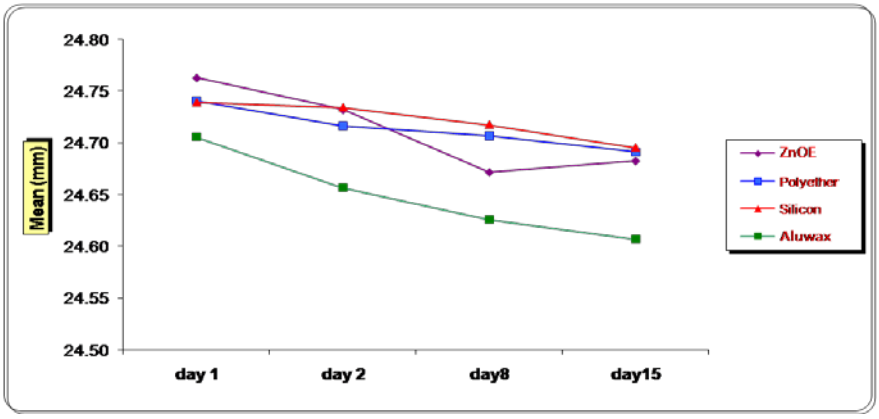


Fig 4: Nikon Profile Projector V-12 (Nikon inc., Japan) with the accuracy of 0.001mm.



Graph 1: Showing comparison of accuracy of four interocclusal recording materials



Graph 2: Showing dimensional stability of four interocclusal recording materials

Table 1: Showing the comparison of accuracy of four interocclusal recording materials (ANOVA).

Materials	Line Criteria								Shape criteria						
	Scores				**Mean ± SD**	Median	Mode	Sum	Scores			**Mean ± SD**	Median	mode	sum
	0	1	2	3					1	2	3				
Aluwax	2	5	3	-	1.1±0.7	1	1	11	6	4	-	1.4±0.5	1	1	14
Poly ether	-	2	3	5	2.3±0.7	2.5	3	23	-	5	5	2.5±0.5	2.5	3	25
Silicon	-	2	5	3	2.1±0.7	2	2	21	-	9	1	2.1±0.3	2	2	21
ZnOE	-	-	2	8	2.8±0.4	3	3	28	-	6	4	2.4±0.5	2	2	24
ANOVA	F = 10.30, p< 0.05, Significant								F = 10.83, p < 0.05, Significant						

Table 2: Showing comparison of dimensional stability of four interocclusal recording materials

Days Materials	Day1	Day2	Day8	Day15
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Aluwax	24.705 ± 0.020	24.656 ± 0.010	24.626 ±0.024	24.607 ± 0.017
Polyether	24.740 ± 0.068	24.716 ± 0.082	24.707 ± 0.056	24.691 ± 0.065
Silicone	24.739 ± 0.015	24.734 ± 0.014	24.717 ± 0.017	24.695 ± 0.017
ZnOE	24.763 ± 0.137	24.731 ± 0.092	24.671 ± 0.082	24.682 ± 0.078
ANOVA	F = 0.93 p = 0.44, NS	F = 3.42 p < 0.05, S	F = 6.35 p < 0.05, S	F = 6.36 p < 0.05, S

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Role & Purpose of Privileges in Global Platform

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Abstract- In this paper, applicability of Privileges on SIM Card during installation of applications is discussed. In addition, small descriptions of privileges, privilege coding in Global Platform 2.2 & Global Platform 2.1 is provided.

Index Terms- Global Platform(GP), Security Domain (SD), Issuer Security Domain (ISD), Supplementary Security Domain (SSD), Data Authentication Pattern (DAP), Cardholder Verification Management (CVM)

I. INTRODUCTION

Before moving to the topic in context with GP (Global Platform), first understand "**Privilege**"!!!

So as per normal goggling Privilege means, **A special right, advantage, or immunity granted or available only to a particular person or group.**

Similar to its definition, "**Privileges in GP**" is also the rights / advantage given to applications on Card during installation of application on card. Privileges may be added or revoked during the Life Cycle of an Application. Applications can be:

- Issuer Security Domain
- Supplementary Security Domain
- Normal Application

II. PRIVILEGE DEFINITION

Table 1: Represents the different types of privileges, their applicability along with small description

Privilege	**Description**
Security Domain	• A Security Domain (SD) is an application which acts as the on-card representative for an off-card entity (*e.g. the Card Issuer or an Application Provider*). • SD's holds keys & mechanisms which can be used to support operations on cards. • All cards have one mandatory Security Domain i.e. Issuer Security Domain (ISD). • When this privilege is set, application acts as a 'SD' and differs from a 'normal' Application.
DAP Verification	• When application Provider may require that their Application code to be loaded on the card shall be checked for integrity and authenticity. • The DAP Verification privilege of the Application Provider's Security Domain provides this service on behalf of an Application Provider. • When this privilege is set, application is capable of verifying a DAP. • To have 'DAP Verification'- the application must have SD privilege i.e. the application must also be a Security Domain.
Mandated DAP Verification	• When a Controlling Authority may require that all Application code to be loaded onto the card shall be checked for integrity and authenticity. • The Mandated DAP Verification privilege of the Controlling Authority's Security Domain provides this service on behalf of the Controlling Authority. • When this privilege is set, application is capable of and requires the verification of a DAP for all load operations. • To have 'Mandated DAP Verification' - the application must have SD privilege and DAP Verification privilege.
Delegated Management	• 'Delegated Management' allows an Application Provider's SD to perform: 1. Delegated loading 2. Delegated installation and make selectable 3. Delegated extradition 4. Delegated update to the Global Platform Registry

	5. Delegated deletion 6. To manage Card Content with authorization. • The SD that has Token Verification privilege controls such authorization. • Delegated Management is not a mandated feature of a GP Card • When this privilege is set, application is capable of Delegated Card Content Management. • To have 'Delegated Management' - the application must have SD privilege.
Token Verification	• Token Verification allows a Security Domain Provider, typically the Card Issuer, to authorize any Card Content management operation. • A Security Domain with Token Verification privilege requires the knowledge of keys and algorithms used for Tokens. • This privilege does not provide Card Content management capability. • When this privilege is set, application is capable of verifying a token for Delegated Card Content Management.
Receipt Generation	• Receipt generation allows a SD Provider, typically the Card Issuer, to provide a confirmation for the performed card content management. • A Security Domain with Receipt Generation privilege requires the knowledge of keys and algorithms used for Receipts generation. • This privilege does not provide Card Content management capability. • When this privilege set, application is capable of generating a receipt for Delegated Card Content Management.
Authorized Management	• SD with this privilege allows a Security Domain provider to perform Card Content management without authorization (*i.e. without a token*) • This is valid where the off-card entity is authenticated as the owner (Security Domain Provider) of the Security Domain. • In this case the Security Domain that has Token Verification privilege is not involved. • When this privilege is set, application is capable of Card Content Management • To have 'Authorized Management' - the application must have SD privilege.
Card Lock	• CARD LOCK is present to provide the capability to disable the selection of SD and Applications. • On receipt of a request to lock the card, the OPEN shall check that the current card Life Cycle State is SECURED. • Once the card Life Cycle State is CARD_LOCKED, all applications except the Application with the Final Application privilege shall be disabled. • The card Life Cycle state transition from SECURED to CARD_LOCKED is reversible. • When this privilege is set, application is capable to lock the card.
Card Terminate	• The state TERMINATED signals the end of the card Life Cycle and the card. • In the card Life Cycle State TERMINATED, all communication to the card is directed to the application with the Final Application privilege. • If the ISD is the application with this privilege all commands other than the "GET DATA" command processed by the ISD shall be disabled. • When this privilege is set, application is capable to terminate the card.
Card Reset	• This privilege was previously known as "Default Selected" in GP2.1 • When this privilege is set, application is capable to modify historical bytes on one or more card interfaces. • Few more key points described below under "Privilege Assignment"
Final Application	• Final Application (*when this privilege is set*) is the only Application accessible in card Life Cycle State CARD_LOCKED and TERMINATED. • In the card Life Cycle State TERMINATED, all communication to the card is directed to the application with the Final Application privilege. • If the ISD is the application with this privilege all commands except the "GET DATA"

	command processed by the ISD shall be disabled.
CVM Management	• CVM is a method to ensure that the person presenting the card is the person to whom the card was issued • When this privilege is set, application is capable to manage a shared CVM of a CVM Application. • CVM services (*Retrieving CVM state, setting new value of cvm, verifying cvm*) shall be provided by a CVM Application to other on-card Applications
Trusted Path	• Application (*when this privilege is set*) acts as a Trusted Path for inter application communication. • The objective is that the GP Trusted Framework forwards the unwrapped command to the "Target Application" indicated by the "Receiving Entity". • Flow of APDU Command 1. An APDU command is received by the Application's SD (*Receiving Entity*) 2. Application SD can be the ISD or a SSD. 3. Command is unwrapped by the SD before being passed on to the Global Platform Trusted Framework.
Global Delete	• Global Delete privilege provides the capability to remove any Executable Load File or Application from the card even if the Executable Load File or Application does not belong to this Security Domain. • A Security Domain without Global Delete privilege and with Card Content management capability can only delete Executable Load Files or Applications directly or indirectly associated with it.
Global Lock	• Global Lock privilege provides the right to initiate the locking and unlocking of any application on the card • Works independent of its Security Domain association and hierarchy. • It also provides the capability to restrict the Card Content Management functionality of OPEN.
Global Registry	• Application (*when this privilege is set*) may access any entry in the Global Platform Registry. • The status of an Application (or a SD): its Life Cycle State, Privileges and other parameters registered in the GP Registry, may be accessed by suitably authorized entities.
Global Service	• Application (*when this privilege is set*) provides services to other Applications on the card. • One or more Global Services Applications may be present on the card to provide services to other Applications on the card. • This is the privilege which separates "Global Services Applications" from other Applications.

III. PRIVILEGE ASSIGNMENT

Below described are the important points to be considered while setting privileges.

- Common key points regarding "Card Reset & Final Application Privileges":

1. Only one Application or Security Domain in the card may be set with the "Card Reset & Final Application Privileges" at a time (*e.g. the ISD, a current legacy Application or an Application that requires specific behavior with regards to logical channels*)

2. Once the "Card Reset & Final Application Privileges" has been assigned to an Application, the privilege can be reassigned to a new Application either by deleting the Application which has the privilege, or by revoking its privilege

3. The "Card Reset & Final Application Privileges" is by default assigned to the Issuer Security Domain. It may be reassigned only if the Issuer Security Domain has the "Card Reset & Final Application Privileges" accordingly

4. If the application with the "Card Reset & Final Application Privileges" is deleted, the privilege is reassigned to the Issuer Security Domain

IV. Backward Compatibility

For backward compatibility, where a card supports only privileges 0-7 i.e. Cards with GP 2.1, the following assumptions (**by Global Platform**) shall apply for the remaining privileges.

Table 2: Coding of the remaining privileges

Privilege	**ISD**	**SSD**	**Other Application**
Trusted Path	Yes	Yes	No
Authorized Management	Yes	No	No
Token Verification	Yes	No	No
Global Delete	Yes	No	No
Global Lock	Yes	No	No
Global Registry	Yes	No	No
Final Application	Yes	No	No
Global Service	No	No	No
Receipt Generation	yes	No	No

V. Privileges Coding

Figure 1: Byte 1 - Available for both GP 2.1 & GP 2.2 and follow same coding

b8	b7	b6	b5	b4	b3	b2	b1	Meaning	Privilege Number
1	-	-	-	-	-	-	-	Security Domain	0
1	1	-	-	-	-	-	0	DAP Verification	1
1	-	1	-	-	-	-	-	Delegated Management	2
-	-	-	1	-	-	-	-	Card Lock	3
-	-	-	-	1	-	-	-	Card Terminate	4
-	-	-	-	-	1	-	-	Card Reset	5
-	-	-	-	-	-	1	-	CVM Management	6
1	1	-	-	-	-	-	1	Mandated DAP Verification	7

Figure 2: Byte 2 - Only available in GP 2.2

b8	b7	b6	b5	b4	b3	b2	b1	Meaning	Privilege Number
1	-	-	-	-	-	-	-	Trusted Path	8
-	1	-	-	-	-	-	-	Authorized Management	9
-	-	1	-	-	-	-	-	Token Management	10
-	-	-	1	-	-	-	-	Global Delete	11
-	-	-	-	1	-	-	-	Global Lock	12
-	-	-	-	-	1	-	-	Global Registry	13
-	-	-	-	-	-	1	-	Final Application	14
-	-	-	-	-	-	-	1	Global Service	15

Figure 3: Byte 3 - Only available in GP 2.2

b8	b7	b6	b5	b4	b3	b2	b1	Meaning	Privilege Number
1	-	-	-	-	-	-	-	Receipt Generation	16
-	X	X	X	X	X	X	X	RFU	-

VI. Conclusion

- In card Life Cycle State, the Issuer Security Domain shall initially have the following set of privileges clearly identifying its functionality: Security Domain, Authorized Management, Global Registry, Global Lock, Global Delete, Token Verification, Card Lock, Card Terminate, Trusted Path, CVM Management, Card Reset, Final Application and Receipt Generation.
- Authorized Management and Delegated Management privileges are mutually exclusive
- Other privileges are not mutually exclusive; therefore, one or more privileges may be marked as set for an Application.

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Empirical Study on Corporate Social Responsibility in United Arab Emirates.

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Abstract- The concern about the corporate social responsibility activities which the organizations provide to their society and stakeholders increased as one reason for living in the era of globalization (Chapple & Moon, 2005). The study attempts to provide empirical evidence on the influence of the 2008 financial crisis on the disclosure about CSR among local banks in the United Arab Emirates. It also attempts to investigate the extent of CSR disclosure on these banks. For that reason, the study examined the annual reports of the local banks which work in the UAE in three different years. These years are 2007, 2009 and 2011. Additionally, this paper investigated the factors which influence the extent of CSR disclosure, namely; the number of the board of directors, the size of the bank, leverage ratio and profit of the bank (profitability ratio). Moreover, the study formulated four null hypothesis based on two theories namely stakeholder theory and legitimacy theory. The findings reveal that, the extent of CSR disclosure increased after the financial crisis. In terms of the factors which influence the extent of CSR disclosure. On the other hand, the multiple regression analysis indicates that the size of the bank, the board of directors and profit of the bank are positively associated with the CSR disclosure, while for the leverage ratio negatively associate with CSR disclosure.

Index Terms- (CSR) Corporate Social Responsibility, (UAE) United Arab Emirates

I. INTRODUCTION

In 2008 the economy in the world influenced by the financial crisis which affected the financial institutions around the world, (Ivashina & Scharfstein, 2010). Moreover, the financial crisis in 2008 affected the financial institutions which collapsed and the global credit market began freezing during that time so the governments intervened to keep the right of the people (Erkens, Hung, & Matos, 2012).

According to (Yelkikalan & Can, 2012), the financial crisis has affected the implementation of corporate social responsibility activities as well as the disclosure about it, which the organization increased the CSR practices to show their customers that they were not affected by the financial crisis, and other organization decreased their CSR practices because they were affected by the crisis. As the organizations were affected by the financial crisis, they might have increased or decreased the extent of their CSR activities as well as their disclosure about it.

According to the previous studies such as (Mashal, 2012), (Erkens et al., 2012), (Brach & Loewe, 2010), (Zaki, Bah, & Rao, 2012) and (Woertz, 2008) which considered that the UAE was influenced by the 2008 financial crisis.

According to the UAE's Corporate Governance Code for Small and Medium Enterprises, the organizations should recognize the needs of stakeholders when the code mentioned clearly that "Stakeholders are understood to mean employees, customers, suppliers, creditors, regulators, the community, the environment, and generally any party enjoying relations with the enterprise. It is important that a company views itself as an integral part of the community in which it operates and is committed to a sound relationship built on respect, trust, honesty and fairness. There is increasing recognition that, managing stakeholder relations and issues can have business benefits. A company's greater understanding of employee attitudes, customer perspectives and impacts on communities can not only reduce risks but also be a way of identifying value enhancing opportunities for the future. Companies should formulate policies outlining their values and objectives in relation to areas such as customer satisfaction, product safety, employee relations, health and safety, the environment and the community in which the company operates. Targets relating to the management of stakeholder relations should be set and progress against the targets monitored and measured. Companies should identify appropriate key performance indicators relating to their key policies, set targets and monitor the progress made against these targets."

All these requirements of the code are to encourage the organization to disclose their social activities as well as to save the environment and to protect it from harming activities.

For the previous reasons, the current study of UAE examines the extent of CSR disclosure, as well as to examine the influence that the 2008 financial crisis might have on the extent of that disclosure.

II. LITERATURE REVIEW

A. What is corporate social responsibility?

The corporate social responsibility has more than one definition in the literature, it's a multidimensional phase (De Bakker, Groenewegen, & Den Hond, 2005) but the common definition was given by (Carroll, 1979) who defined CSR as " the social responsibility of business encompasses the economic, legal, ethical and discretionary expectations that society has of organizations at a given point of time". This definition gave an overview that the organizations have four social responsibilities which they provide them to their society as well as to their stakeholders, these responsibilities are:

- Economic responsibility: The economic responsibility of the organization is to produce goods and services which benefit the whole society, which includes what the society needs from the organization products and goods.
- Legal responsibility: The legal responsibility of the organization indicates that the organizations have the duty to perform their economic transactions on legal way under the governing law without doing illegal things.
- Ethical responsibility: The ethical responsibility of the organization means what the society expects from the organization which benefits the whole society and to avoid harmful thing which affects the society as all such as avoiding the damage of the environment, serving the community. Moreover, the organization is required to do right things such as respecting the human rights.
- Discretionary responsibility : Discretionary responsibility includes the voluntary duties of the organization which means doing the good things to the society and serving the community outside the organization such as philanthropy or humanitarian (Galbreath, 2010)

B. Why CSR disclosure?

The disclosure about CSR will bring many benefits to the organizations which disclose it. These benefits are:

- The image and the reputations of the organization will improve, and this helps the organization with the competitive environment by providing it more advantages to face these competitions due to the idea that , each organization that has a good reputation the people will have a good idea about the organization and this is considered as one type of motivation to the organization (A. Hassan & Harahap, 2010).
- The relationship between the organizations and their employees will improve, this relationship encourages the employees to have a loyalty to their organizations, and this is because giving the employee the justice which they need in their work (Galbreath, 2010).
- Increases the relationship with the local society by providing the activities that benefit the organization community such as, supporting of public health, serving the community. (Pratten & Mashat, 2009)
- Improvement of organization financial performance (Oeyono, Samy, & Bampton, 2011) (Arendt & Brettel, 2010). According to (Arendt & Brettel, 2010) when the organizations disclose their CSR activities their reputation will increase among the people, in this way the competitive advantages also will increase, by this process all the performance of the organization will increase.
- Improves the relationship with the organization stakeholders (Cheng & Ahmad, 2010) as well as providing a clear information about the beliefs and the position of the organization. Besides, decreases ambiguity in the mind of investors and stakeholders on long term risks and actions, the idea behind this is when the organizations disclose their CSR activities which are considered as a voluntary disclosure, this means that the organizations generate their profit and don't have big problems in their work (A. Hassan & Harahap, 2010)
- Improvement of the customer loyalty to the organization (Galbreath, 2010)
- The image of the organization will improve, so by this improvement the amount of sales will increase. (Gallego, 2005)
- Enhances the interaction between the organizations and their suppliers and their customers as well, and this will reduce the operating cost as well as the amount of sales will increase. (Gallego, 2005).

C. **Corporate social responsibility disclosure in developed Countries?**

- There were a lot of studies conducted in developed countries to investigate the disclosure of CSR activities, (Arendt & Brettel, 2010) conducted their study in European multi – industry companies with a sample of 389 companies, the purpose of the study is to look on the effects of corporate social responsibility practices on the image, identity, and the firm's performance. The study concludes that the activities of CSR could provide benefits to the organizations such as the image and the firm's performance and that depends on the company size and the marketing budget of the company.
- In Spain (Gallego, 2005) did his empirical study to investigate corporate social responsibility information among certain Spain firms between the year 2001-2002, and the study focused on the information that disclosed corporate social responsibility which complies with the Global Reporting Initiative (GRI) framework. The study showed increase and improvement of the type of the information on corporate social responsibilities among Spanish firms in the recent years.
- For the purpose of investigating whether if the national cultures have an influence on the level of the corporate social responsibility disclosure, (Orij, 2010) conducted his study among 600 large industrial corporations in 22 countries both developed and developing countries. The study showed that the influences of national culture are significant on the information disclosed on corporate social responsibility among the 22 countries.

D. Corporate social responsibility practices in UAE?

- (Jahamani, 2003) in his study about green accounting in developing countries conclude that UAE firm's decision makers were aware of the issue of the green accounting which concentrates on the issues of environment in the three aspects which are; environmental awareness, environmental reporting and environmental involvement.
- To investigate the issues of social accounting and reporting (Kamla, 2007) conducted her study among nine of the Arab Middle East countries, which are Kuwait, Qatar, United Arab Emirates, Saudi Arabia, Oman, Bahrain, Jordan, Egypt and Syria. The study used content analysis method to examine the result. The data of the study were 68 annual reports of companies

which worked in nine Arab Middle East countries. The study also looked on three dimensions about the social accounting namely; environmental dimension, economic dimension, disclosure about general social issues dimension and social characteristic of the reports dimension. The study concluded that, the disclosure about employee issues were the common among Arab Middle East countries as well as the community disclosure and customer related issues disclosure while the disclosure about the environment got the lowest level disclosure compared to economic and social.

- (Rettab et al., 2009) investigated the relationship between the disclosure about corporate social responsibility and the organization's performance among 280 organizations from different sectors which worked in Dubai by using the survey method. The study measured the firm's performance by looking on three dimensions namely; financial performance, employee commitment and corporate reputation. The study concluded that, there is a positive relationship between the disclosure about corporate social responsibilities and firm's performance.
- (Hossain & Hammami, 2009) conducted his study in order to examine the voluntary disclosure of the one of the emerging countries namely Qatar, the authors developed a list of 44 items which the organization disclose in a voluntary basis and one of them is a disclosure about corporate social responsibility. The study used multiple regression analysis method for analysing the data. The sample of the study was 42 annual reports of the companies listed on the Qatar Security Market at the end of 2007. The study concludes that the size of the company, age, assets and complexity have been the main variables that encourage the companies to disclose about voluntary disclosure.
- To examine the disclosure about corporate social responsibility in UAE as one of the Islamic countries with multinational companies that came from all over the world such as Shall, DHL, Intel as well as is the one of the developing countries (Katsioloudes & Brodtkorb, 2007) did their study by surveying 403 companies with a questionnaire of 12 questions about the awareness of these companies on the issue of corporate social responsibility as well as the authors concentrated of 4 dimensions about CSR, these are environmental issues, consumer protection and community affairs. The study concluded that, the UAE companies are aware of the issue of CSR and the importance of disclosing it as well as the firms which work in the UAE has the same understanding the concept of CSR that generated from America and Europe.

III. Discussion

One reason behind the difference of the disclosure about CSR in local banks in UAE may because the influence of the 2008 financial crisis in the UAE, according to previous study such as (Mashal, 2012) (Ellaboudy, 2010) , the financial crisis affected UAE.

For the disclosure in 2011, the results indicated that, the maximum level of disclosure in 2011 on a scale of 0-1 was 0.88, however, the minimum level of the disclosure was 0.31, as well as the average level of disclosure was 0.58. Moreover, we can see that the disclosure was increased after the crisis to become 0.58 in 2011 which was in 2008, 0.53.

The second way which the current study used to examine CSR disclosure is by having four hypotheses to investigate the relationship between the four independent variables (size, profitability, leverage and number of the board of directors) and the disclosure about CSR.

Hypothesis of one of the current study examined whether there is no significant relationship between the disclosure on CSR and the size of the organization. From the previous literature review the current study expected that, there is a positive relationship between the disclosure about CSR and the size of the organization. Furthermore, the findings about the effect of the size of the bank generate that, the size of the organization has a relationship with the disclosure about CSR.

For the second hypothesis which examined whether there is no significant relationship between the disclosure about CSR and the profit of the organization. The current study used the return on equity ratio "net income / shareholders equity" as a proxy to measure the profit of the bank. The result indicated that, there is a significant positive relationship between the profit of the organization and the CSR disclosure. Moreover, the findings about the effect of the profit of the bank generate show that, the profit of the bank has a relationship with the disclosure about CSR, as well as influenced the disclosure about CSR.

For the third hypothesis which examined whether there is no significant relationship between the disclosure about CSR and the number of the board of directors. The result indicated that, there is a positive relationship between the number of the board of directors of the bank and the CSR disclosure. Moreover, the finding about the effect of the number of the board of directors of the bank generates that, the number of the board of directors has a relationship with the disclosure about CSR, as well as has an impact on the disclosure.

For the last hypothesis of the current study, which examined whether there is no significant relationship between the disclosure about CSR and leverage ratio of the organization? The current study used the debt ratio 'total debt to total assets" as a proxy to measure the leverage ratio of the bank. The result indicated that, there is a significant negative relationship between the disclosure and the leverage ratio.

Furthermore, the results show that, there is a fluctuating of the disclosure about CSR between three years 2007, 2009 and 2011 and this might have happened because of the financial crisis which affected the world in 2008 as well as affected UAE. And this is another answer of the research question number 2 which showed that the extent about CSR disclosure has been changed after the financial crisis.

Moreover, most prior studies which conducted to examine the extent of CSR disclosure provide evidence based on one year data such as (Menassa, 2010) (Pratten & Mashat, 2009) (Kotonen, 2009) (Siregar & Bachtiar, 2010) (Ghazali, 2007) , or two years data such as (Oeyono et al., 2011) (Saleh et al., 2010)

(Kuasirikun & Sherer, 2004). Hence the current study contributes to the literature of CSR disclosure by examining three years data (2007,2009 and 2011) to investigate the factors which affect the extent of CSR disclosure in annual reports of UAE local banks.
At the same time, the current study focused on the one of the developing countries as well as the implementation and the extent of CSR disclosure in UAE. At the same time, it may give an idea or an overview about CSR disclosure in the same regime – Gulf state countries such as Kuwait, Yemen.

IV. CONCLUSION

To conclude, this study was conducted to examine the extent of the CSR disclosure among local banks in UAE. The study examined four hypotheses which showed the relationship between the disclosure about CSR and four variables, these variables are; the size of the organization, profit of the organization, the number of the board of directors and the leverage ratio. Moreover, the study examined if the 2008 financial crisis has affected the disclosure on CRS or not. The findings of this study are consistent with the previous studies conducted to examine the disclosure on CSR. The results of the study showed that, there no significant relationship between the disclosure about CSR and the size of the organization, the number of the board of directors and the leverage ratio, while for the profitability ratio there is a significant relationship between it and CSR disclosure . For the effect of the financial crisis on the CSR disclosure, the study showed that there is an effect of the financial crisis, before the financial crisis which in the year 2007, the results showed the disclosure about CSR on a scale of 0-1 is 0.67, while in 2009 after one year of the crisis the study showed that the disclosure was decreased to become 0.54, however the disclosure increased to become 0.60 in 2011.

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"From Likes to Loyalty: The Power of Social Media"

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Abstract- There has been a continuous open deliberation about whether the exercises of brands and organizations in online networking space has a quantifiable rate of return. A few analysts accept that social media platforms give a one of a kind chance for brands to cultivate their associations with clients, while others accept the opposite. Some see it as a rising medium for generating brand mindfulness and reliability though other contend that there is no successful rate of return from such activities. This paper, based on investigation of distributed writing in the Indian market, expects to highlight the developing significance of social media for advertisers in India by aggregating how a few brands are now harvesting advantages from their ventures and moving beyond just "likes" and "followers"

Index Terms- Advertisers, Brand, Online networking, Rate of return, Social media

I. Introduction

Organizations comprehend the expanding ubiquity of online networking and the impact it can have on advertising and the general association with their clients. As of now, organizations are adjusting to the new patterns of social networking and utilizing social networking destinations as an important element of their marketing strategy. However do online networking truly influence what individuals buy and their associated brand loyalty, or is it all simply an enormous exercise in futility?

Online social networks have emerged as the most blazing stage for organizations to showcase or promote themselves. Today online networking is affecting the obtaining choice of clients on the grounds that they have access to information about products and services along with verified reviews from previous users. This gives them better bargaining power as it opens up an abundance of alternative options for consideration. Businesses are similarly using the same medium to forge a stronger bond with their customers and continuously competing with their counterparts to emerge as the most "liked" brand on their minds.

This paper plans to provide information on how how social networking and online media channels have advanced as a favored medium for organizations to proliferate brand trust and faithfulness among customers. It means to highlight the methods embraced by brands keeping in mind the end goal to get the best conceivable quantifiable profit from online networking.

II. Literature Review

Safko and Brake (2009, s.6) characterize social networking "exercises, practices and conduct among groups of individuals who accumulate online to impart data, information, and assessments utilizing conversational online networking". As indicated by Robinson (2007)`social media are the apparatuses utilized for correspondence that have Web 2.0 traits that is, they are participatory, collective, have information imparting and user-enabling instruments accessible on the Web. Social networking, for example, Facebook, Twitter and YouTube are element devices that encourage online connections (Golden, 2011). It is generally a minimal effort manifestation of advertising and permits associations to take part in direct and end-client contact (Kaplan and Haenlein, 2010).

Online networking advertising is unique in relation to the customary techniques for promoting; consequently, it obliges uncommon consideration and method building to accomplish brand picture and dependability. Its notoriety with shoppers is unprecedented in light of the fact that web showcasing and promoting can give purchasers more data, more intelligence, and can track the hobbies of customers (Janal 1995).

Social networking additionally permits customers to partake and get to be intelligent with an organization's online networking website, which allows purchasers a feeling of fairness in the middle of themselves and the organization (Evans 2011). But, in place for online networking to be a viable manifestation of showcasing, organizations need to plainly express their targets and have an intensive comprehension of their group of onlookers and chose target markets (Evans 2011). Organizations need to adjust their methodologies to the shoppers they are focusing to guarantee all methods, not simply through social networking, are executed appropriately to keep up a deep rooted relationship.

III. Research Elaborations

A. Social Networks – The Double Edged Sword

> *"People influence people. Nothing influences people more than a recommendation from a trusted friend. A trusted referral influences people more than the best broadcast*

message. A trusted referral is the Holy Grail of advertising." – Mark Zuckerberg, Facebook.

"Social media is a saviour not a nemesis, an asset not a liability, a time saver not a time killer for ad agency new business" – Michael Gass, new business consultant for advertising agencies

Social networking assumes an essential part in how purchasers find, research, and offer data about brands and items. Online networking Report published in 2011 by Nielsen and NM Incite, a Nielsen/McKinsey company showed that social networking is progressively turning into a stage for customers to express their reliability to their most loved brands and items. Truth be told 60 percent of customers scrutinizing items through numerous online sources found out about a particular brand or retailer through long range interpersonal communication destinations.

On the other hand, shielding others from terrible encounters, or imparting their negative encounters to "rebuff organizations" social networks act as the one stop engagement stage for everyone. Consumers have started utilizing online networking more as a client administration channel to charge brands' consideration and organizations are compelled to react to clients by specifically reaching them for issue determination. With clients burning through 20-40% more with organizations who react to client administration asks for over online networking (Bain & Company, 2013), most organizations have observed that its more successful to have prepared client administration reps who are furnished with answers and learning to deal with the same request on online networking that were generally made through email, visit rooms, and so on.

B. The Business Perspective

With the enormous development in the utilization of social networking, brands have been grappling with how best to exploit it. As indicated by the CMO Survey by Duke University, advertisers are required to build their offer of online networking spending from 6.6 percent to 15.8 percent of their financial plans by 2018.But Christine Moorman, kindred at Duke University and a Forbes donor calls attention to the fact the a considerable measure of organizations don't have an unmistakable online networking strategy and they're simply doing a ton of stuff in light of the fact that different organizations are doing it. Rather, they ought to "build up a testable hypothesis" to focus their promoting methodology.

"*Make a speculation, and afterward utilize those forecasts to truly nail down the measurements that you think ought to be utilized," she says. "Else, you're just on the fleeting trend.*"

Numerous advertisers, even those that have explored different avenues regarding social networking, recognize that they have yet to truly figure it out. The inquiry of regardless of whether online networking drives ROI still torment numerous advertisers and brands. As per a 2010 review by Millward Brown of the individuals from the World Federation of Advertisers more than 50 percent of CMOs' were uncertain of the profits they were getting on this speculation.

C. How brands are utilizing social media

The ROI of social media could be through direct monetary return, increased brand awareness, engagement and loyalty, repeat purchases, word of mouth and more. Most of the companies try to establish a direct link between social media campaigns and associated returns. But the issue is not always as straightforward as it seems, as there are multiple ways to measure the benefits of social media. It isn't as simple as looking for a direct sales return at one end, with the social media input at the other. Viewing social media holistically to gain a better understanding of how it can work for a business is more beneficial than looking for one single return1. The following example would validate that

- The chocolate – coated wafer brand of Nestle, Kitkat promoted their new Twitter campaign #RichBreak in August 2014 in which users were intimated via Twitter to become a participant and follow the KitKat India handle and to include #RichBreak hashtag for every tweet they do .Six winners were rewarded with a Rs. 1000 Flipkart vouchers and the grand prize, a trip to Goa. Due to the perks they offered, they got a good number of responses. They promoted the hashtag on Twitter as well to leverage this opportunity at-max.

- For the ICC Champions Trophy 2013, Pepsi launched the 'Road to Champions' social media campaign using a combination of Facebook, Twitter and Instagram, taking fan engagement to the next level. The game invited one to share their favourite moments in cricket and earn points. Points mean kilometres with which one could travel on a virtual map to reach closer to the Champions finals at London. It managed to have 16 million likes on Facebook and another 61 million followers on Twitter

- Tata Docomo, one of India's leading telecom brand with nearly 13.5 million fans on Facebook, had built an application that will throw light on their Facebook lives. The app called 'Open up' explored a fan's Facebook profile to find out who were their best friends, which were their most amazing moments, which are the friends they had lost touch with and more. For the Facebook obsessed young generation, Open up was a boon to engage better with their friends, with Tata Docomo acting as the enabler.

- For its new nail paint collection called 'Color Show', Maybelline New York India sought to create a new nail revolution on social media. Each of the 40 shades in the range was introduced across 80 days in an interesting manner – each color was introduced with the nail art

combinations that go with it, from educating fans about how they could get the 'complete look' with the right shoes and accessories to match with their preferred shade. A Facebook app enabled fans to try out the shades too

- In Feb 2013, Motorola propelled its exceptionally encouraging cellular telephone MOTO G in India which received unprecedented response. The marriage resulted in the biggest deal ever in the history of e-tailing. The reason was in the company's choice to go to market with an online vicinity by means of a solitary restrictive accomplice in Flipkart which was empowered to reach to enormous masses in India exceptionally quickly. This worked in favor and now the company has already augmented its elite online association with Flipkart to catch more market share.

- Croma, India's leading gadgets retail chain from the Tata conglomerate, marked an arrangement with a web offering website Snapdeal.com to provide hardware like versatile ,tablets and portable workstations etc.online which are accessible in Croma stores. This coordinated effort helped Croma in expanding its reach at an extremely fast speed through Croma's flagship brand store on snapdeal.com.

- Social networking has started to supplant a considerable measure of exercises that used to happen on different parts of the internet and the most essential effect is en route clients shop online. Social media has turned into a research instrument which helps in seeking as well as helping the clients by investigating different online sites. Various reputed internet shopping sites like *"myntra.com, snapdeal.com, jabong.com, and amazon.com* " are making utilization of Facebook for the promotions. This further results in increment in the prevalence of use of these internet shopping sites - 67% clients use social destinations on cell phones while shopping has seen to to increase from 24% last year . According to a report from *Technorating media* the greater part of shoppers follow brands on social locales to get more information about an item (56% for facebook and 47% for twitter). This analysis shows that social media is acting as an important tool to increase the growth rate of the companies which further helps in creating brand loyalty. Matrimonial sites are additionally making utilization of social networking stages to pick up prominence. these days matrimonial administrations, group particular chatrooms and gatherings and so forth are accessible on different social networking platforms

Every one of these examples demonstrate that there is no deficiency of chances for a brand in the social stadium; the key is to comprehend what goals need to be accomplished and which set of instruments with their relating measurements can best accomplish them. Web advertisers are currently setting an expanding measure of accentuation on building groups by means of informal organizations and are incorporating every stage to convey a consistent stream of introduction. Actually, obtaining a "Like" on Facebook or new adherent on Twitter is held in higher respect than special site activity. In any case, what is most engaging about online networking is that unlike all different types of web showcasing –, for example, PPC and SEO – its totally free

In a planned social networking crusade, shoppers are prone to spread viral features, make extra brand-related substance, tweet about the brand and post about their encounters on Facebook or Twitter taking into account their fundamental inspiration to draw in with the brand. An incorporated showcasing crusade which is firmly attached to online purchaser conduct would have a tendency to procure better returns for the brand over the long

IV. CONCLUSION

Online networking is turning into a more noticeable wellspring of showcasing and publicizing and is being utilized all the more reliably by organizations attempting to get their name out to people in general and in the psyches of purchasers. The longing to wind up included in online networking is reasonable; the development being used of online informal organizations has been extraordinary. Businesses today are being transformed from having a transactional relationship to a social relationship Though the medium is still in nascent stage in India, the ripples have already begun. It is now becoming clearly evident that companies need to engage themselves in more innovative social media based advertising strategies in order to consolidate its brand awareness and brand loyalty. It is time for the companies to make effective strategies and execute them to win larger share of business through this revolutionary medium and become the innovative firm of coming future.

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Efficient Driver Fatigue Detection and Alerting System

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Abstract- In order to the drowsy driver, this paper contains a new fatigue driving detection algorithm. Experts told that such drivers who do not take usual break, when driving long distance can be feeling sleepy. Most of the severe road accidents are caused by sleepy drivers than drink driving.

In order to avoid accidents fatigue detection method will detect early signs of fatigue in drivers. If driver is falling symptoms of weariness then immediately message is generated that driver is fatigue, then this message will be transferred to the control room in COMMAND navigation system that indicating status of driver. The fatigue is detected in the system by image processing method of comparing the images in video and by using human features we will detect the driver is fatigue or not.

Index Terms- Face detection, Fatigue Detection, Feature Extraction, Eyes location.

I. INTRODUCTION

The drowsiness increases the risk of human-error related accidents. Driver's state of mentality and tiredness is one of the most important reasons of traffic accidents. The overall studies in France, the National Police Administration shows that of insufficient sleep can cause more road accidents than drink driving. The studies also show that 14.9 percent of accidents causing human damage and 20.6 percent of accidents causing death are fatigue related.

Also the growing number of traffic accidents in United States that are due to a decreased driver's awareness level has become a problem of severe worry to society. Drivers with a decreased observation level suffer from a serious danger to their own life and the lives of other people. Statistics show that a most important origin of critical or injury causing traffic accidents is due to drivers with a decreased awareness level.

Sleepiness is defined as, it is inversely proportional to hours slept, and difficulty falling asleep was more with a full-time job. Studies indicate that 8 to 9 hours of extended nocturnal sleep are needed to resolve sleepiness caused by decreased sleep time. Motor vehicle accidents related to fatigue, drowsy driving, and falling asleep at the wheel are particularly common but often underestimated. Sleepiness-related motor vehicle crashes have a fatality rate and injury severity level is more than alcohol related crashes.

In the trucking industry, 57% of fatal truck accidents are due to driver fatigue. It is the principal reason of heavy truck crashes. Seventy percent of American drivers details driving fatigued. The National Highway Traffic Safety Administration (NHTSA) estimates that there are 100 000 crashes that are caused by sleepy drivers and result in more than 1500 fatalities and71 000 injuries each year in U.S. With the rising traffic conditions, this problem will further increase.

For this reason alerting the driver of any insecure driving conditions is essential for accident prevention or avoidance. In the last 10 years to avoid many accidents due to driver's fatigue many countries all over the world have begun to pay attention to driver safety problem and to investigate the mental state of driver relating to driver safety. Therefore, how to avoid fatigue driving efficiently can help to prevent many accidents, and save the life of human beings.

Visual delay and mistreatment of emergencies are common faults for high-speed train drivers, heavy rail freight locomotive drivers and car drivers. According to related materials, if the hidden dangers could be warned to drivers several seconds before they become out of control, 90 percent of the traffic accidents could be avoided. Actually, visual delay is the appearance of fatigue, so we should improve the early warning system for fatigue driving. In this way, a large number of traffic accidents will be reduced. It's important to understand the real-time monitoring of drivers and vehicles condition and send out warnings when abnormal cases happen.

This problem will increase day by day. So, there is a requirement of designing detection systems for the driver drowsiness or inattention and can produce some warning alarms to alert the driver and the further people in the vehicle. Driver's behaviors such as visual interruption, false determination on the environment and improper handling of emergencies just the accidents have close connection to crash. This method we'll discuss in this paper, fatigue driving based on image processing.

II. RESEARCH ELABORATIONS

A. First of all driver drowsiness detection has focused on medical science, people reflected on medical science with the help of medical electroencephalograph (EEG), electrocardiograph (ECG) and electromyography (EMG) to detect a driver's EEG waveform, ECG waveform and EMG wave-form . In spitefulness of the truth of medical methodology, it's complicated to detect fatigue. The method we'll discuss in this paper, fatigue driving based on image processing. The research "An Evaluation on Various Vision-based Fatigue Driving Detection Methods" shows fatigue driving results.

Previous research shows that principal cause for different road accidents is the variety of speed of eye moving, external lighting obstruction and realistic lighting conditions. In the realistic lighting condition the eye motion is highly nonlinear. In references, Qiang Ji et al. made many changes facial fatigue detection over existing techniques. However, these techniques need infrared (IR) eye detector, or clear pupils and stable illumination. Later they used Kalman filtering for eye-tracking

method, it is a linear system estimation algorithm. In fatigue detection eye motion has the highly nonlinear so standard Kalman filter is no longer favorable. To solve these problems ZHANGs used a nonlinear unscented Kalman filter for fatigue detection but it require IR-sensitive camera.

B. Main reasons of driving drowsiness

Four main factors of driver weariness: sleep, work, time of day, and physical. Most of the work is done successfully in day rather than in midnight. Sometimes by consuming caffeine or other stimulants people continue to keep on awake. Daily insufficient sleep increases and lastly the body fall downs and the person falls asleep. Time of day factor matters on body. Human brain much tries to think in day.

Between the hours of 2 AM and 6 AM, the brain tells the body it should be asleep. The final factor is a person's physical condition. People sometimes are on medications that create drowsiness or have physical ailments that cause these issues. Being physically unhealthy, by being either weak or fat will cause fatigue. Additionally, being psychologically worried will cause the body to get fatigued.

III. FACE DETECTION

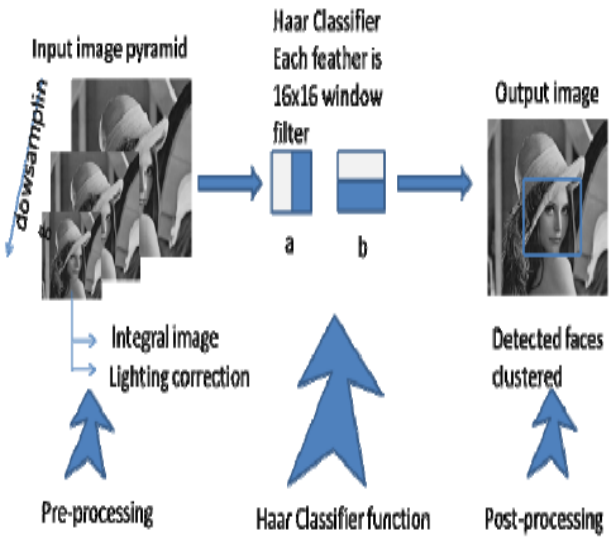
A. Algorithm for Face detection

Face detection and tracking are important in many computer vision applications including activity recognition. Face detection done through an image or video. There are various methods for face detection, artificial neural network method, template matching method, Voila and Jones algorithm , AdaBoost face detection algorithm. Therein, skin color detection method is useful when it appears to multi-face detection and tracking. Systems based on color can recognize human faces from different visual angles, but this method adapts to color image and cannot be used in night mode. Template matching method mainly identifies human faces by the geometrical relationship within face structure. As for illumination and pose variation and covered partial human faces, this method shows its drawbacks. AdaBoost algorithm is adaptable to light variation, anti-shake and can localize human faces with all-weather conditions.

B. Using Modified AdaBoost Algorithm

Viola and Jones came up with the cascade of the Haar classifiers, which increases the computational .We modified Viola and Jones algorithm based on characteristics of FPGA. First, we used 16 classifiers as parallel computing tool. Each stage has 16 integer multiple of the number of classifiers. Also, the output passing rate of Bayesian training algorithm is modified to insure the overall detection rate and false alarm rate remain un-changed after modified the number of classifiers. The eventually trained Haar classifier contains 40 stages, 2192 classifiers and 4680
features.

Fig.1 Face Detection flow based on Haar Classifiers



Fatigue Detection using surf feature extraction algorithm

C. Implementation on FPGA

Only the region of the picture through all of the stages is considered as human face region, and each stage contains 16 integer multiple of the number of classifiers, paper. We designed to simultaneously process the computing of 16 classifiers, and could obtain a speed 16 times faster than the traditional computing process. Because each stage declines regions that don't contain face area, declined regions cannot enter the next stage. The pass rate of the first stage in this design is 20%, while traditional pass rate is 50%. Because most of the computation is centralized on the first stage, as long as image region is blocked by the first stage, then there is no need to initialize parameters for the second stage. Thus time wasted on initialization will be cut off.

IV. PROPOSED SYSTEM

Image input:

We click images from camera which is situated in front of driver. Then we extract one by one Images. We will compare these images with previous images.

Surf feature detection algorithm :

First of all we detect the feature from eyes is useful for finding and tracking of face. It decides whether eyes are closed or opened.

After extracting the feature points in image we track the face and eye movements if eyelids are 80% closed then the driver drowsiness detected.

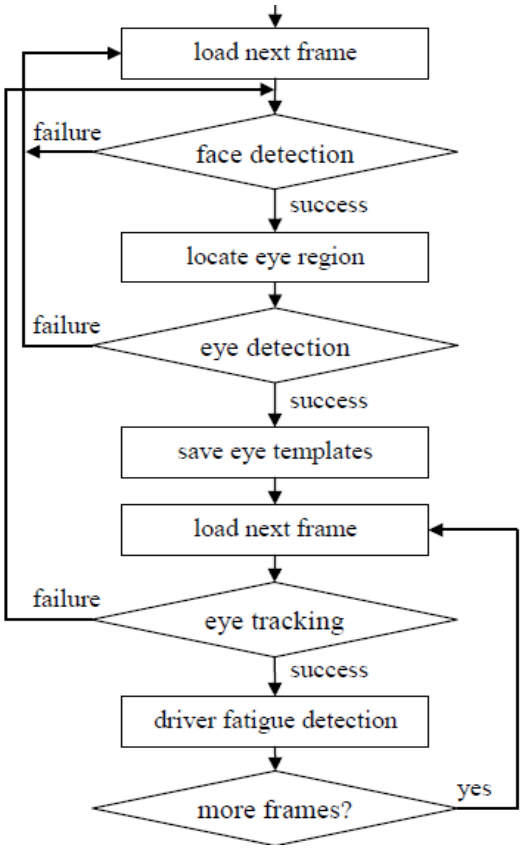


Fig 2.Flow Diagram

D. Eye state recognition

We apply PRECLOS, it is the criteria to judge the fatigue. PRECLOS is identifies as the most helpful vision-based fatigue evaluation method. The U.S. Highway Traffic Safety Administration suggested that it is typical method for measurement of fatigue while driving. PRECLOS is the time fraction of eye slowly close in a certain period of time relatively than rapid eye blinking. Person whose eyelids are shut down at least 80% in one minute is described as sleeping .

When Eye localization completed then Eye state identification should be performed. By using frame differential accumulation figure Eye position, open eye pattern and closed eye pattern of person are obtained. Then use closed and open eye pattern to determine whether this person is fatigue or not. This is the template matching algorithm, where Pm,n (i,j) denotes the pixel value of eye coordinates i, j. T(i,j) denotes the pixel value of pattern coordinates i,j. S(m,n) denotes the correlation value between detected eye image and pattern image, $0 \leq S(m,n) \leq 1$.Threshold th is set. If $S(m,n) \geq th$, detected eye image and pattern image are considered match each other.

V. CONCLUSION

As explained overall the paper, many technologies exist for detection fatigue in driver. This system also tried to overcome the shortcomings of earlier developed fatigue detection system. In this technique the fatigue will be detected immediately and also shows current status of driver. It provides new enhancement in technology. The system can be very useful an efficient to avoid accident and can save people life. It can make the world a much better and safe place to live.

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Speed Control of BLDC Motor Using DSPIC30F4011 Processor

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Abstract- Traditionally inexpensive analog components are used for the design purposes of Motor drives. The weakness of analog systems is their susceptibility to temperature variations and component aging. Another drawback is the difficulty of upgrading the systems. Digital control structures eliminate drifts and, by using a programmable controller, the upgrades can be easily accomplished by software. The high performance of digital signal controllers allows them to perform high-resolution control and minimize control loop delays. These efficient controls make it possible to reduce torque ripples, harmonics and improve dynamic behavior in all speed ranges. The motor design is optimized due to lower vibrations and lower power losses such as harmonic losses in the rotor [2].

Moreover designers have recognized the opportunity to redesign existing systems to use advanced algorithms. For improved efficiency and torque performance, brushless DC (BLDC) motors require a phase advance circuit. Because of the problem of controlled phase advance in BLDC motor we need digital control methodology instead of conventional analog control for the speed control of PMBLDCM. By applying direct digital control it will substantially increase the effective speed range and facilitates a constant power profile. Here the DSP controller is designed to meet the needs of control-based applications of Brushless DC Motor. BLDC motors are becoming popular in Aerospace applications due to better speed v/s torque characteristics, higher efficiency, and high power to frame size, silent operation and reliability.

Index Terms- BLDC motor, DSPIC30F4011, closed loop system.

I. INTRODUCTION

Speed Control of BLDC motor using DSP controller requires more hardware, and with the availability of DSP controller with versatile features motivated to develop a cost effective and reliable control with variable speed range. The proposed hardware and the program are found to be efficient and the results are promising.

II. BLOCK DIAGRAM OF SYSTEM

The proposed control for BLDC motor control using DSP controllers of MICROCHIP with device name DSPIC30F4011.The system consists of following blocks are1ϕ Bridge rectifier, BLDC motor, hall sensor, signal conditioner, DSP- DSPIC30F4011, opto-coupler, MOSFET driver, keypad.

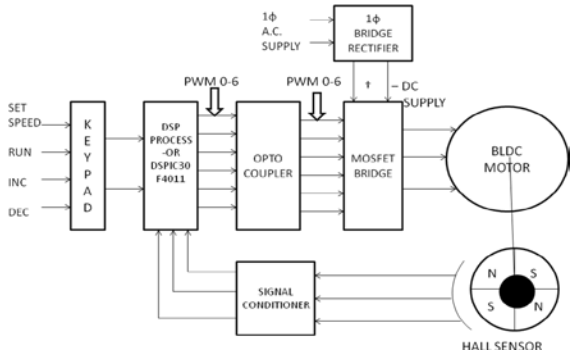


Fig 1 Block diagram of speed control of BLDC motor using DSP

The system takes 1ϕ, 230v supply; this supply is converted into 24V, DC supply through bridge rectifier. The 24V, DC supply gives to MOSFET Bridge. MOSFET bridge consists of six MOSFET (IRF640) connected in bridge format. According to the sequence these MOSFETs are Switch ON and OFF.

Rotor position senses by hall sensor. The output of hall sensor is amplifying through signal conditioner, this signal given to DSP processor. DSP processor takes input from keypad if we want to change speed and from signal conditioner. In DSP processor compare current speed with reference speed and according to that gives output which control MOSFET Bridge. In MOSFET Bridge switching transistors and flow current through two windings of stator winding and the other winding is inactive and hence commutation is done electronically and hence rotor starts rotating. This is closed loop system.

The base drive to the MOSFETS in the Inverter circuit is given by the DSPIC30F4011controller through driver (IR2101).The Hall signals from the motor are fed as inputs to the DSPIC30F4011 device and based on the Hall position and the direction of rotation of the motor specified by the manufacturer the corresponding gate drive is made active by the microcontroller and fed to the stator of the BLDC motor. The commutation sequence for rotating the motor in clock wise direction when viewed from the non driving end is given in the Table 1.

Hall Sensor Code			Phase Sequence	Driver Transistor Activating sequence		Phase Current		
A	B	C				A	B	C
0	0	1	1	Q1 (PWM1)	Q6 (PWM6)	+DC	OFF	-DC
0	0	0	2	Q1 (PWM1)	Q4 (PWM4)	+DC	-DC	OFF
1	0	0	3	Q5 (PWM5)	Q4 (PWM4)	OFF	-DC	+DC
1	1	0	4	Q5 (PWM5)	Q2 (PWM2)	-DC	OFF	+DC
1	1	1	5	Q3 (PWM3)	Q2 (PWM2)	-DC	+DC	OFF
0	1	1	6	Q3 (PWM3)	Q4 (PWM4)	OFF	+DC	-DC

Table 1: Sequence for rotating motor in clockwise direction

Based on the Hall sensor input to the DSP controller, the corresponding transistors are made active and current flows through two windings and the other winding is inactive and hence commutation is done electronically with the use of a DSP controller.[4]

Thus by properly exciting the corresponding winding based on the hall signal, the motor is commutated and is made to run at the desired speed. Initially irrespective of the rotor position, the windings are excited in the given sequence and once the motor starts rotating, rotor position is sensed by the Hall sensor and then the motor is excited based on the Hall signal and according to the direction of rotation of the motor.

The speed can be controlled in a closed loop by measuring the actual speed of the motor. If the speed is greater than the desired rated speed, then all the transistors are turned off for a short duration and then again excited based on the Hall position and accordingly speed can be adjusted to get constant speed. The demand of PMBLDC motors in high power servo applications is increased because of its High efficiency due to reduced losses, low maintenance and low rotor inertia. Also the invention of modern solid state devices like MOSFET, IGBT and high energy rare earth Permanent Magnets have widely enhanced the applications of PMBLDC motors in variable speed drives.

As the opto-coupler (HPCL817) provides the electrical isolation between circuits, it is called opto-isolator. In KEYPAD SET SPEED key sets the speed of motor and direction of motor clockwise/anticlockwise. RUN/STOP key runs the motor and stop the running motor. INC key increments the set speed by 100 rpm. DEC key decrements the set speed by 100rpm

A. BLDC Motor

BLDC motors are basically inside-out DC motors. In a DC motor the stator is a permanent magnet. The rotor has the windings, which are excited with a current. The current in the rotor is reversed to create a rotating or moving electric field by means of a split commutator and brushes. On the other hand, in a BLDC motor the windings are on the stator and the rotor is a permanent magnet. Hence the term inside-out DC motor.

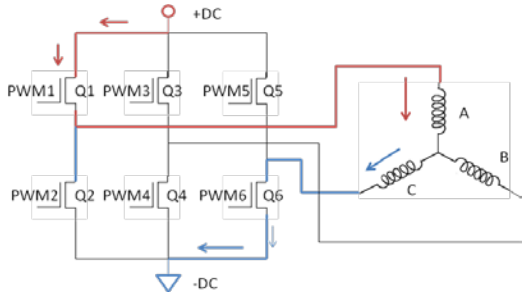


Fig (a)

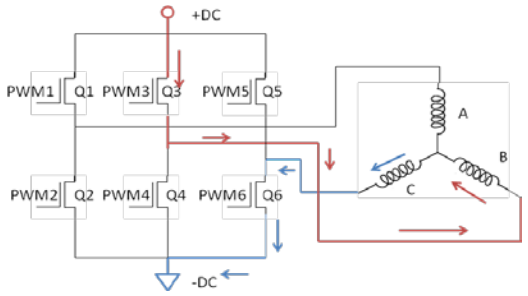
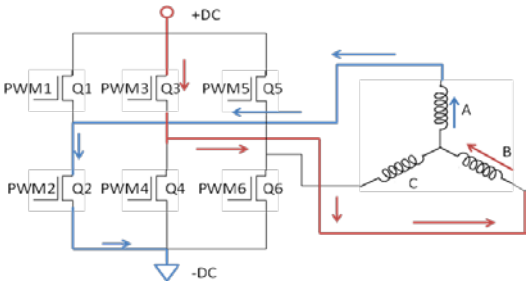


Fig (b)



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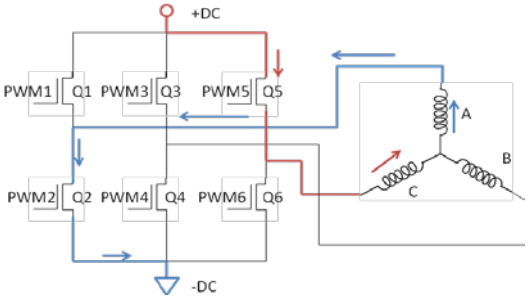

Fig (d)

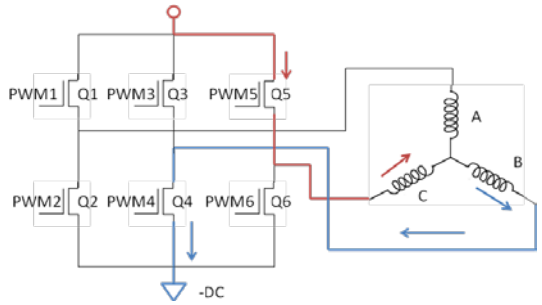

Fig (e)

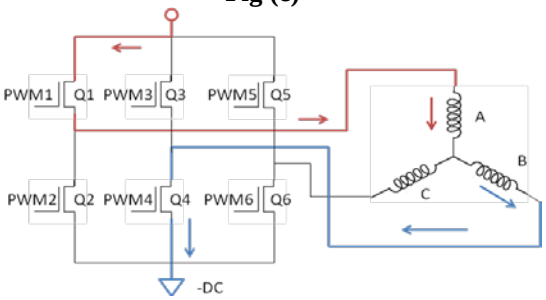

Fig (f)

Figure 2(a-f): Winding energizing sequence with respect to the hall sensor

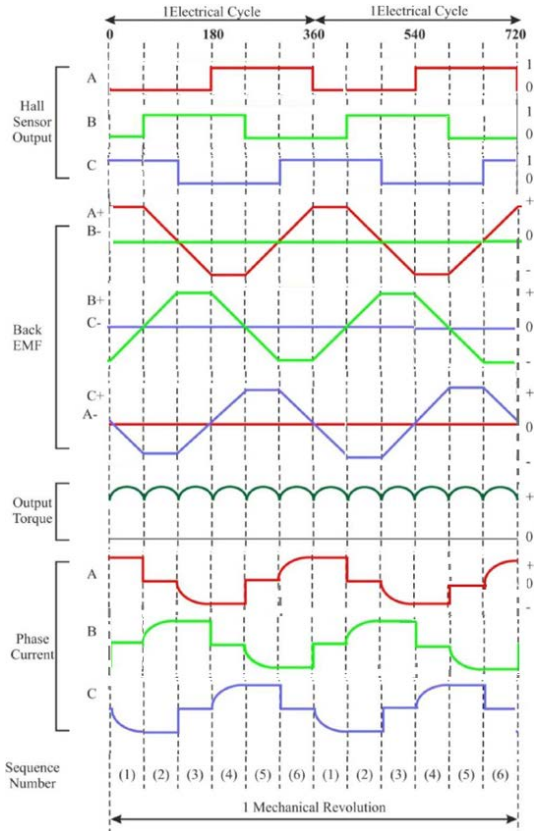

Fig 3 hall sensor signal, back emf, and phase current

To make the rotor turn, there must be a rotating electric field. Typically a three-phase BLDC motor has three stator phases that are excited two at a time to create a rotating electric field(fig 2(a-f)). This method is fairly easy to implement, but to prevent the permanent magnet rotor from getting locked with the stator; the excitation on the stator must be sequenced in a specific manner while knowing the exact position of the rotor magnets. Position information can be gotten by either a shaft encoder or, more often, by Hall Effect sensors that detect the rotor magnet position. For a typical three phase, sensored BLDC motor there are six distinct regions or sectors in which two specific windings are excited. These are as shown in Figure 3.

B. dsp processor

The dsPIC30F4011 is a 40-pin 16-bit MCU specifically designed for embedded motor control applications. AC Induction Motors (ACIM), Brushless DC (BLDC) and DC are some typical motor types for which the dsPIC30F4011 has been specifically designed. Some of the key features on the dsPIC30F4011 are[9]:

- 6 independent or 3 complementary pairs of dedicated Motor control PWM outputs.
- 9 input, 500 kbps, ADC with up to 4 simultaneous sampling capabilities.
- Multiple serial communications: UART, I^2C^{TM} AND SPI
- DSP engine for fast response in control loops.

In this application we discuss how the dsPIC30F4011 used to control a sensored BLDC motor. Hall sensor is connected to dsPIC30F4011. By reading the Hall Effect sensors, a 3-bit code can be obtained with values ranging from 1 to 6. Each code value represents a sector on which the rotor is presently located. Each code value, therefore, gives us information on which windings need to be excited. Thus a simple lookup table can be used by the program to determine which two specific windings to excite and, thus, turn the rotor.

i) PWM CONTROL SYSTEM

The MCPWM has a dedicated 16-bit PTMR time base register. This timer is incremented by a user defined clock tick, which can be as low as TCY. The user also decides the period required for the PWM by selecting a value and loading it in the PTPER registers. The PTMR is compared to the PTPER value at every TCY. When there is a match, a new period is started. The duty cycle is controlled similarly, by loading a value in the three duty cycle registers [6].

Unlike the period compare, the value in the duty cycle register is compared at every TCY/2 interval (i.e., twice as fast as the period compare). If there is a match between the PTMR value and the PDCx value, then the corresponding duty cycle output is driven low or high as dictated by the PWM mode selected. The three outputs from the duty cycle compare are channeled to a complementary output pair where one output is high while the other is low, and vice versa. The two outputs can also be configured as independent outputs. When driven as complementary outputs, a dead time can be inserted between the time the high level goes low and the low level goes high.

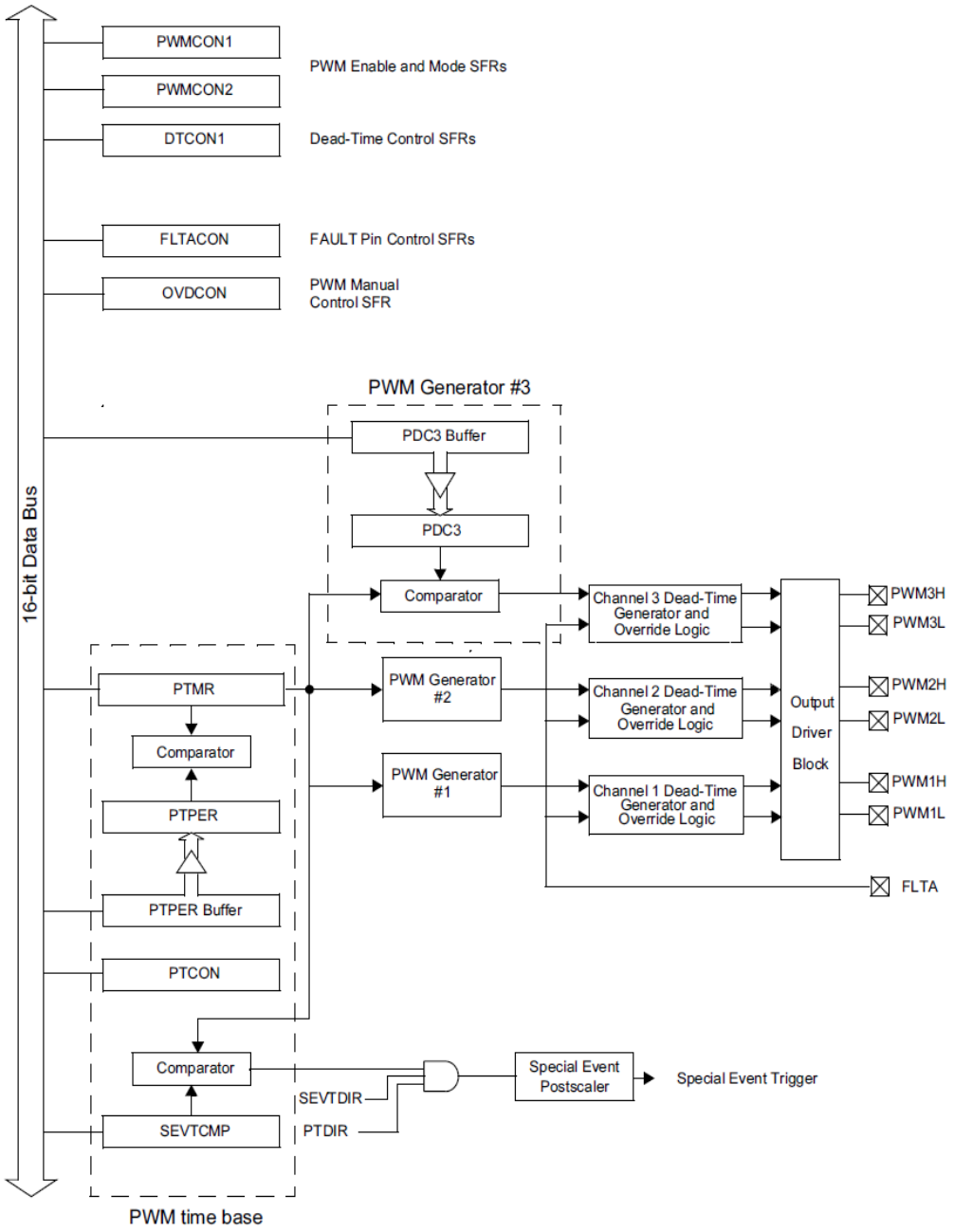

Fig 4 PWM module block diagram.

This dead time is hardware configured and has a minimum value of TCY. Dead time insertion prevents inadvertent shoot-thru in output drivers. There are several modes in which the MCPWM module can be configured. Edge aligned output is probably the most common mode. The operation of an edge aligned PWM. At the start of the period, the outputs are all driven high. As the PTMR increments, a match with the duty cycle registers causes the corresponding duty cycle output to go low thereby marking the end of the duty cycle. The PTMR match with PTPER register caused a new period to start and all outputs go high to start a whole new cycle.

The important feature of the MCPWM used in this application is the Override Control. The Override Control is the last stage of the MCPWM module. It allows the user to directly write to the OVDCON register and control the output pins. The OVDCON register has two 6 bit fields in it. Each of the six bit fields corresponds to an output pin. The high byte portion of the OVDCON register, determines if the corresponding output pin is driven by a PWM signal (when set to 1) or (when set to 0) driven Active/Inactive by the corresponding bit field in the low byte portion of the OVDCON register. This feature allows the user to have PWM signals available, but not driving, at all output stages of the pins.

For BLDC motors, the same value is written to all PDCx registers. Depending on the value in the OVDCON register, the user can select which pin gets the PWM signal and which pin is driven active or inactive. When controlling the BLDC sensored motor it is necessary to excite two winding pairs depending on

where the rotor is located and dictated by the value of the hall sensors. In the CN Interrupt service routine the hall sensors are read and then the value of the sensors is used as an offset in a lookup table which corresponds to the value which will be loaded in the OVDCON register. Table 2 and Figure 5 show how different values are loaded in the OVDCON register depending on which sector the rotor is located in and thereby which windings need to be excited.

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8
POVD4H	POVD4L	POVD3H	POVD3L	POVD2H	POVD2L	POVD1L	POVD1L

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
POUT4H	POUT4L	POUT3H	POUT3L	POUT2H	POUT2L	POUT1H	POUT1L

POVD								POUT							
-	-	3H	3L	2H	2L	1H	1L	-	-	3H	3L	2H	2L	1H	1L
0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0

Table 2 OVDCON resister values

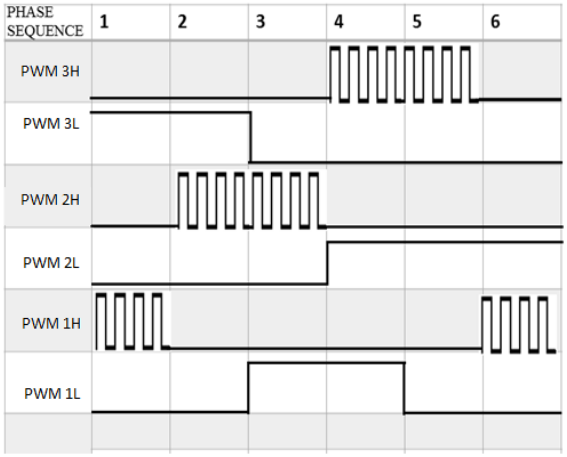

Fig 5: PWM waveform

iii) CHANGE NOTIFICATION INPUTS

The Hall Effect sensors are connected to the Change Notification Pin. The CN interrupt is enabled. As the rotor spins, the position of the rotor magnet changes and the rotor enters a different sector. Each new position is signaled by a CN Interrupt. In the CN Interrupt routine, this is shown CN Interrupt Flow, the Hall Effect sensors are read and based on the value, and a table lookup value is got and written to the OVDCON register. This action will insure that the correct windings are excited in the right sector and the motor will continue to spin.

ii) cLOSED loop control

As system make SWITCH ON .It initialize MCPWM, ADC, Timers & Ports. System reads hall sensor signals and read last set speed. Set speed stored in the period registers PDC1, PDC2, and PDC3. As START Key is pressed. According to hall sensor signal read lookup table, Load the OVDCON register and ON the PWM signals and motor starts to rotate. As STOP key is pressed. DSP processer disables PWM signals. This closed loop system explains in following flowchart.

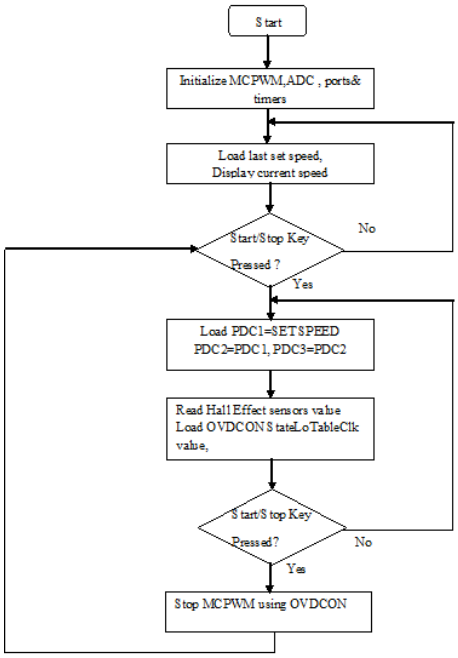

Fig 6 Flow chart of closed loop control.

III. RESULTS

These PWM signals are shown in fig 7(a), 7(b), 7(c) for speed range 400rpm, 600rpm & 1000rpm respectively. From waveforms it is seen that as speed increased time period of pulses decreased. The phase to phase voltage signals are shown in fig 8(a), 8(b) & 8(c) for speed range 400rpm, 600rpm & 1000rpm. From waveform it is seen that as speed increased the number of pulses are increased and time period of pulses decreased.

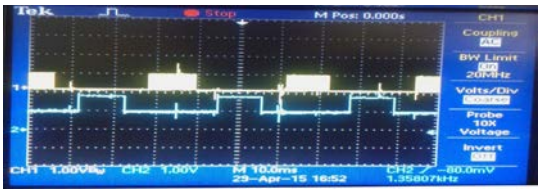

Fig 7(a) Waveform of PWM at speed 400 rpm.

Fig 7(b) Waveform of PWM at speed 600 rpm.

Fig 7(c) Waveform of PWM at speed 1000 rpm.

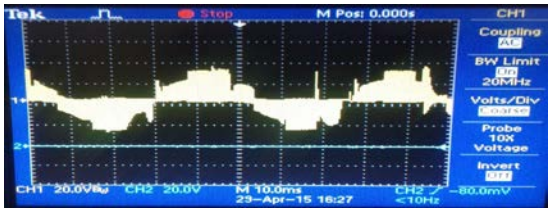

Fig 8(a) Waveform of phase to phase voltage (red-black) at speed 400 rpm.

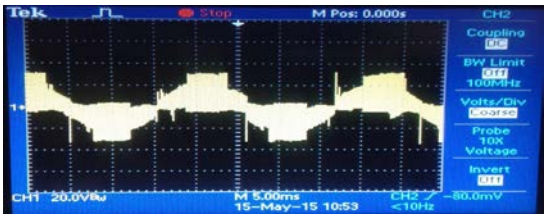

Fig 8(b) Waveform of phase to phase voltage (red-black) at speed 600 rpm.

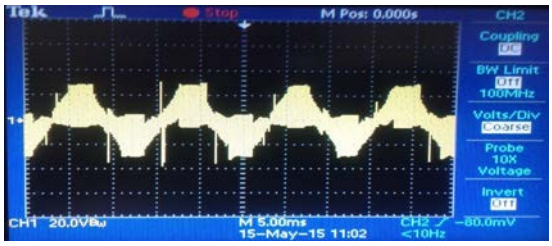

Fig 8(c) Waveform of phase to phase voltage (red-black) at speed 1000 rpm.

IV. CONCLUSION

1. The results obtained outlined the success of the prototype circuit for its intended application. System runs successfully. When change set speed, motor takes 2.77 sec to rotate. The transient response of system is 2.77sec, after motor rotating at set speed, and then motor comes to steady state response after 1.57 sec.
2. LCD is displaying the approximate current speed of the motor. The motor rotated at given speed range, and rotated in both directions clockwise and anticlockwise. The rotor speed can be regulated to operate within ±5% speed error band
3. The speed control parameter is duty cycle of PWM signal. It is seen that as duty cycle is changed speed of motor is changing. Speed is directly proportional to frequency.

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Characterization and Solubility Studies of Mefloquinehydrochloride Inclusion Complexes with α -Cyclodextrin/ Hydroxypropyl α -Cyclodextrin.

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Abstract- The present study aimed to improve the solubility and ultimate bioavailability of poorly soluble Mefloquinehydrochloride, an antimalarial drug by encapsulating it in α-cyclodextrin and Hydroxy propyl α- cyclodextrin. Effect of these complexes was studied by UV-VIS spectroscopy, Fluorescence spectroscopy, Phase solubility study, SEM-EDS and FTIR spectroscopy. The association constant of the inclusion complexes were determined by the Benesi- hilde – brand relation and the inclusion ratio was found to be 1:1. The water solubility of Mefloquinehydrochloride was increased by inclusion with α-CD and HP-α-CD according to the phase solubility diagram.The results obtained from SEM-EDS and FTIR spectroscopy confirmed the inclusion of Mefloquinehydrochloride into cyclodextrins cavity.

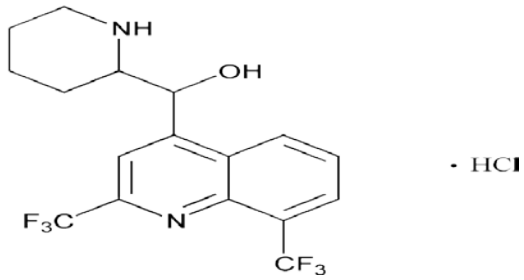
Index Terms- Alpha cyclodextrins, Hydroxypropyl alpha cyclodextrins, inclusion complex. Mefloquinehydrochloride.

I. INTRODUCTION

Malaria is the most life threatening disease among parasitic infections. Plasmodium falciparum, the human malaria parasite, is the overwhelming cause of serious disease and death(1). Mefloquinehydrochloride, a rapidly acting antimalarial drug is potent , efficient against acute and severe p.falciparum malaria. The efficiency of Mefloquinehydrochloride is greatly hampered due to its poor bioavailability and low aqueous solubility. The solubility of poorly soluble drug can be altered in many ways, such as modification of drug crystal forms, addition of co-solvents, addition of surfactants, complexation with cyclodextrins (CD) , etc. (2,3,4,5,6). Among the possibilities CD approach is of particular interest.

Cyclodextrins (CDs) are non–toxic cyclic oligosaccharides, consisting of (α-1,4) linked α–D–glucopyranose units with a hydrophilic interior. The most abundant natural cyclodextrins are α–Cyclodextrin (α–CD) , β-Cyclodextrin (β-CD), γ-Cyclodextrin (γ-CD) containing six, seven and eight glucopyranose units , respectively (7,8,9,10). Cyclodexrin complex has been successfully used to improve the solubility, chemical stability and bioavailability of a number of poorly soluble compounds (10,11,12). Recently, various hydrophilic, hydrophobic and ionic cyclodextrin derivatives have been utilized to extend the physicochemical properties of water insoluble drug through inclusion complexes formulations. (13,14,15). α-CD and HP-α-CD are water soluble molecules, which has been widely studied as a complexation agent for many pharmaceuticals.

In this study, an attempt was made to improve the solubility of Mefloquinehydrochloride by complexing with α-CD and HP-α-CD, thereby increasing its bioavailability and therapeutic efficiency. The characterization of drug with α-CD and HP-α-CD using UV-VIS spectroscopy , fluorescence spectroscopy,phase solubility study, SEM-EDS and FTIR spectroscopic studies were performed.



α-2-piperidinyl-2,8-bis (trifluoromethyl)-4- quinolinemethanol hydrochloride

II. EXPERIMENTAL SECTION

2.1.Materials and Methods

Mefloquinehydrochloride was obtained as gift sample from Ipca Laboratories ltd. Mumbai, India, α-CD and HP-α-CD were purchased from Sigma Aldrich; both were used as received with no further purification. All other reagents and chemicals were of analytical grade.

2.2.Instruments

The UV-VIS spectra were carried out with Systronic Double- beam spectrophotometer-2203. Fluorescence spectral measurements were carried out with JASCO spectrofluorometer FP-8200. Phase solubility studies were carried out using a rotary shaker. FTIR studies were carried out by FTIR-8400S type and SEM-EDS studies were examined by means of JEOL MODEL JSM – 6390 LV.

2.3.Preparation of liquid inclusion Complex

The inclusion complex was prepared by adding constant volume of drug into 10ml volumetric flasks containing the absence and presence of increasing concentrations (2-10 mM) of

α-CD and HP-α-CD. The absorption and fluorescence spectra were recorded.

2.4.Preparation of solid inclusion complex

Solid dispersion / Co-evaporated dispersion method

The solid inclusion complex of Mefloquinehydrochloride with α-CD and HP-α-CD in 1:1 molar ratio were prepared by dissolving the drug in methanol and α-CD and HP-α-CD were dissolved in water separately (15,16). The α-CD and HP-α-CD solutions then added to the drug solution and stirred for about 48 hours at room temperature to attain equilibrium. The resulting solution was evaporated to dryness.

2.5.Phase solubility studies

Phase solubility studies were performed according to the method reported by Higuchi and Connors (17).Mefloquinehydrochloride , in amounts that exceeded its solubility, was taken into vials to which were added 15 ml of distilled water (pH 6.8) containing various concentration of α-CD and Hp-α-CD (2-10 mM). These flasks were sealed and shaken at 20^0 C for 5 days to reach equilibrium and the samples were filtered immediately through a 0.45 – μ nylon disc filter and appropriately diluted. A portion of the sample was analysed by UV spectrophotometer at 283 nm against blank prepared in the same concentration of α-CD and HP-α-CD in water so as to cancel any absorbance that may be exhibited by the α-CD and HP-α-CD.

III. RESULTS AND DISCUSSION

Table–1. Absorption maxima of Mefloquinehydrochloride at different concentration of α-CD and HP-α-CD

α-Cd / HP-α-CD concentration	λ_{max} (nm)		Absorbance	
	[α-CD]	[HP-α- CD]	[α-CD]	[HP-α-CD]
0	284.4	284.4	0.412	0.412
0.002	280.2	282.0	0.436	0.438
0.004	278.4	280.8	0.455	0.499
0.006	278.2	278.4	0.462	0.530
0.008	276.0	276.2	0.494	0.552
0.01	276.4	274.8	0.501	0.569

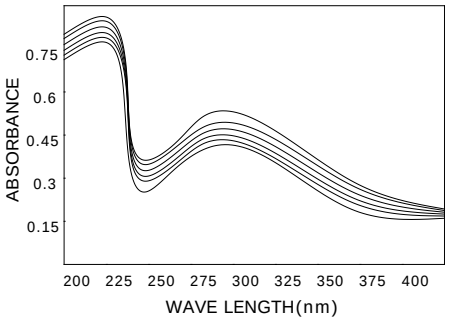


Figure1. Absorption spectra of mefloquinehydrochloride with α-CD

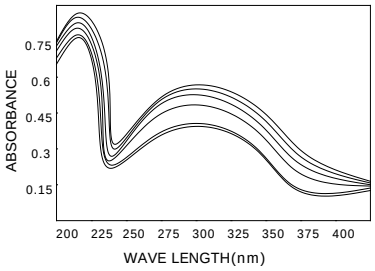


Figure 2.Absorption spectra of mefloquinehydrochloride with HP-α-CD

Table 2. Fluorescence maxima of Mefloquinehydrochloride at different concentration of α-CD and HP-α-CD

α-Cd/ HP-α-CD concentration	λ_{flu} (nm)		Intensity	
	[α-CD]	[HP-α-CD]	[α-CD]	[HP-α-CD]
0	387	387	282.65	282.65
0.002	384	385	344.46	347.24
0.004	382.5	383	347.63	348.05
0.006	381	382	349.34	350.79
0.008	380	380	350.24	351.37
0.01	378	380	351.79	353.82

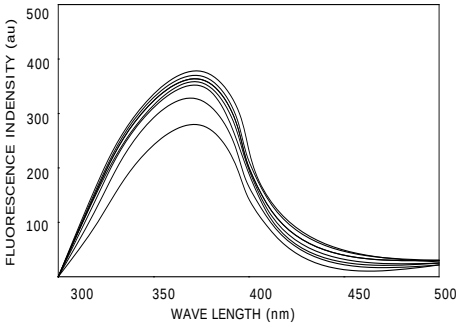


Figure 3. Fluorescence spectra of mefloquinehydrochloride with α-CD

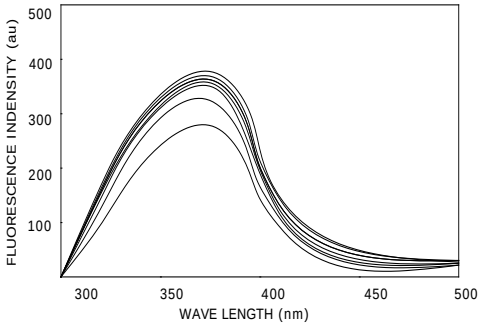


Figure 4 . Fluorescence spectra of mefloquinehydrochloride with HP-α-CD

Table-2 and fig (3) (4) shows the fluorescence maxima and spectra of Mefloquinehydrochloride containing various

concentration of α-CD and HP-α-CD. The emission spectrum is blue shifted from 387nm to378nm and 387nm to 380nm for both α-CD and HP-α-CD. This results indicates that Mefloquine hydrochloride is entrapped in α-CD and HP-α-CD to form Mefloquinehydrochloride: α-CD and Mefloquinehydrochloride : HP-α-CD inclusion complexes. By the addition of α-CD and HP-α-CD the fluorescence maxima is blue shifted by the formation of hydrogen bonding.

The association constant (K) for the formation of an inclusion complex has been determined by analyzing the changes in the intensities of absorption and fluorescence maxima with the α-CD and HP-α-CD concentration. The association constant and stoichiometric ratios of the inclusion complex of Mefloquinehydrochloride with α-CD and HP-α-CD can be determined by using the Benesi - Hilde – brand relation(18). The equation for 1:1 complxes are given below.

Absorption

$$1/A - A_0 = 1/A - A_0 + 1/k\,(A - A_0)\,[\alpha\text{-CD}]$$

Fluorescence

$$1/I - I_0 = 1/I - I_0 + 1/k\,(I - I_0)\,[\alpha\text{-CD}]$$

In the above equation A_0/I_0 is the intensity of absorbance / fluorescence of Mefloquine hydrochloride without α-CD and HP-α-CD.

A / I is the absorbance / fluorescence intensity with a particular concentration of α-CD and HP-α-CD. Linearity is obtained in the plot of $1/A - A_0$ or $1/I - I_0$ verses 1/ [α-CD] and 1/ [HP-α-CD]. This confirms the formation of 1:1 inclusion complexes. The association constant K was calculated from the slope of Benesi – Hilde – Brand plot using the equation.

For absorption

K = 1 / slope ($A - A_0$) = 147.84 for Mefloquinehydrochloride : α-CD and 176.92 for Mefloquinehydrochloride : HP-α-CD inclusion complexes

3.1.Phase solubility

Phase solubility diagram of α-CD/Mefloquinehydrochloride system (fig.5) and HP-α-CD/Mefloquinehydrochloride system (fig.6) shows drug solubility increases linearly with increasing α-CD and HP-α-CD concentration.

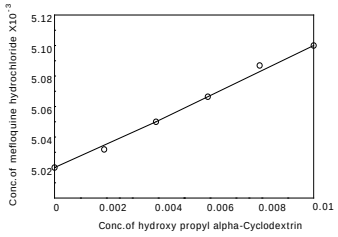


Figure :5Phase solubility diagram of α-CD/ Mefloquinehydrochloride

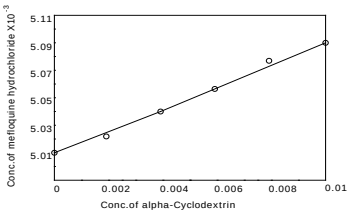


Figure :6 Phase solubility diagram of HP-α-CD/ Mefloquinehydrochloride

The diagram can be classified as A_L type according to the model proposed by Higuchi and Connors (19). It can be related to the formation of a soluble inclusion complex. The apparent stability constant (Ks) was calculated from the linear fit of the curve according to the following equation.

$$Ks = \frac{slope}{S_0(1 - slope)}$$

Where slope is the value found in the linear regression and S_0 is the aqueous solubility of the drug.Slope of less than one suggested the formation of 1:1 inclusion complex for both α-CD and HP-α-CD with Mefloquinehydrochloride. The apparent stability constant Ks obtained from the slope of the linear phase solubility diagram was found to be $110M^{-1}$ and $160M^{-1}$ which also indicates that the α-CD and HP-α-CD Mefloquinehydrochloride complexes at 1:1 ratios are adequately stable.

3.2.Scanning Electron Microscopy

It is clear from the SEM images that i) α-CD is present in plated form (fig.7), ii) HP-α-CD is present in spherical shape (fig.8) iii) Pure drug is present in irregular shaped crystal (fig.9).The SEM pictures of inclusion complexes are completely different from that of pure drugs and CDs(fig.10&11). The difference in morphological changes of these structures with EDS analysis can be taken as a proof of the formation of a new inclusion complex.

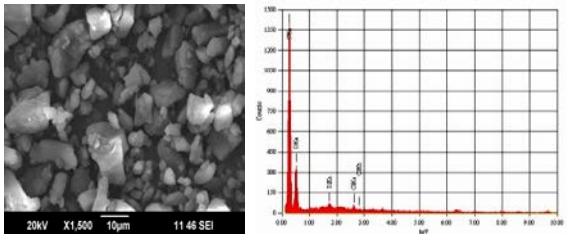


Figure 7: SEM-EDS image of α-CD

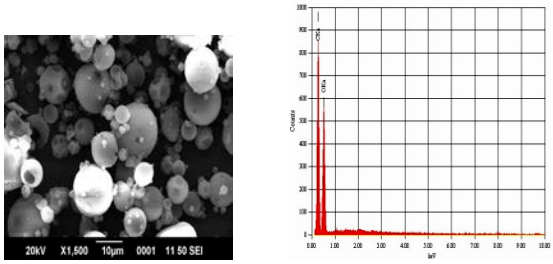


Figure 8: SEM-EDS image of HP-α-CD

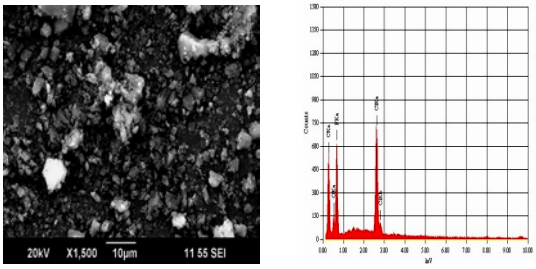


Figure 9: SEM-EDS image of Mefloquine hydrochloride

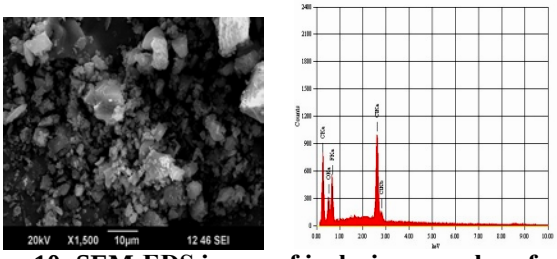


Figure 10: SEM-EDS image of inclusion complex of α-CD and Mefloquinehydrochloride

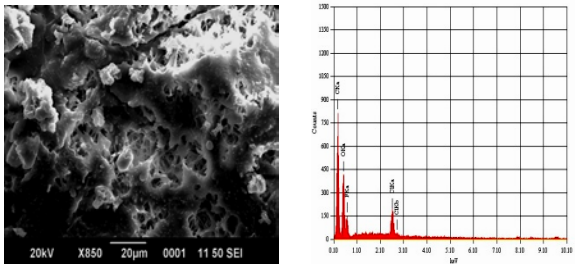


Figure 11: SEM-EDS image of inclusion complex of HP-α-CD and Mefloquine hydrochloride

3.3.Fourier Transform Infra red (FTIR) Spectroscopy:

The FTIR spectra of pure Mefloquinehydrochloride (fig.12) showed a characteristic peak at 3240.19 cm^{-1} (N-H stetching vibration), 2850.59cm^{-1} (C-H bridge), 2947.03cm^{-1} (CH2), 1583.45cm^{-1}(C=N / C=C) ,1267.14cm^{-1}(C-N), 1049.20cm^{-1}(Piperidine ring),1166.85cm^{-1}(C-C / N-H Stretching vibration),1311.5cm^{-1} and1135.99 cm^{-1} (CF3 Stretching vibration), 1110.92cm^{-1},1380.94cm^{-1} and 1517.87cm^{-1} (Quinine ring stretching).The spectrum of pure α-CD (fig.13) showed characteristic peak at 3382.91cm^{-1} (O-H Stretching vibration), 2925.81cm^{-1} (C-H), 1641.31 cm^{-1} (H-O-H bending), 1155.28cm^{-1} (C-O) and 1029.92cm^{-1} (C-O-C).The spectrum of pure HP-α-CD(fig.14) showed a characteristic peak at 3388.70cm^{-1} (O-H Stretching vibration), 2927.74cm^{-1} (C-H), 1643.24cm^{-1} (H-O-H bending),1155.28cm^{-1} (C-O) and 1033.77 (C-O-C). In the IR spectra of HP-α-CD inclusion complex(fig.15) , the peaks at 1380.94cm^{-1} and 1110.92 cm^{-1} of Mefloquinehydrochloride appears at same frequency with high intensity where as in α-CD inclusion complex(fig.16) they appear with low intensity.The absorption peak of α-CD (C-H) at 2925.81cm^{-1} is shifted to 2931.80cm^{-1} in complex and there is no change in the (C-H) stretching vibration in HP-α-CD inclusion complex. Absorption peaks at 1311.5cm^{-1} (CF3 stretching vibration) appears with high intensity at 1315cm^{-1} in HP-α-CD inclusion complex. Some peaks at1583.45cm^{-1}(C=N/C=C),2850cm-1(C-H bridge) and 1049.20cm^{-1} (piperidine ring) are missing in the inclusion complexes.These changes occurred in FTIR spectra of samples indicating the formation of an inclusion complex in solid state.

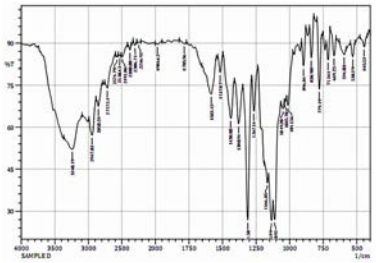


Figure 12.FTIR spectra of Mefloquine hydrochloride

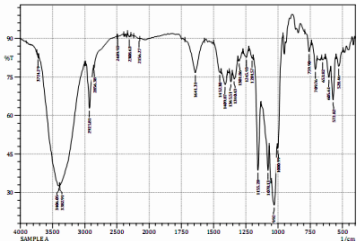


Figure 13.FTIR spectra of α-CD

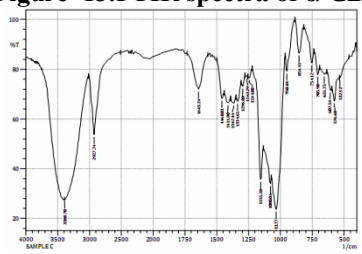


Figure 14.FTIR spectra of HP-α-CD

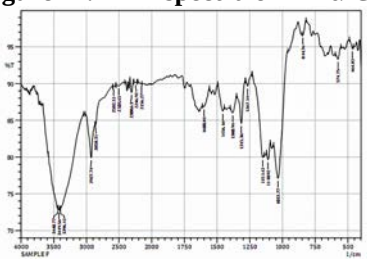


Figure 15: FTIR spectra of HP-α-CD - Mefloquine hydrochloride inclusion complex

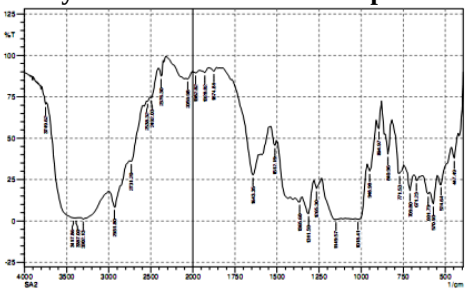


Figure 16. FTIR spectra of α-CD - Mefloquine hydrochloride inclusion complex

3.4.Comparative study

Inclusion of Mefloquinehydrochloride an anti malarial drug with both α-CD and HP-α-CD shows the same features. Due to the presence of propyl group in HP-α-CD, the absorption and emission wave lengths slightly increased than α-CD. The association constant value is higher for HP-α-CD complex than

α-CD complex. The stability constant value is also higher for HP-α-CD complex. From these observations , it can be concluded that HP-α-CD is the best host for the guest Mefloquinehydrochloride .

IV. CONCLUSION

In the present research work the results obtained from UV-Visible spectroscopy, phase solubility studies , FTIR spectroscopy and SEM analysis showed a 1:1 complex of Mefloquinehydrochloride with α-CD and HP-α-CD.The aqueous solubility and apparent stability of Mefloquinehydrochloride can be increased by inclusion complex with HP-α-CD. The FTIR data provided information about the functional groups involved in the complexation. According to the present observation HP-α-CD seems to be the best host for the Mefloquinehydrochloride. A complete inclusion can be detected in a complex with HP-α-CD This solid state structure should be benefit to improve solubility and stability of Mefloquinehydrochloride. Consequently the bioavailability of Mefloquinehydrochloride in human body can be increased.

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Productivity Improvement through Single Minute Exchange of Die (SMED) Technique

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Abstract- To stand up in today's highly competitive world, the manufacturers need to find a way to reduce the production time. Elimination of the wastes can improve the productivity of the company. By making use of the lean manufacturing tools the company can remain in competition and they can survive in modern world. The main objective of this project is to reduce the setup time of the Gear Hobbing Machine by 20 – 25 % through Single Minute Exchange of Die (SMED) Technique and thereby improving the productivity. The work is carried out at a gear manufacturing company. Careful observation is done while changeover or setup and maximum possible internal activities have been converted to the external activities and then some of the activities were made parallel, hence saving a considerable amount of time.

Index Terms- SMED, Setup Time, Internal and External Activities, Lean tools

I. INTRODUCTION

The high variety and low quantity parts is major scenario of the present production system. Due to the smaller production quantities and high variety parts, the setup time tends to increases which in turn decrease the productivity. Companies are these days focusing on to reduce the setup time and to remain in the competition [1]. Quick changeover or the setup plays a vital role in the lean manufacturing. Changeover or the setup reduction is one and same which deal with eliminating the non value adding activities during the setup [1]. Eliminating the non value adding activities will increase the productivity. To face today's competitive environment, the manufacturers should adopt a method where the non value adding activities should be eliminated. Many of the firms are going for the SMED method which is quite simple and results obtained are well satisfying. Flexibility and Responsiveness are the two main pillars of manufacturing, which is operated by the demand of the products variety and quality [2].

II. SINGLE MINUTE EXCHANGE OF DIE (SMED) TECHNIQUE

SMED was developed by the Shiego Shingo in 1985 in Japan. Due to the increasing demand of the smaller lot sizes and to meet the required flexibility of the customer, shingo proposed a method called as Single Minute Exchange of Die which states that the changeover should take one minute or more precisely less than ten minutes [2]. Single Minute Exchange of Die is related to setup reduction and is main objective is to reduce the time to a single digit value. This will help the organization to minimize the level of inventory and effective utilization of the equipments [3]. As we can observe that the product life cycle of the products is reducing, and demand for variable products is increasing, the need for SMED feels compulsory in any organization. The analysis of the SMED has to begin with the details of the process and the time study. If any internal activity cannot be eliminated or converted then it has to be combined or simplified or replace if possible. Here the major concern is to identify the activities which are being done and then to separate it. There are two kinds of activities which are involved in the setup or the changeover [4].

Internal Activities: These are the activities which can be done after stopping the machine [2]. Example, Removal of the Fixture or the tool etc

External Activities: These are the activities which can be done when machine is still on [2]. Example, bringing the next Fixture or the Cutter when the machine is still on

Value added activities: The time spent on activities that add value to an item from the customer's perspective. These are the activities that effectively change the form and function of a raw material into good or service that the customer is willing to pay for [4].

Non Value Added Activities: The time spent on activities that add cost but no value to an item from the customer's perspective. These are the activities that the customer is generally not willing to pay for [4].

III. OBJECTIVE OF THE PRESENT WORK

The aim of the project is to study the existing setup operation thoroughly and observe each and every activity which is done by the operator. Single Minute Exchange of Dies (SMED) is the tool and technique of the lean manufacturing which is adopted and applied at this area. This technique will help company to eliminate the wastes during the setup or the changeover of the machine which will help the company to improve the productivity. The objective of the project is to reduce the Setup time of the Gear Hobbing Machine by 20-25% through the Single Minute Exchange of Dies (SMED) Technique.

IV. METHODOLOGY

The method followed to implement the SMED Technique is,

1) Review the Literature about the Single minute Exchange of Die (SMED) by referring Journal papers, books etc.
2) A detailed study of operation and existing setup changeover is done.
3) Internal and External activities are identified from the setup operation.
4) Separation of Internal and External activities is done carefully.
5) Now the Internal activities are converted to the External Activities.
6) Some of the activities are made parallel wherever possible.
7) The optimization of the activities, confirming the results and standardizing the operations is done.

V. PROCEDURE AND DATA COLLECTION

A. Data Collection

The data has been collected by observing the current situation and analyzed. It is found out that there is several non value adding activities happening during the setup operation. As we can see that the less time in tool change will improve the productivity of the company [5]. Based on the actual production, data was collected and recorded and the time taken was measured using the stop watch. Subsequently, a statistical bar chart can be drawn to monitor and analyze the problem [6].

Work Station	6728
Part Name	Output Shaft
Operation	Hobbing
Cycle time	680

The details of the activities performed by the operator and corresponding time taken are tabulated. Tooling required during the setup is also enlisted and whether the operator is performing internal or external activity is also tabulated. The activities which are marked have chosen for converting the internal activity to External activity.

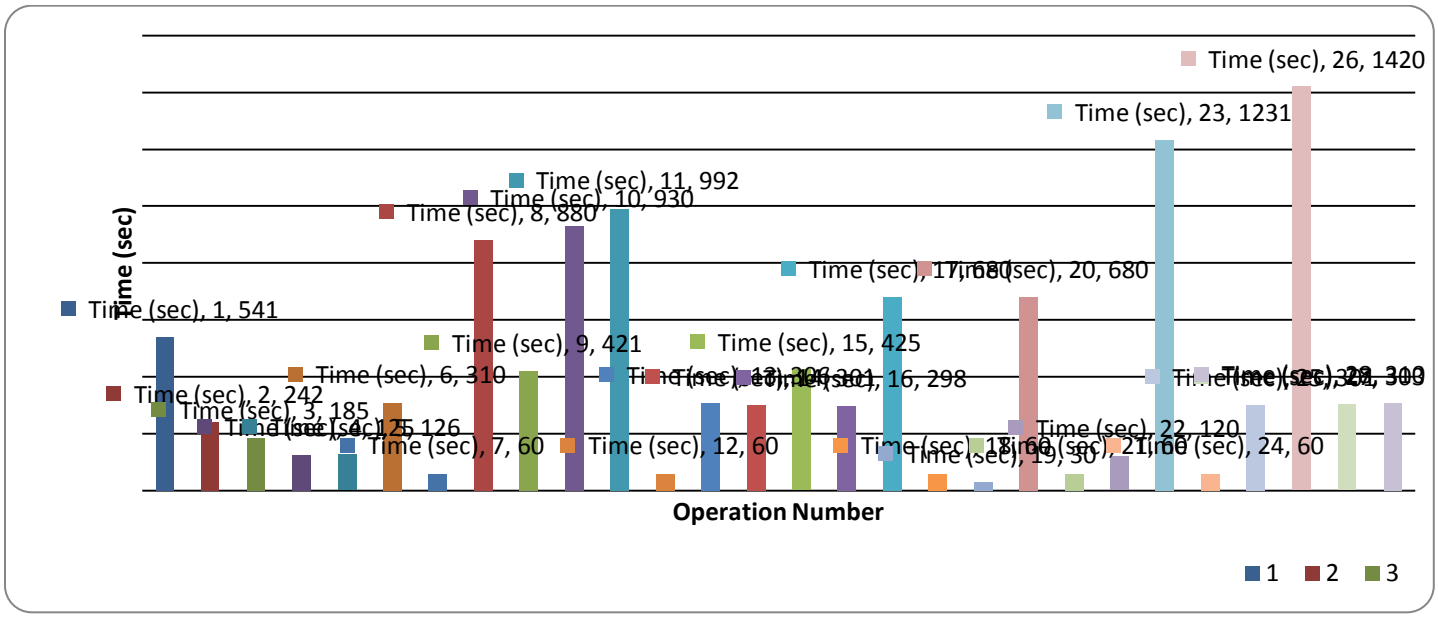
Table 1 shows the details of the Activities performed and corresponding time consumed

Opn No	Process Steps	Time Taken(sec)	Tools Required	Type of activity
1	Operator writes the LOC and takes the Sign of Q/C inspector	541	LOC book, Pen, Carbon paper	Internal Activity
2	Operator goes to the control plan table and picks up the required control plan chart	242	Control plan chart	Internal Activity
3	He brings the Required tools from the tool rack	185	Hammer, Spanner, Allen key, Al rod,	Internal Activity
4	Now he removes the Hob , Cleans it and kept just beside	125	Allen key, Al rod, Hammer	Internal Activity
5	He remove the Fixture now and cleans it	126	Allen key, Al rod, Hammer	Internal Activity
6	He goes to Fixture stand and brings the required fixture and height block	310	Height block	Internal Activity

7	Fixing the height block and tightening it	60	Height block	Internal Activity
8	Now he is fixing the required fixture and star washer, checking R/O , bringing the Extension	880	Hammer, Spanner, Allen key, Al rod,	Internal Activity
9	Now he brought the Work piece from vendor store	421	Work piece	Internal Activity
10	Once again he setting the Height block and checking the R/O of height block	930	Allen key, Al rod, Hammer	Internal Activity
11	Loaded work piece and setting the De burr tool	992	De burr tool	Internal Activity
12	Kept back unnecessary tools	60	Al rod , Allen key	Internal Activity
13	He goes to the consumable store and returns the previous hob and issues the required one	306	Hob	Internal Activity
14	Keeps the hob on hob arbor stand and checks the R/O	301	Spanner, Allen key	Internal Activity
15	He cleans the hob gripper and fixes the hob and checks the R/O	425	Cotton, Allen key, Al rod	Internal Activity
16	Operator Programming according to control Plan chart	298	Control plan chart	Internal Activity
17	Hobbing Starts	680	Nil	External Activity
18	He Checks the Diameter over the pin (DOP) - not okay	60	Micrometer, rubber band	Internal Activity
19	Once again he runs the program with some adjustments	30	Control plan chart	Internal Activity
20	Hobbing Starts	680	Nil	External Activity
21	Checks the DOP and finds satisfactory	60	Micrometer, rubber band	Internal Activity
22	Removes the work piece and cleans it	120	Cotton	Internal Activity
23	Now Operator goes to the graph test-waiting	1231	Work piece, control plan	Internal Activity
24	Operator finds the graph satisfactory	60	Graph paper	Internal Activity
25	Goes to the Q/C inspector and takes sign	301	Graph paper	Internal Activity
26	Operator hob 2 more parts and waits for the line Quality inspector	1420	Nil	External Activity
27	Quality inspector checks and okays it	303	Micrometer , pins, rubber	Internal Activity
28	Operator writes the FOC and Takes sign of Q/C head, production Starts	310	FOC book, Pen	Internal Activity

B. Analysis of the present situation

The collected details from the above setup are analyzed; from the chart below we can see that.

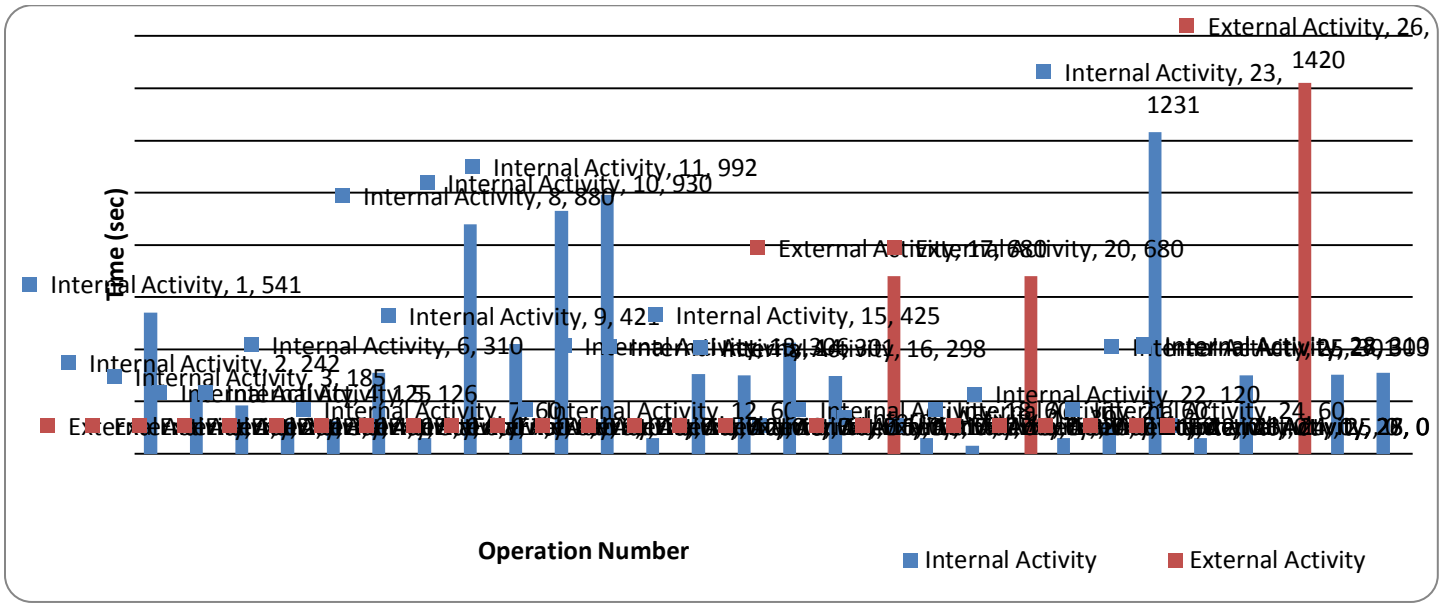


From the above chart,

- Setting up of the new fixture during the setup takes 7.76% of the total time loss
- Fixing of the height block consumes 8.20% of overall time loss, and
- Setting up the De burr tools takes 8.75% of the total time loss

So from the above data, there are many areas in the setup where I could reduce the time and improve the productivity. From the above chart there are various activities which were performing as internal activities only so there is the scope that I can convert it to the external activity and thereby reducing the setup time.

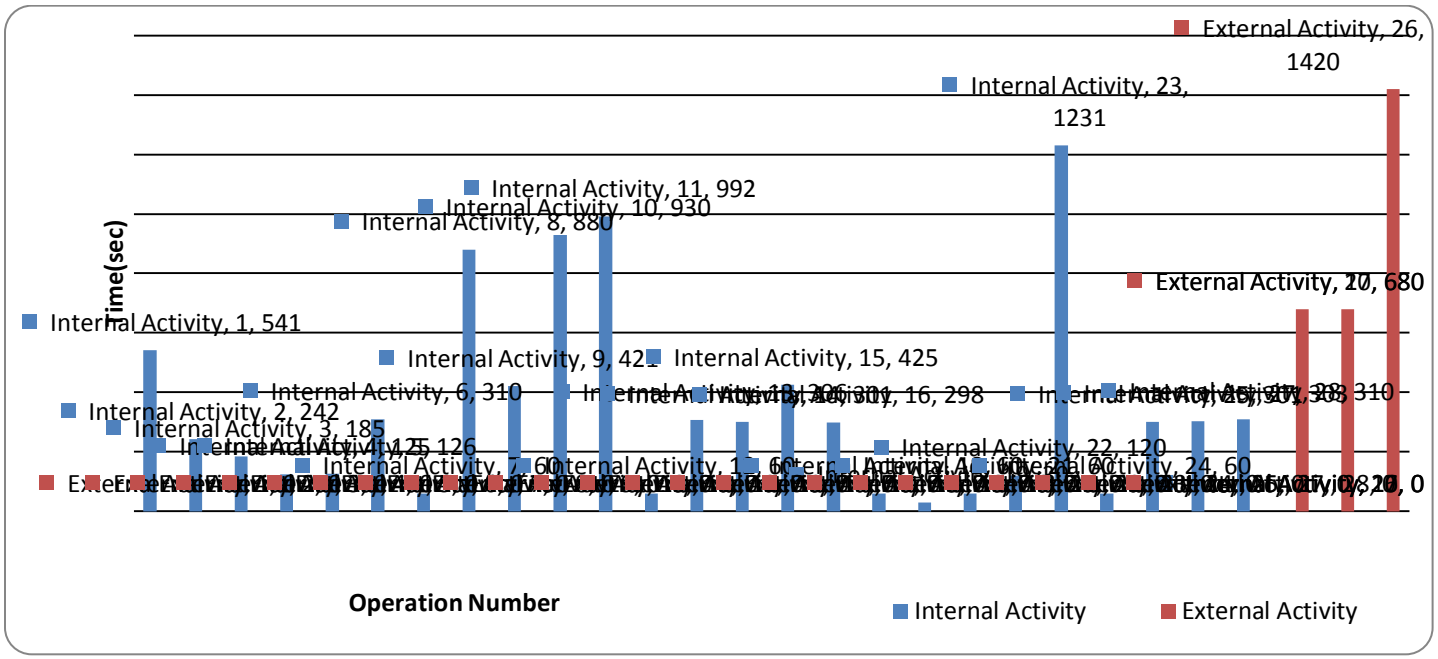
C. Identification of Internal and External Activities



From the above chart it can be seen that only three activities are external and the rest 25 activities are internal. My aim is convert as many as possible internal activity to external activity so that maximum time can be saved and productivity can be improved.

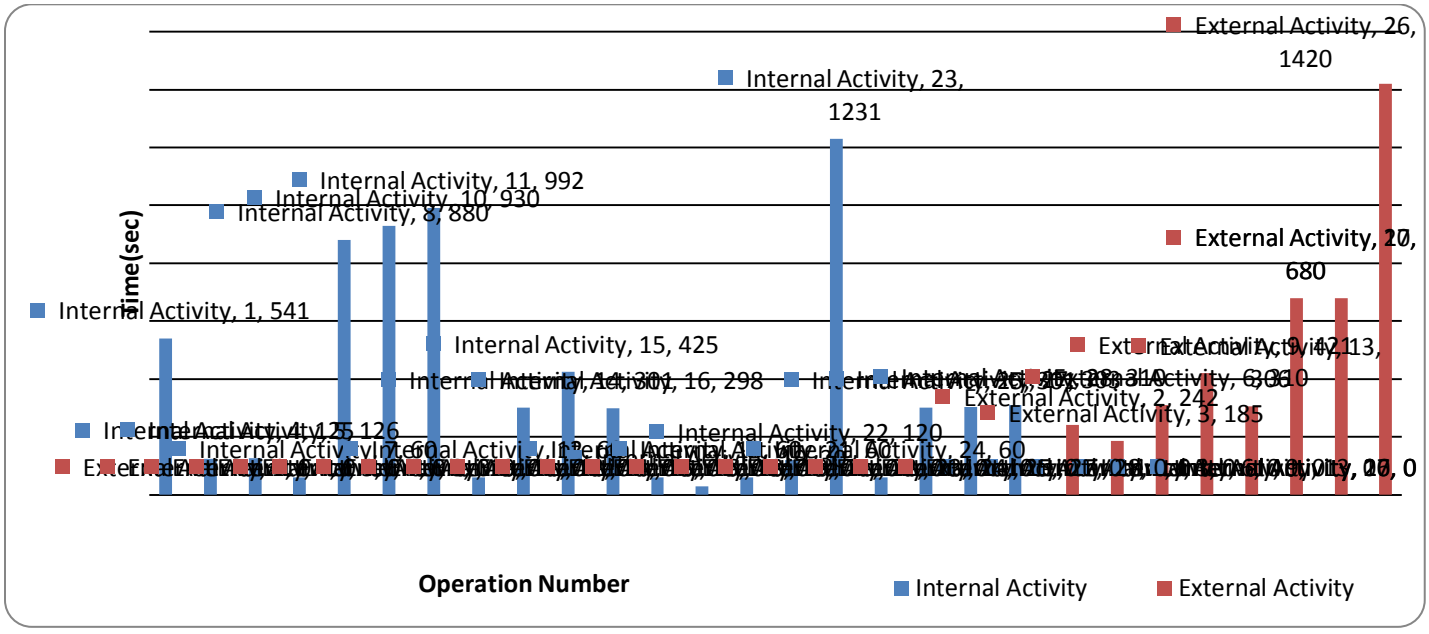
D. Separating Internal and External Activities

After analyzing the present situation in the setup, internal and external activities are identified and now separated as show in the figure. The blue color column indicates the internal activities whereas red color indicates External activities.



Here the three external activities (17, 20 and 26) were separated. Now I can see the clear picture of the activities that where they stand and how much time they consume. From the above table 1 activities need to convert are marked and thus it has to be changed to external. The next step will elaborate that.

E. Conversion on Internal Activities to External Activities



Five activities (2, 3, 6, 9, and 13) were successfully converted to the external activities and thus time 24.4 min is saved. Table 2 shows the details below.

Table 2 shows the details of the activities converted and corresponding time saved

Operation Number	Activity	Previously Activity	Planned Activity	Time Saving (sec)
2	Operator goes to the control plan table and picks up the required control plan chart	Internal	External	242
3	He brings the Required tools from the tool rack	Internal	External	185
6	He goes to Fixture stand and brings the required fixture and height block	Internal	External	310
9	Now he brought the Work piece from vendor store	Internal	External	421
13	He goes to the consumable store and returns the previous hob and issues the required one	Internal	External	306
Total Time Saved				1464

From the careful observation, I sorted out five internal activities which can be converted to the external one. These activities were performed as Internal. For example, operator had a habit of bringing all the required tools when the machine is turned off. Work piece also he used bring during the off period of machine. It was same for all activities like bringing the required fixture, Hob or Control plan chart. Here I can save time and that add up to the improvement of the productivity. From the above table it can be seen that 1464 seconds (24.4 minute) is saved. 13% time is saved from overall setup time.

F. Parallelism of Present Activities

In the present scenario, the operator was all the activities and but he has some lack of skills and ideas. Each activity was doing at a time and he was unaware that he could perform those activities parallel also. I combined some of the activities which can be made parallel and those activities are feasible also. The table 3 below shows the details about the activities combined and corresponding time saved.

Sl No	Activities done parallel	Time consumed (Before Parallelism)	Times consumed (After parallelism)
1	LOC and Sign of Q/C + Control plan chart + tools back	968	420
2	Brings Fixture + brings Height block	370	195
3	Graph Test satisfactory + Q/c Sign	361	205
4	FOC book + unnecessary tools	370	200
	Total Time	2069	1020
Time Saved after Parallelism = 2069 - 1020 = 1049 sec			

From the parallelism of actvities, a total of 17.48 minutes have been saved and it will add up to the time saved. 22.18% setup time reduction is obtained.

VI. RESULTS AND DISCUSSION

After converting the possible internal activities to external activities and then making some of the possible activities into parallelism, a setup time reduction of 22.18% is seen which is well in the range of 20 – 25 %. The following column charts shows the comparison in setup time before and after SMED.

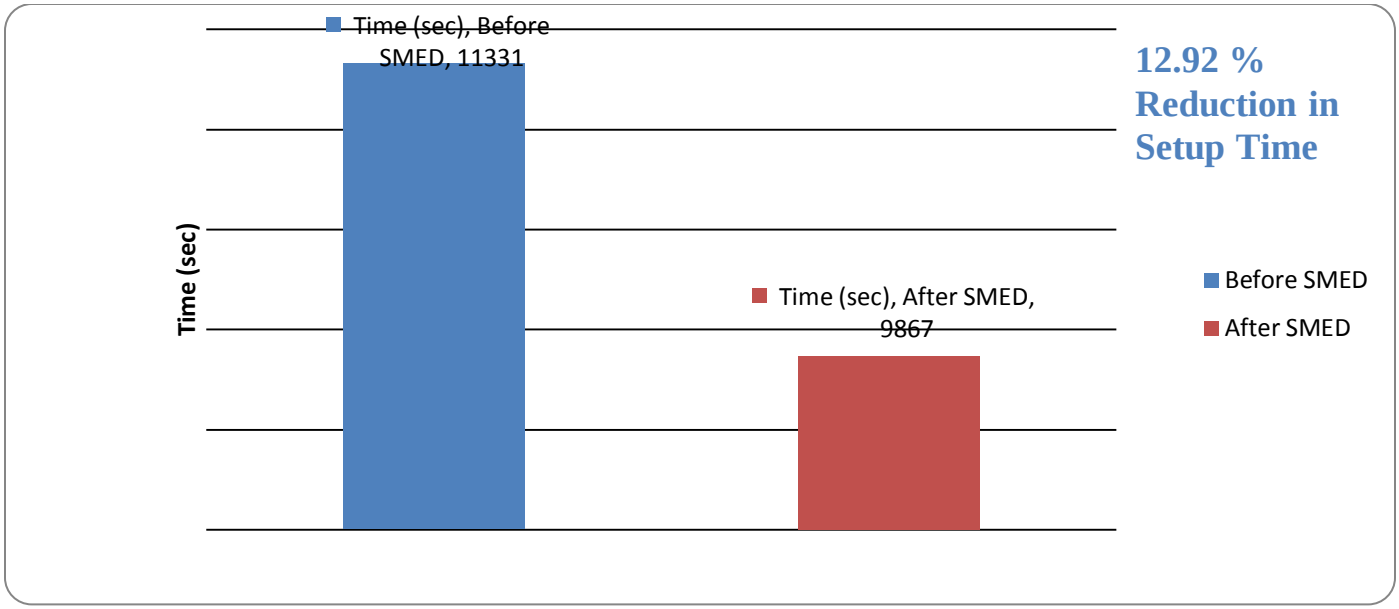


Figure 5 shows the comparison in setup time before and after SMED

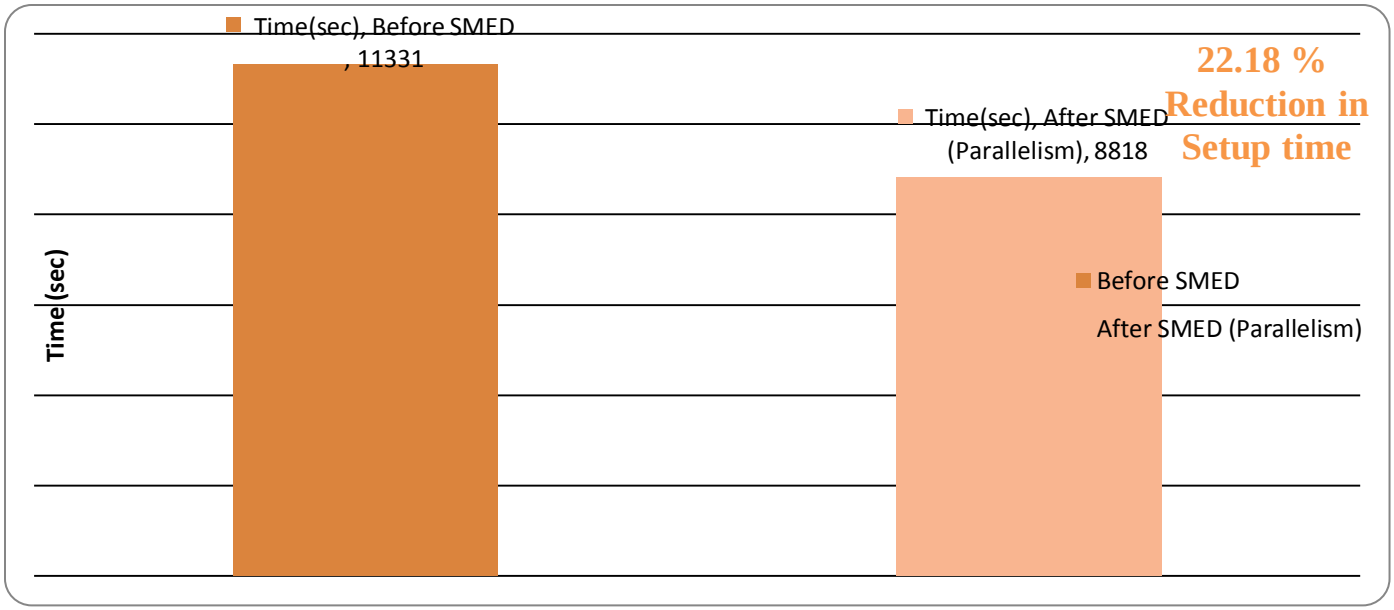


Figure 6 shows the comparison in setup time before and after SMED (some of the activities made parallel)

Table 4 Details of the result obtained

Objective	Time taken before SMED (min)	Time taken after SMED (min)	Time Saved (min)	Percentage Reduction (%)	Cycle time (min)
To reduce the Setup time of the Hobbing machine (6728) to 20 - 25%	188.85	146.96	41.9	22.18	11.3

VII. CONCLUSION

Implementation of the lean principles in any process will bring good results to any industry. Huge results can be achieved by elimination of non value adding activities. If these principles are applied in all department of the organization they will bring considerably good results. SMED methodology is applied to prepare a standard operating procedure for the changeover operation on particular machines. A comparison of results achieved before and after SMED implementation was made. In the objective, 22.18% of the setup time is reduced (41.9 min) and the corresponding cycle time of that machine is 11.33 min which implies that 41.9 / 11.33 = 3.7 parts can be produced in the time saved. The elimination of the wastes improves the productivity which in turn delights the customer and helps the organization to move towards their vision and goals. I conclude that by implementing the SMED technique, Productivity can be achieved and wastes can be eliminated.

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Challenges Involved in Developing Intelligent Automatic Command and Control Systems

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Abstract- Command and Control systems are the key components of defence arena. In today's world there is a need for automating these systems with intelligence. The paper below describes in brief the challenges faced during the development of such systems along with benchmarking of a prototyped application.

Index Terms- Prototyping, initialization, benchmarking, sources and sensor data

I. Introduction

All defence systems require a command and control system to receive information process it and generate a common operational picture. The input can be in the form of data from sensors, sources, intelligent reports and images. The inputs are required to be processed, linked with the historical database and generated outputs are shown as military symbols on map background or as entities on electronic charts. There are innumerable number of design challenges during the development of these systems. Hence prototyping shall be required. For selecting the hardware benchmarking shall be done. Based on the performance results, the architecture decisions shall be made.

II. Design and Development Challenges

While designing a system it is desirable to benchmark the hardware using prototyped application in order to select small form factor.The algorithms can also be benchmarked for resource utilization namely CPU and RAM.The maps used are not intelligent enough to provide information about the terrain like roads,railwaystations and areas. Hence provisioning has to be done so that the user can draw these geometries.The knowledge base or rule base for fusion,situation and threat assessment is built into the system with the domain expertise.Additions and modifications to it is an ongoing process.The library of keywords and images is also an ongoing process.During peace time, the system is configured and is started on reaching its mobilized location.A lot of initialization data is retrieved from the persistent database to the applications residing in the system for real time response.During the data loading process,there are chances of data loss.Hence the data structure and communication design of the applications have to cater for these conditions.Fault tolerance of the hardware is done by providing dual nodes.There is also a requirement, to build the fault tolerance of software and quickly switchover without disrupting the processed infromation supply for the generation of Common Operational Picture(COP). The sensors and sources which provide inputs to command and control systems are limited in number.Also,their ranges and types of entities detected automatically also exists.Therefore ,the received inputs have to be assigned weights or probability and processed accordingly.Information about the built up of battlefield scenario in the enemy depth areas is challenging and not available at many times. Systems depend on historical data which is data mined and utilized but the availability of war data is limited.Uncertainity in predicting the behaviour of enemy and enemy course of movement exists.The terrain where the systems are operated is difficult and weather unpredictable.A number of legacy systems exist in the defence forces and interfacing with them is also a challenge for automation.The communication media has its own bandwidth limitations.

There is a need to analyse and develop video transfer and utilization schemes as most of the video output are analog in nature.Hardwares used have large form factors and there is demand of the small form factor needs.There is also a lack of requirements clarity at domain level and difference in opinion among the users of the domain.The doctrines are not fixed .The time duration of systems from the point of inception to fielding is large.Hence there is always a manual override or manual intervention included in an automated system.

III. Prototyping of Algorithms

Prototyping of various algorithms for situation and threat assessment has been done in a quad core server with 4 GB RAM. The input to the prototyped application has been fed in using recorded data from various inputs and sources or Test Driver. The inputs have been collected ,correlated in real time ,undergone a cycle of situation assessment (SA) and threat assessment (TA) to provide the output for generation of Common Operational Picture (COP).The setup is as given in the Fig 1.

After the targets have been generated in the system, the CPU and memory utilization measured has been done .The measurement data is in Table 1.Graphs have been plotted for CPU and RAM utilization with respect to the number of targets generated in the system .The graphs are in Fig 2 and Fig 3.

Number of Targets	CPU Utilization in % with 4 core	% RAM utilization (RAM is 4GB)
550	0	2.4
1000	0	2.4
2100	0	2.4
2500	0	2.4
5050	156.8	2.7
10150	100.9	4.6
15000	107.9	4.8
20000	101	5.1
25000	187	5.5
30000	94.9	5.9
35000	202.6	6.2
40000	97.6	6.9
45000	173.8	8.4
50000	143	9.2
55000	106	9.8
60000	96.8	10.8

Table 1: Performance Measurement of Targets

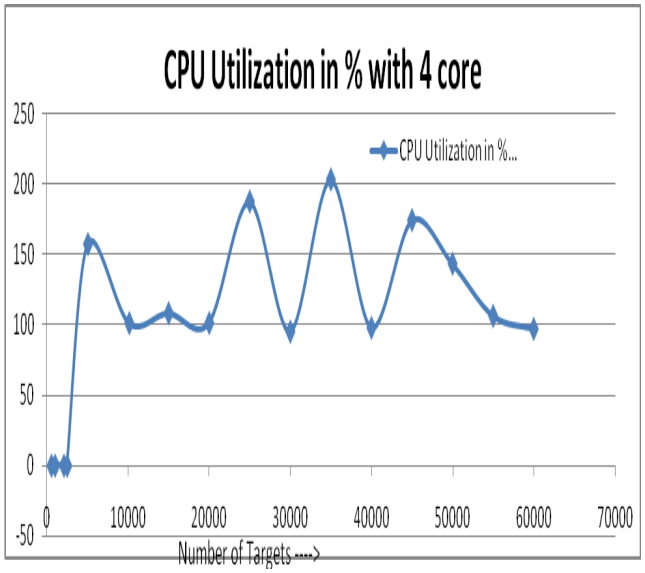

Fig 2: CPU utilization with respect to number of targets

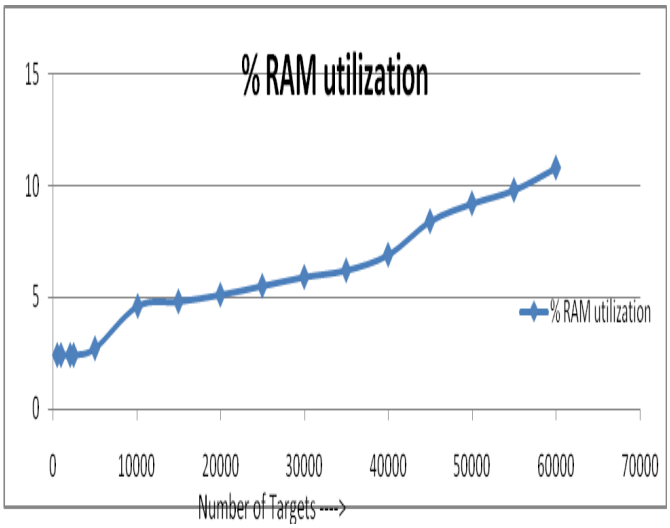

Fig 3: RAM utilization with respect to number of targets

IV. Enhanced Setup for Command and Control Systems

The hierarchical setup for command and control systems is as indicated in the Fig 4. Every node shall receive the information from various sensors and sources.COP shall be generated at every level and transferred to peer level as well as higher levels. The highest level shall resolve all the information and generate the COP of the entire region. Duplicate information shall be filtered out, old information shall be given less weightage and situation report shall be generated. Enemy threat shall be indicated with prioritized list of threats. Alerts shall be generated to attract the operator attention. Conflicts in the system shall also be indicated and resolved by the system.

V. Conclusion

A prototyped application for surveillance of symmetric and asymmetric warfare has been designed and implemented. The CPU and RAM utilization has been measured with maximum capacity tests. The same concept has been extended to a hierarchical architecture for analysis of sensor inputs, processed information, textual analysis, image interpretation and link it with the knowledge base to generate the output at the Ops room.

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Perovskite Solar Cell - A Source of Renewable Green Power

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Abstract- The earth receives $2.9X10^{15}$ kW of energy every day in the form of electromagnetic radiation from the sun, which is about one hundred times the total energy consumption of the world in a year. Bell Telephone Laboratories produced a silicon solar cell in 1954 with an efficiency of 4% efficiency which later enhanced to achieve 11%. The cost of generation of one watt of solar power in 1977 was $77/watt which was later brought down to about 80 cents/watt. Recently a new substance called a perovskite used for solar cell preparation could cut the cost of a watt of solar generating capacity by three-quarters. The potential of this material that it could lead to solar panels that cost just 10 to 20 cents per watt has been presented.

The characteristics of Perovskite, a calcium titanium oxide mineral species composed of calcium titanate. Perovskites solar cells first tried in 2009 converted about 3.5 percent of the energy in sunlight into electricity. PV device have already achieved 15% efficiency and aiming for higher efficiency upto 20% has been discussed.

Based on organic-inorganic perovskite-structured semiconductors, the most common of which is the triiodide ($CH_3NH_3PbI_3$), these perovskites tend to have high charge-carrier mobilities. The flexible transparent panel made from cultured colored perovskite proved that future solar cells can be beautiful facades with architectural designs for the building in addition to generating power required for the buildings. Further one could charge the car battery when parked in sun and will soon become the reality with flexible solar cell painted on car roof and other surfaces. The perovskite material is dirt-cheap and has a bright future in solar cell industry for renewable energy generation.

Index Terms- Solar energy, Perovskite, renewable energy, renewable energy, Perovskite solar cells, High efficiency solar cells, Replacement of tin in perovskite, flexible solar cells, Solar cells painted on sky scrapers, Perovskite cell as lasers.

I. INTRODUCTION

The earth receives $2.9X10^{15}$ kW of energy every day in the form of electromagnetic radiation from the sun, which is about one hundred times the total energy consumption of the world in a year [1]. Solar technology isn't new. Its history spans from the 7th Century B.C. to today. We started out concentrating the sun's heat with glass and mirrors to light fires. Today, we have everything from solar-powered buildings to solar powered vehicles. The solar energy falling on earth has been quantified as "Sun" and is approximately equal to 100 watts/ft^2 or 1000 watts/m^2.

Daryl Chapin, Calvin Fuller, and Gerald Pearson Daryl Chapin, Calvin Fuller, and Gerald Pearson at Bell Telephone Laboratories, USA produced a silicon solar cell with 4% in 1954 efficiency and later achieved 11% efficiency [2]. The development of solar concentrators was necessitated due very low current and voltage capabilities of a solar cell and it all started only after 1970s. Today we have everything from solar powered buildings to solar powered vehicles. However, till date the efficiency of the solar cells could not cross 16 to 17% and the electrical power produced by solar costs $5-6 per watt.

Fig. 1: The Perovskite Mineral

Recently in 2009 a new substance called a perovskite as shown in Fig. 1 has been identified for the preparation of photovoltaic (PV) devices solar cells that could cut the cost of a watt of solar generating capacity by three-quarters. The potential of this material is enormous and could soon replace silicon the base material used so for the fabrication of solar cells. It is expected that the solar energy converted to electrical energy by these perovskite solar cells/ and the panels would cost just 10 to 20 cents per watt.

The **Perovskite** mineral is a calcium titanium oxide mineral species composed of calcium titanate, with the chemical formula $CaTiO_3$.The mineral was discovered in the Ural Mountains of Russia by Gustav Rose in 1839 and is named after Russian mineralogist Lev Perovski (1792–1856). It lends its name to the class of compounds which have the same type of crystal structure as $CaTiO_3$ ($^{XII}A^{2+VI}B^{4+}X^{2-}{}_3$) or $CH_3NH_3PbI_3$ known as the perovskite structure. The crystal structure shown in Fig. 2 was first described by V.M. Goldschmidt in 1926. The crystal structure was later published in 1945 from X-ray diffraction data on barium titanate by the Irish crystallographer Helen Dick Megaw (1907–2002). It has a formula mass of 135.96 and its color is black, reddish brown, pale yellow, yellowish orange.

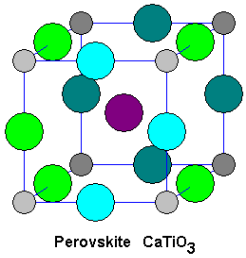

Fig. 2: Perovskite Crystal Structure

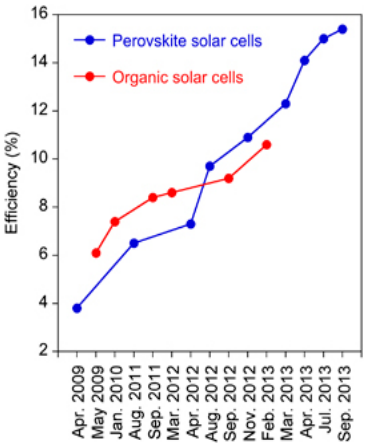

Fig. 3: Efficiency of perovskite solar cells with time

New solar cell material perovskite offers both cheap and efficient power. When perovskite solar cells were first tried in solar cells in 2009 converted about 3.5 percent of the energy in sunlight into electricity. With consistent research at different labs work perovskite PV device have already achieved 15% efficiency and scientists are aiming for higher efficiency upto 20% [3].

The progress since 2009 has been astonishing, even for a dynamic sector like solar: from 4% to 19% efficiency in five years. Chart from Burn & Meredith, Nature, January 2014. The chart is out of date and the record has risen to 19.3%, announced by Yang Yang at UCLA [4].

Functioning of perovskite solar cell

Photovoltaic energy conversion offers one of the best means for the future of renewable energy in the world. The efficiency of solar cells depends heavily upon the light-absorbing materials they use. Photovoltaic systems based on lead halide perovskite are a new, revolutionary type of device with efficiencies currently exceeding 16%. However, a detailed description of how these solar cells turn light into electrical current is still lacking. Publishing in Nature Photonics, scientists from Ecole Polytechnique Fédérale de Lausanne (EPFL), Netherlands have investigated how the generated electrical charge travels across the perovskite surface of solar cells built with different architectures [5].

Lead an environmental drawback in perovskite replaced with tin

In four years, perovskite's conversion efficiency has grown from 3.8% in 2009 to just north of 16%, with unconfirmed reports of even higher efficiencies arriving regularly. That's better than a four-fold increase. By contrast, efficiencies of single-crystal solar cells grew by less than 50% during their first five years of development, and most other types of solar cells showed similar modest improvements during their first few years. As seen above, the presence of lead (Pb) in perovskite however is major drawbacks. Hence the early perovskite-based solar cells containing lead a material that is not without its environmental drawbacks as the light-absorbing layer.

Tin Replaces Lead in Promising Solar Cell

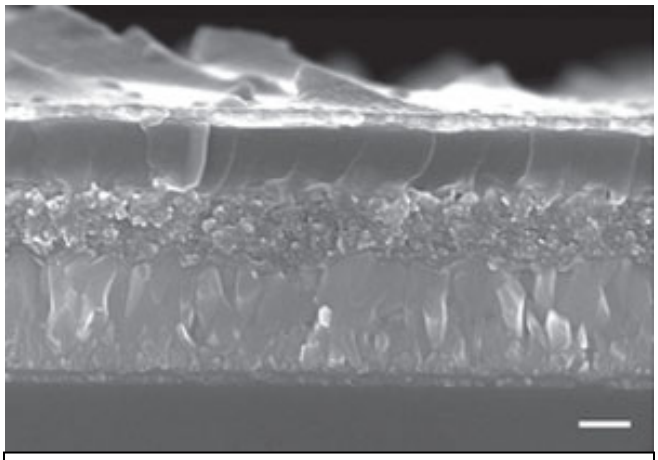

Fig. 4: Cross-sectional view of a completed photovoltaic device using tin perovskite. Courtesy: Nature Photonics.

Efforts were made at Northwestern University to develop a new form of perovskite-based solar cell that replaces lead with tin, a commonly available and much more benign material. The efficiency of this early tin-based cell is a just below 6 percent, but it is believed that there is no reason that tin perovskite solar shouldn't achieve much greater efficiencies on a par with lead. Oxford Photovolatics (Oxford PV), which is commercializing the technology developed by award-winning physicist Professor Snaith, says that omitting lead from the product will make it even more attractive to the potential licensees and customers. The future is lead-free for perovskite solar cells. The new solar cell uses a structure called a perovskite but with tin instead of lead as the light-absorbing material. Lead perovskite has achieved 15 percent efficiency, and tin perovskite should be able to match and possibly surpass that. Perovskite solar cells with tin are being touted as the "next big thing in photovoltaics" and have reenergized the field. “There is no reason this new material can't reach an efficiency better than 15 percent,” said lead researcher Mercouri G. Kanatzidis, an inorganic chemist with the Weinberg College of Arts and Sciences at Northwestern. “Tin and lead are in the same group in the periodic table, so we expect similar results” [6].

Lead free perovskite cells could speed up delivery of low cost solar power

Although the quantity of lead in Pb-based perovskites is miniscule, the research team, recognizing the requirement to eliminate lead in electronics, has been looking for a substitute that is more sustainable and also inexpensive and abundant. A new breed of solar cells, developed at the University of Oxford by Professor Henry Snaith and his research team, could bring low cost electricity to the market sooner than predicted following the development of a perovskite cell which uses tin instead of lead. "The use of tin has given the scope to produce incredibly cost effective solar cells and it is predicted that tin based solar cells could generate power for as little as $0.20/Watt and even this could drive down costs even further." Professor Snaith acts as the firm's Chief Scientific Officer. He was recently awarded Outstanding Young Investigator of the year by the Materials Research Society for his pioneering work on perovskite solar cells and was one of Nature magazine's ten nominated people who made a difference in science during 2013.

Diffusion Length

'The diffusion length tells us the average distance that charge-carriers (electrons and holes) can travel before they recombine,' says Dr Sam Stranks. 'Recombination happens when excited electrons and holes meet, leaving behind a low-energy electron which has lost the energy it gained from the sunlight.
If the diffusion length is less than the thickness of the material, most charge-carriers will recombine before they reach the electrodes so you only get low currents. You want a diffusion length that is two to three times as long as the thickness to collect almost all of the charges.'

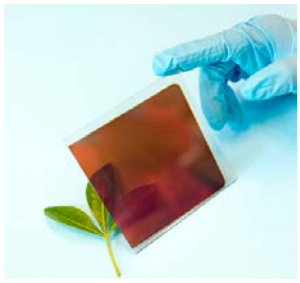

Fig. 5: Perovskite Fabricated on a Glass Sheet

Fig. 6: A Painted Flexible Coloured Solar Cell

Previously, researchers were able to get mesostructured perovskite cells to 15% efficiency, using a perovskite compound with a diffusion length of around 100 nanometres (nm). But by adding chloride ions to the mix, [the group] achieved diffusion lengths over 1000nm. These improved cells can reach 15% efficiency without the need for complex structures, making them cheaper and easier to produce.

There's a huge amount of research going on into solar PV, in many different avenues and the scientists are looking for following aspects and innovations:

- enhance efficiency, not simply reduce costs,
- look reasonably close to marketable products,
- use cheap not exotic materials and straightforward methods of fabrication,
- build on silicon, the dominant technology today.

Ultrathin Solar Cell is efficient and easy to make

Researchers at Oxford University in the UK have made a thin-film solar cell with better than 15% light-conversion efficiency from an emergent class of semiconductors known as perovskites. The devices have a simple architecture and could easily be produced in large quantities because the vapour deposition process used to make them is compatible with conventional processing methods for fabricating such solar cells. The perovskite cell fabricated on glass sheet is shown in Fig. 5, 6.

Use of nanoparticles in the manufacture of solar cells: Benefits

- Reduced manufacturing costs as a result of using a low temperature process
- Reduced installation costs achieved by producing flexible rolls instead of rigid crystalline panels.
- Currently available nanotechnology solar cells are not as efficient as traditional ones; however their lower cost offsets this. Nanotechnology using quantum dots would increase efficiency levels significantly.
- It is believed that solar cell technology will be contributing significantly to our energy needs by 2020 as costs are dropping rapidly.
- Accordingly to Deli Wang the efficiency of nanowire solar cells have been increasing dramatically in the past few years, from tenth of 1% to 15-16%. While it is still lower than the best Si cells (silicon), but it is fast improving.

Latest Developments & Highlights

Now there is excitement, and it is over a class of materials known as perovskites. Perovskite materials for solar cells were first reported in 2009 (organo-lead halides, in case you are interested), but they were very low efficiency and had to remain liquid in use. Not promising. . By doing some clever polymer chemistry, they were able to make solid perovskite solar cells, and then, in only 18 months, engineered these up to efficiencies of 16%. It took decades of research on silicon to get such improvements. But the polymer was expensive and complex. Still, **Science magazine classed perovskite solar cells as one of the breakthroughs of 2013.** So perovskite PV is at the point of, perhaps, maximum optimism. There are predictions that the efficiencies could reach 50%, the costs could fall to well below where silicon might get to in 10 years, and the science points to it being desirable to make these cells thicker, rather than as thin films, meaning they can be suitable as window or roofing materials. And the prototype cells produced have partial transparency.

II. Study: Perovskite solar cells can double as lasers

The new findings, recently published online in the *Journal of Physical Chemistry Letters*, show that these "wonder cells" can also produce cheap lasers. By sandwiching a thin layer of the lead halide perovskite between two mirrors, the team produced an optically driven laser which proves these cells "show very efficient luminescence"—with up to 70% of absorbed light re-emitted. Perovskite promises solar cell by day, light panel by night. This is seen in Fig. 7.

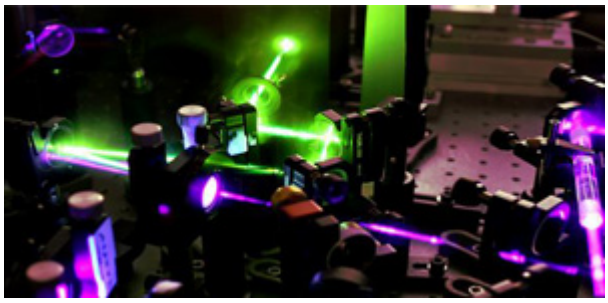

Fig.7: By sandwiching a thin layer of the lead halide perovskite between two mirrors, the team produced an optically driven laser which proves perovskite cells can re-emit up to 70% of

1. Lead free perovskite cells could speed up delivery of low cost solar power

A new breed of solar cells, developed at the University of Oxford by Professor Henry Snaith and his research team, could bring low cost electricity to the market sooner than predicted following the development of a perovskite cell which uses tin instead of lead. Oxford Photovolatics (Oxford PV), which is commercialising the technology developed by award-winning physicist Professor Snaith, says that omitting lead from the product will make it even more attractive to the potential licensees and customers. Scientists at Northwestern University in Illinois have become the first to develop a new solar cell with good efficiency that uses tin instead of toxic lead perovskite to convert sunlight into electricity. The breakthrough will enable the manufacture of cheaper solar cells, also called photovoltaic cells or PV cells. The tin solar cell is being hailed as "the next big thing in photovoltaics."

2. Perovskite thin-film using vapour deposition to turn skyscraper as power plant

Fig. 8. The glass sides of skyscrapers will become power plants in the not-too-distant

The glass sides of skyscrapers will become power plants in the not-too-distant. The rapidly falling cost of converting sunlight into electricity means it's just a matter of time before solar power generation is part of the structure of new buildings. At the same time, the development of new photovoltaic materials for turning photons into electrons is increasing the range of ways the sun's energy can be harnessed. The scientists think will be very widespread around the world in the next three to five years. It won't be considered a novelty in new buildings - it will be a no-brainer in terms of building cost-effectiveness." **Perovskite solar material to reach conversion efficiency of over 30 percent.** There is a bright future for solar ahead**.** The glass sides of skyscrapers will become power plants in the not-too-distant. This is shown as shown in Fig. 8.

III. Spray-on cells can turn anything into a solar panel:

Scientists from Sheffield have developed low-cost, spray-on solar cells**.** They are applied to surfaces in a similar way to paint or graphic printing**.** The spray-on cells are made perovskite that produces very little waste. They can be easily mass produced, meaning manufacturing costs are low.

IV. Spinning Solar Cells Into Electronics Textiles

Scientists have developed solar cells in the form of fibers that can be woven into textiles, paving the way for powering small electronic devices incorporated into clothing. Although promising as a source of renewable energy, solar cells are facing a trade-off between cost and efficiency: they are either inexpensive or inefficient, or they have a reasonable efficiency and are very expensive. One solution may come from solar cells made of perovskite materials, which are less expensive than silicon and do not require any expensive additives. Perovskites are materials with a special crystal structure that is like that of perovskite, a calcium titanate. These structures are often semiconductors and absorb light relatively efficiently. Most importantly, they can move electrons excited by light for long distances within the crystal lattice before they return to their energetic ground state and take up a solid position, a property that is very important in solar cells.

A team led by Professor Peng Hisheng at Fudan University in Shanghai has now developed perovskite solar cells in the form of flexible fibers that can be woven into electronic textiles (8). Prototype solar panels incorporating nanotechnology are more efficient than standard designs in converting sunlight to electricity, promising inexpensive solar power in the future. Nanostructured solar cells already are cheaper to manufacture and easier to install, since they can use print-like manufacturing processes and can be made in flexible rolls rather than discrete panels as shown in Fig. 6. Newer research suggests that future solar converters might even be "paintable." The multi colored facades on the buildings as shown will be flexible and will not only be decorative but also will generate electrical energy required for the buildings.

V. Spray Deposition Steers the Perovskite Solar Cells Towards Commercialization

Ultrasonic spray coating has been developed by a team of researchers in the UK. It represents a significant step towards commercializing perovskite solar cells. Thin-film solar cells using perovskite semi-conductors have become a promising form of photovoltaic device achieving power conversion efficiencies of up to 15–19%, surpassing the efficiencies of amorphous silicon and organic semi-conductor photovoltaics. Perovskite films can be fabricated by depositing precursor materials from solution. However, there have been few reports detailing the application of scalable solution-processing techniques to create these films.

Conclusions

1. The future is lead-free for perovskite solar cells.
2. "Solar energy is free and is the only energy that is sustainable forever," Kanatzidis said. "If we know how to harvest this energy in an efficient way we can raise our standard of living and help preserve the environment."
3. Typical solar panels have an efficiency of about 10%; expensive ones perform at 20%. (Fundamental physical laws limit the efficiency of photovoltaic systems to at best 60% with perfect concentrating mirrors or lenses, and 45% without concentration. A mass-produced [photovoltaic] device with efficiency greater than 30% would be quite remarkable.)
4. Accordingly his scenarios assume 20% panel efficiency for residential and 10% for utility. That's till 2050. In 100% renewable scenarios, the volume of solar is constrained by total roof area and competing land uses. So if you could plug in a higher efficiency, the limits shift too.

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Understanding of Internet of Things (IoT) and Experimental Approach using WICED Sense in Android Platform

Saminath.V, Jung Su

Abstract- Internet of Things (IoT) is extending your physical devices to internet lively connected with human. Controller based intelligent devices connected with low power wireless and sensor nodes, it accesses over the Internet. The power of internet makes intelligent interaction between human being and smart devices. Smart devices run autonomously self-decisive devices or externally monitored and controlled by human, anywhere in the universe. IoT brings ability to connect network automated devices and communicates remotely to manage multitudinous number of functioning over internet is viable solution. IOT device should have low power usages like Bluetooth Low Energy (BLE), sensor measures and control specific characteristic of the target device. The intelligence of IoT enables devices to perform their tasks and recognize and counteract threats. IoT brings you new shape on your business, Day-to-Day regular activity. This paper explains the details of BLE devices, IoT cloud connectivity, protocol communication and Android Platform Bridge for IoT communication. To Demonstrate IoT the development kit (WICED from Broadcom) integrated with Open source Cloud service architecture.

Index Terms- IoT: Internet of Things, BLE: Bluetooth Low Energy, SoC: System on Chip, URL: Unified Resource Locator, RFID: Radio Frequency, NFC: Near Field Communication.

I. INTRODUCTION

IoT enables you to manage and monitor all the devices in remote. There are various benefits of using Internet of Things, like offering new features on the products, Enhancing existing feature by add-on, allowing to make new business model. Devices are physically at remote place. We can employ following activities using IoT. If your devices become a faulty, we can run our diagnostic tool remotely, and we can suggest repairing the system based on the report. IoT allows you manage the physical device remotely, control, configure, and fix issues. It makes you close to your end clients, giving you a deeper and richer understanding of the working environment.

IoT establish bridge between the 'Digital world (Internet)' and the 'Real world (physical device)'. The devices objects are connected to the cloud and creates unique identification over the internet. IoT reference Design as explained in the Figure-1, is categorized into 6 major layers

1. Smart devices and Controllers
2. Connectivity and protocol Communication
3. Cloud Server and
4. Data Storage and Accumulation
5. Data analysis and Computing
6. User Application and Report Generation.

Devices can be connected to the Internet in two ways, either in an active mode or in a passive mode. In passive mode connection devices are not connected to internet directly, but it publishes device information to the internet. Each device has unique identification from RFID or Barcode like tags will be present. Ad-hoc device is connected in internet and publishes those information to cloud. In Active mode connection, device has capability of measuring various sensor information and record it. These information is directly broadcasted to clouds.

IoT has a lot of potential to enhance consumer's services and provides solutions to Health-care, Education, Transport, Energy, Security, Agriculture, Retail domains in all aspects of daily life. In the home security system, all smart devices are integrated and connected to cloud-based services and controlled by Smart Applications. The connected smart devices will enable a reduction in power utility costs and outages and it improves home security via remote monitoring.

IoT changes our life style in every aspects and surroundings becomes automated by connecting almost all devices over internet. Making Smart decision yields easy customization, avoiding human latency, optimizing utilization, lowering energy consumption, remote diagnosis, efficient operation, lower maintenance.

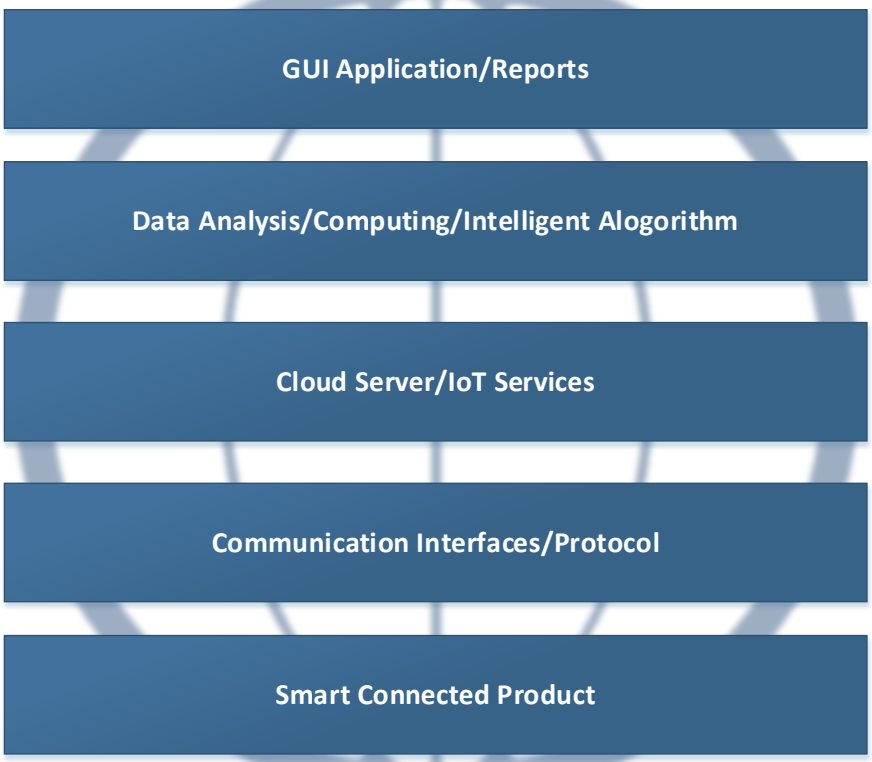

Figure-1: IoT Building Blocks

II. IoT Devices

IoT has plenty of constraints and restrictions to use smart device like, Size of the Messages, Distance between device communications, support of Wired/wireless technology, processing speed, data security. Based on the product solution, IoT components and technology used for design will vary. Table-1 describes plenty of embedded devices support for IoT product design and each has special characteristic to use the device. Application requirements can be changed as the number of sensor node needed, monitor only or monitor and control target nodes.

Table-1 IoT Device Characteristic

Technology	**NFC**	**RFID**	**BT**	**BLE**	**Wi-Fi**	**Zigbee**	**WPAN**	**WiMax**	**2G-3G**
Power	Low	Low	Low	Low	High	Low	Low	High	High
Speed (Kbps)	400	400	700	1000	100000	250	250	100000	5000
Distance covered in Meters	0.01	3	30	7	15	300	800	50000	Cellular Network depends
Cost to Build IoT	Less	Less	Less	Less	Average	Less	Less	High	High
IoT Target Application	Payment Application, Share Details in short Distance	Product Identification, Tracking Segments	Data Exchange in Medium distance, with medium scale of data	Fitness Tracking, Health Monitoring	Interface with Internet, IoT Server communication	Automotive product support, Sensor Interface, Home Automation	Automotive product support, Sensor Interface, Smart City Automation	Interface with Internet, IoT Server communication	Interface with Internet, IoT Server communication

IoT proficiency is defined by embedded processor used for real-time data processing. The microcontrollers are specially designed for IoT devices that sleep most of the time and wake up when needed for low power consumption. It simplifies and speed up the deployment of IoT products and makes launch into market on time.

Controller has features to maintain stack for cloud-based IoT management. Controller portfolio includes SoC, Development tools and software IP, secured interconnectivity of IoT, and provides the quickest and the most efficient path to deploy connected platforms and associated services, wearable extension.

As per the ARM IoT design statement, two classes of devices are used for Internet of Things (IoT). Devices have more complex capabilities with amply of local processing functionalities and similar complexity and those which are simpler local computation systems. The complex systems apply for Industrial controllers, ATM machines, Kiosks and Digital Signage. ARM Controller offers a wide range of solutions for these market products. These systems run with Smart Operating systems like Linux, Android or IOS and contain built in graphics cores to render UIs. Other one is relies on inexpensive, small sensors and the need to be power efficient, the ability to run on batteries for long time. The IoT is about the devices and services in end to end solutions. Internet of Things utilizes open source protocols like CoAP/HTTP, MQTT, TLS/TCP, DTLS/UDP and OMALWM2M for data communication and device management.

III. Bluetooth Low energy (BLE) devices

Bluetooth low energy technology is used to streams the connected devices information to Internet-based services and applications in limited power usage. Bluetooth low energy has significant features in IoT domain compared with other wireless technologie's seamless supports for smartphones and tablets. Bluetooth low energy (BLE) protocol allows a Bluetooth device to transfer small chunks of data in periodic interval. BLE device is connected with sensors, actuator and other measuring devices which require low power consumption during connectivity.

Bluetooth Smart BLE devices are optimized and operated with small coin battery, device consumes low cost and low power consumption, it is capable of sensor and attenuator information transfer. Bluetooth Smart Ready BLE devices are for low energy with support of Classic mode of bluetooth operations. Devices like mobile phones, tablets, and computers are used as gateway to pair with BLE devices. Bluetooth low energy uses a Client- Server model. The Client connects and accesses one or several Servers. Client devices operate as e Central role expect to get the sensor information, pass control information and the Server operate as Peripheral role which collects sensor information transit to central, has connected with sensor and attenuators. The gateway typically takes on the Client / Central role. There are four stages for data transactions.

1) Scanning
2) Advertising
3) Initiating
4) connecting

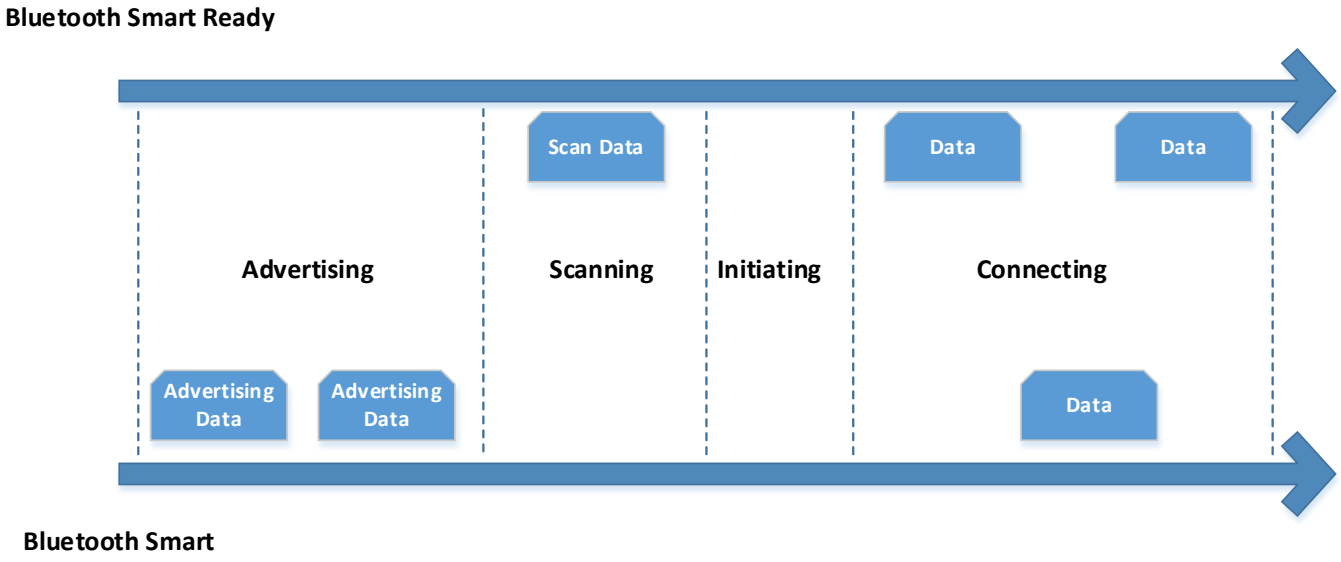

Figure-2: BLE Connectivity Sequence

Bluetooth smart device transmit non-connectable advertising packets periodically over the air medium, anyone willing to receive them. Bluetooth Smart Ready Repeatedly scans the preset frequencies to receive any non-connectable advertising packets currently being broadcasted. The WICED sense device is "advertising" when he wants to connect. The Smart Device is scanning for new devices, When the Observer finds a new device it wants to connect to it. Then it initiates a connection and pair it. The advertisement may contain broadcasted data.

IV. Experimental Setup

Figure-3 explains the experimental set-up for IoT development. WICED sense kit is built by Broadcom BCM20737 SoC, supports Bluetooth low energy with wireless charging and integrated five sensors: gyroscope, accelerometer, eCompass, pressure and humidity/temperature. WICED sense device pair with smart device and transmit real time data to paired device. Android/IoS based Smart phone has wireless supports like Wi-Fi, Bluetooth, NFC and Develop Application for communicate with WICED sense. Smart devices has Bluetooth capability to pair with WICED sense kit, sends sequence bytes of sensor data. The paring sequence is explained in figure-2, after starting scan operating device paired each other. Smart device send initialize configuration and sensor on/off to wiced sense kit. Then Smart device start to receive encoded byte of information from WICED device.

Smart phone Connect to the IoT Foundation Cloud using Client application which passes URL, Port number and Client ID. The server is identified by client host name, port number and register itself. Once connection is established with IoT server register with the callback function, notification messages intimates data processing. Sensor messages packetized and published to IoT server. Message payload are encapsulated with various attributes. Payloads uploaded to IoT server continuously with fixed interval of time. During message transaction disconnect information receives via callback notification.

After receiving the payload information, the IoT server decode information and display in messages with time information. Messages are different types of event, connection oriented message, published sensor message. Decoded payload data are stored into database for final report generation or, UI application development for end-customer.

Typical architectural approach can be used for design with wearable devices that communicates with the cloud. Wearables devices have many features like tracking, reporting on individual activities communicate with a smartphone or tablet.

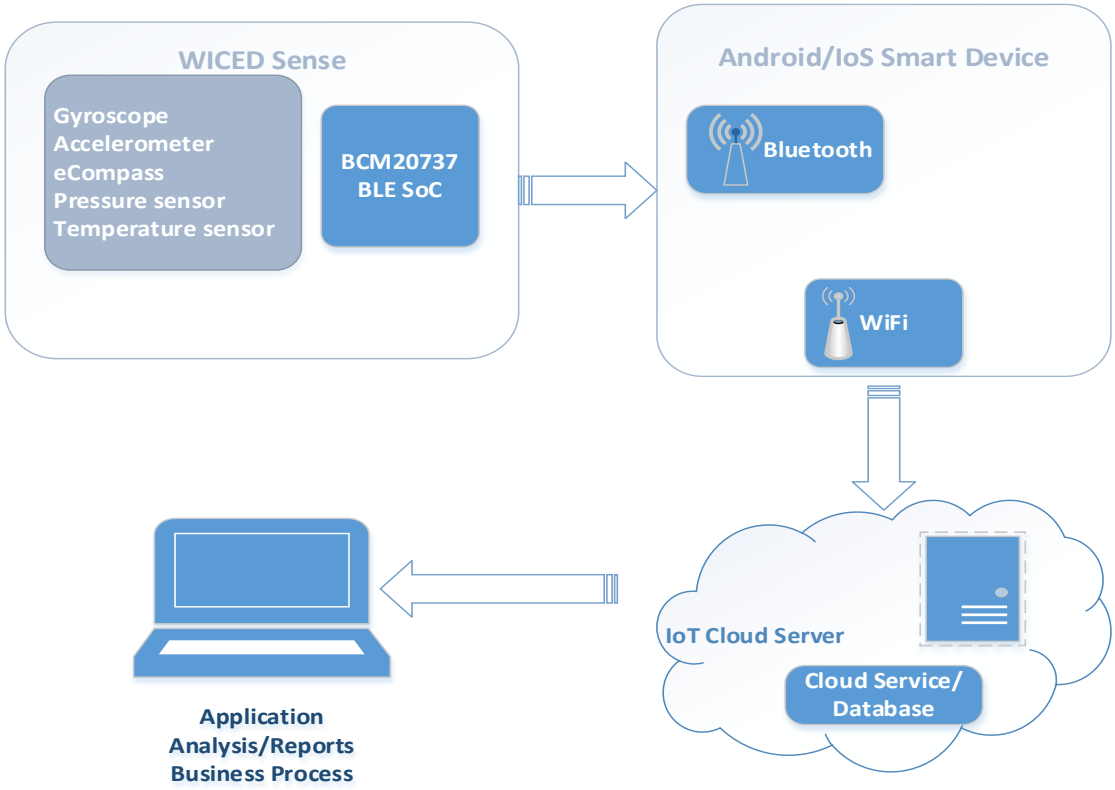

Figure-3: Experimental set-up for IoT

V. RESULTS

The WICED kit consists of a Bluetooth Low Energy (BLE) SoC with five sensors and is powered by coin cell battery. The appearance of the kit is small form factor, cheaper cost and easy choice for experimentation of IoT. Android Phone (supports SDK 4.4) is used for development of IoT Hybrid applications. WICED sense kit transmit Sensor information's via BLE to paired devices. Android phone has two major applications (Interfacing with BLE, Protocol communication with IoT foundation Server) developed in Cordova Java script. The WICED sense firmware by default stream data, Android phone scan and pair with the sensed device. Application receives stream of encoded bytes. Application has algorithm to extract the sensor byte streams and displays on phone in figure-4. It displays the current value of gyroscope, accelerometer and movement of WICED sense. It displays the Connectivity information with WICED sense and IoT foundation server.

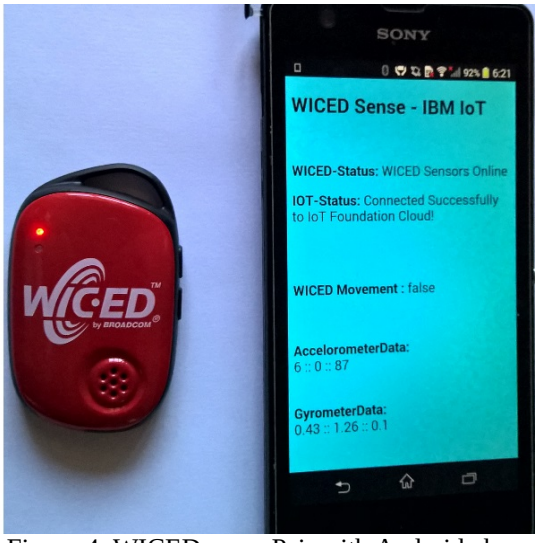

Figure-4: WICED sense Pair with Android phone

Android application connects to IoT Foundation server, MQTT library provides MQTT services, Message Queue, Telemetry Transport, light weight messaging protocol. MQTT client is open source libraries support for different platforms, like C, C++, Java, JavaScript, and Ruby. Android application do IoT service configuration and registration as MQTT device as explained in Reference [2]. The payload message is encoded in JSON format and published to IoT server in fixed interval of time. Figure-5 display the WICED sense data on IoT foundation server. Two event types of information display in server, Device Status and Message are published. Device Status interested on device is connected or disconnected with time information. Message status display the complete payload message sent by the WICED sense device. Devices tab has device type information, Last Synced details, Message reporting interval and owner of the module.

Add Device Remove Device(s)

Device Type	Device ID	Last Event	Message Rate	Date Added	Added By
WICED-Sense	04051976	4 hours ago	-	Monday, June 15, 2015	saminathmail@gmail.com

Latest 10 Inbound Events

Click on a row to get more detailed message information.

Event Type	Event	Timestamp
Device status	Disconnect	Thursday, June 18, 2015 6:06:07 PM
Device status	Connect	Thursday, June 18, 2015 6:06:10 PM
Device status	Disconnect	Thursday, June 18, 2015 6:07:41 PM
Device status	Connect	Thursday, June 18, 2015 6:15:59 PM
Message published	iotsensor	Thursday, June 18, 2015 6:17:37 PM
Device status	Disconnect	Thursday, June 18, 2015 6:17:49 PM
Device status	Connect	Thursday, June 18, 2015 6:19:29 PM
Message published	iotsensor	Thursday, June 18, 2015 6:19:37 PM
Message published	iotsensor	Thursday, June 18, 2015 6:19:40 PM
Device status	Disconnect	Thursday, June 18, 2015 6:27:01 PM

View Payload

Thursday, June 18, 2015 6:19:37 PM

{"d":{"movement":true,"when":"2015-06-19T01:19:40.690Z","ACC_0":-1,"ACC_1":-7,"ACC_2":88,"GYR_0":8.82,"GYR_1":-22.99,"GYR_2":240.12}}

Figure-5: IoT Foundation server with WICED Data

VI. CONCLUSION

IoT lets RFID, BLE, Wi-Fi and other sensor networks empower computers to perceive the world for themselves. IoT captures real-time data and provides services remotely to targeted mobility devices with efficient and effective manner, dramatically reducing wasting of time and improving productivity. The Internet of Things promises to deliver a step change in individuals' quality of life and enterprises productivity. IoT touches every aspect of our lives, make easier our lives and decides how things will ACT. Explains the end-to-end system which enables your devices to connect to the IoT Foundation server. This experimental set-up explains the solution of MQTT open source library, Android Application development and internal of WICED sense development, simple and interesting way to build Internet of Things (IoT). Further development initiates supplementary action for each message data, send an SMS alert, write data to big database, or Display the movement of Sense data.

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Analysis of kidney stones by PXRD and evaluation of the antiurolithic potential of *Coix lacryma jobi*.

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Abstract- From centuries human has been afflicted by urinary calculi (Urolithiasis). These calculi are formed from crystal aggregation and retention in the urinary tract. The incidence and prevalence of urolithiasis may be related to various factors including age, sex, ethnicity, diet, fluid intake, genetic predisposition, climatic conditions, and urinary tract infections. Study of chemical composition and ultrastructure of various types of calculi helps in understanding mechanism of urolith nucleation, growth and aggregation; subsequently, it helps in prevention and management of urolithiasis. In the present investigation, PXRD technique was used to determine mineral composition of renal calculi. Results of the present investigation revealed that renal calculus of calcium oxalate is more abundant than calcium salts of phosphate. Among the calcium salts of oxalate, whewellite form is more abundant than weddellite form. From centuries back, medicinal plants were used for the treatment of urolithiasis. Here in the present investigation, antiurolithic property of a commonly used medicinal plant, *Coix lacryma jobi* was assessed by subjecting different extracts of this plant for its *in vitro* antibacterial activity and decrystallizing property. Among the different extracts, extracts of chloroform and petroleum show maximum antibacterial property. Moreover, the aqueous extract can decrystallize renal calculi. Therefore, *Coix lacryma jobi* may be used as a plant for the treatment of urolithiasis. The present investigation also highlights that calcium oxalate are found to be more prevalent than other types of renal calcluli. However, mechanism of decrystallizing property and antibacterial activity of this plant needs further investigation.

Index Terms- Urolithiasis, Antibacterial, Renal calculi, Decrystallization.

I. Introduction

Urolithiasis, the formation of urinary calculi anywhere in the urinary system, is one of the common disease of urinary tract and can cause renal failure in human (1). The incidence and prevalence of the urolithiasis may be related to various factors including age, sex, ethnicity, diet, fluid intake, genetic predisposition, climatic conditions and urinary tract infections (2). It has been recognised as one of the most painful medical disorders having the tendency to recur, and the recurrence rate is 75% during 20 years (3). Approximately 80% of stones are composed of calcium oxalate and calcium phosphate, 10% of struvite, 9% of uric acid and the remaining 1% composed of cystine or ammonium acid irate (4). Apart from various factors which induce the formation of kidney stones, kidney stone formation by bacterial infection in the urinary tract is one of the serious problem due to its high prevalence of recurrence. Most of the urea splitting organisms such as *Pseudomonas aeruginosa, Klebsiella pneumonia*, *Escherichia coli* were reported to be capable of causing urinary tract infection (5),(6). Bacterial infection may induce stone formation by cystal adherence. When the urea-splitting organisms infect the urinary tract, bacteria disintegrate the urea excreted in the urine in the presence of urease enzyme, which subsequently trigger the formation of ammonia rendering the urine alkaline. In alkaline state, urine tends to contain precipitated crystals of calcium and magnesium phosphate and calcium carbonate in large amount thereby leading to a strong tendency to form calcium phosphate and calcium carbonate calculi (7). For the prevention and management of urolithiasis, studies of chemical composition and ultrastructure of various types of kidney stones is very important. Various techniques can be used to determine the mineral composition of the kidney stones. The PXRD technique can be used as one of the most efficient method to determine mineral composition of the renal calculi (8). From centuries plants have been used for the treatment of various ailments. About 80% of the world population depends on medicinal plants for their primary health care (9). From the last three decades the use of medicinal plants is increased as people thought that medicinal plants has less side effects and are more safer than the modern allopathic medicines (10),(11). A variety of plants including those used by traditional medical practitioners grow luxuriantly in Manipur, a region in the North-Eastern part of India, which happens to be within the Indo-Burmese mega-biodiversity hot-spot (12). Many plants are conventionally used to prevent formation of stone as well as to dissolve and remove them from the human body. Among them *Coix lacryma jobi*, a tall grain-bearing tropical plant belonging to the family Poaceae have been used from the time immemorable by local traditional healers in the treatment of kidney stone and Urinary tract infection (13). But no scientific investigation had been carried out. The present study aims to investigate the antiurolithic property, antimicrobial property and kidney stone solubility test of the different extracts of *Coix lacryma jobi.* Moreover, present investigations also perform the kidney stone analysis using PXRD method.

II. Materials and Method

2.1 Collection and preparation of plant extracts:

The leaves of *Coix lacryma-jobi* Var. were randomly collected from different locations of Imphal East and Imphal West Districts of Manipur, India. The leaves were washed with tap water, then rinsed with distilled water and cut into small

pieces and then subjected to shade dry at 28°C. Then the leaf-pieces were crushed into fine powder with mortar and pestle. 150gm of the powder was subjected to extraction with different solvents (aqueous, methanol, chloroform, hexane, petroleum ether) having 2.5 L each for each solvent at 60-80°C by continous hot percolation using Soxhlet extractor. The extraction process was continued for 24 hour. The crude extract was separated using Rotar vapour evaporator. The semi solid fractions were redissolved in Dimethyl sulfoxide (DMSO) and were kept at 4°C until further use.

2.2 Analysis of Kidney stones by PXRD:

Renal calculi were collected from seven urolithic patients who have done litrostropic surgery at Department of Urology, Regional Institute of Medical Sciences, Manipur. The determination of the qualitative and quantitative analysis of chemical compounds present in the kidney stones was performed by PXRD at Indian Institute of Chemical Technology (IICT), Hyderabad.

2.3 *In vitro* antimicrobial activity assay:

Antibacterial activity was determined by standard filter-disc diffusion technique. The *in vitro* antimicrobial activity was performed against overnight grown cultures of three selected bacteria, namely *Escherichia coli, Klebsella pneumonia* and *Pseudomonas aeruginosa*. Gentamicin was used as positive control in this experiment. The bacterial cultures were maintained on slants consisting of nutrient agar medium. 48 hour cultures of *E. coli, K. pneumoniae* and *P. aeruginosa* were used in the *in vitro* antimicrobial activity assay. 0.05 mg of each extract was dissolved separately in 1ml sterile of dimethyl sulfoxide (DMSO). Nutrient agar medium was prepared and sterilized by pressure cooker. In an aseptic room, inside the laminar flow they poured unto sterile petridishes to a uniform depth of 3mm and then allowed to solidify at room temperature for overnight for checking of contamination. Next day after solidification the test organisms were inoculated with the help of L-shape spreader a bacterial culture of suspensions. Thus provides the uniform surface growth of bacterium and is use for antibacterial sensitivity studies. The wells (6mm in diameter) were dug in the media with the help of a sterile metallic borer. The recommended test sample (0.05gm/1ml in DMSO) was introduced in the respective wells. The plates were incubated immediately at 37°C for 48 h. Microbial growth inhibition was determined by measuring the diameter of the zone of inhibition which was assessed at 48 h incubation.

2.4 Solubility test of Kidney stones:

Solubility test of the renal calculi were performed by keeping the kidney stones to the aqueous extract of *Coix lacryma-jobi*. 0.05 gm of aqueous extract of plant was dissolved in 1ml of distilled water to make a solution. Three stones were taken and measured their weight (W1 = 0.038g, W2 = 0.050g, W3 = 0.050g) before putting to the aqueous extract of *Coix lacryma-jobi* Var. The stones were kept in separate sample tube after proper labelling. Then 1ml of the solution were added and kept at room temperature for one week. After one week, the supernatant were removed from the 3 test tube and then transferred to another three different test tube for further investigation. The stone have been taken out and wipe with the filter paper until it was dry and then measured their weight.

III. Results

3.1 Analysis of Kidney stones by PXRD:

X-ray diffraction analysis was used for identifying the crystalline components of renal calculi. Studies of chemical composition and ultrastructure of various types of renal calculi using X-ray diffraction analysis can help to understand the mechanism of urolith nucleation, growth and aggregation and subsequently help in the prevention and management of urolithiasis. In the present investigation, PXRD technique was used to determine mineral composition of the renal calculi. Results from the PXRD studies revealed that the calcium oxalate, represented by Whewellite and Weddellite mineral shown in figure 1, is the most dominant type of the renal calculi under investigation, in addition to other minerals such as calcium phosphate and Hydroxy apatite. The chemical formula and mineralogical name of the renal calculi are shown in the Table 1.

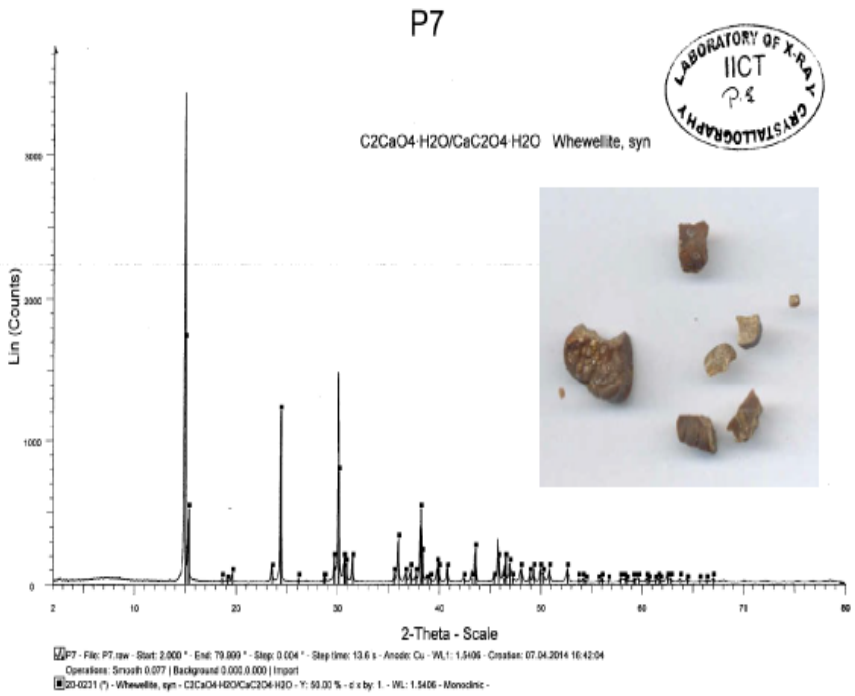

Figure 1: Photograph showing the PXRD data of Whewellite

Table1: Chemical formula and mineralogical name of renal calculi

Formula	Mineralogical Name
$Ca_2CaO_4.H_20/CaC_2O_4.H_20$	Whewellite
$CaC_2O_4(H_2O)_2$	Weddellite
$CaHPO_4$	Calcium hydroxide phosphate
$Ca_{10}(OH)_2(PO_4)/10CaO.3P_2O_3.H_2O$	Hydroxy apatite
$Ca_2P_2O_7$	Calcium phosphate

3.2 *In vitro* antimicrobial activity assay:

The efficacy of the antibacterial activity of the five different extracts of *Coix lacryma-jobi* (aqueous, methanol, chloroform, hexane and petroleum ether) were tested against *Escherichia coli*, *Klebsella pneumonia* and *Pseudomonas aeruginosa*. The antibacterial activity tested against *Klebsella pneumonia* shows maximum efficiency in the chloroform extract followed by petroleum ether extract, aqueous extract, hexane extract and methanol extract. The antibacterial activity tested against *Klebsella pneumonia* also shows maximum efficiency in the chloroform extract followed by petroleum ether extract, aqueous extract, methanol extract and hexane extract. However the antibacterial activity tested against *E.coli* do not show any activity i.e. couldn't inhibit the growth of microbe. The antibacterial efficacy of the different extracts of *Coix lacryma-jobi* were compared with Gentamicin. The results obtained from the present investigation reveals that the non polar extracts (chloroform and petroleum ether) of *Coix lacryma-jobi* have highest antibacterial efficacy than the polar extracts (aqueous and methanol) of *Coix lacryma-jobi*. The effect of plant extracts of *Coix lacryma-jobi* on *Klebsella pneumonia* and *Pseudomonas aeruginosa* were shown in Figure 2.

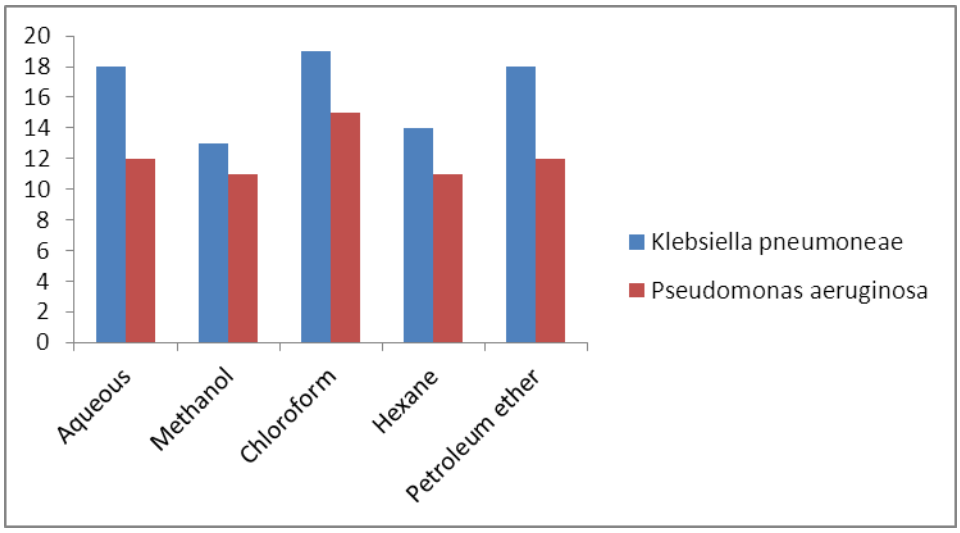

Figure 2: Effect of plant extracts of *Coix lacryma-jobi* on *Klebsella pneumonia* and *Pseudomonas aeruginosa*

3.3 Solubility test of renal calculi:

The effect of the aqueous extract of *Coix lacryma-jobi* on renal calculi decrystallization activity was investigated. Results from the present study observed a siginificant positive effect on renal calculi decrystallization in almost all the tested samples (Table 2).

Table2: Comparing the weight of renal calculi

Weight of renal calculus before putting the aqueous extract of *Coix lacryma-jobi*	Weight of renal calculus after putting the aqueous extract of *Coix lacryma-jobi*
0.038g	0.036g
0.050g	0.048g
0,050g	0.036g

IV. Discussions

Renal calculi have been recognized as one of the most painful medical disorders. The incidence of renal calculi formation also increased with the years to come. Identification of the chemical constituents of renal calculi is important in the diagnosis and management of urolithiasis. The compositional variability of uroliths has different etiologies and requires various mode of treatment and prophylaxis. The results of the present study shows identification of chemical constituents of renal calculi by PXRD. Results from the PXRD studies revealed that the calcium oxalate, represented by whewellite and weddellite mineral shown in figure 1, is the most dominant type of the renal calculi under investigation,in addition to other minerals such as calcium phosphate and hydroxy apatite. The control of urolithiasis depends on the active biomolecules present in the medicinal plants. This eventually would lead to a break-through in the prevention of urolithiasis and may lead to the discovery of novel bioactive molecules which can be helpful in the management and control of urolithiasis.(13) Thus, this investigation would further open up new avenues to the use of these medicinal plants in drug development for the treatment of urolithiasis.

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Preparation and Characterization of Sprayed Mo-doped ZnO Films

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Abstract- Zinc oxide (ZnO) thin films doped with molybdenum (Mo) have been grown on corning 7059 glass substrates by spray pyrolysis technique. The layers were deposited for different solution concentrations ranging from 0.01M to 0.2M, keeping Mo – doping constant as 2 at. %. The change in properties of the films by varying Zn molarity was studied. X-ray diffraction studies showed polycrystalline nature of the films with (002) preferred orientation and exhibited wurtzite structure. The layers formed at 0.1M molar concentration exhibited better crystallinity compared to other layers. Raman studies are in good agreement with XRD. Surface morphology varied significantly with Zn-molar concentration. An average transmittance of the layers was 80% in the visible region and the band gap varied from 3.31 eV to 3.5 eV. The detailed analysis of the results including photoluminescence are reported and discussed.

Index Terms- Thin films; ZnO: Mo; spray pyrolysis; structural properties; optical properties.

I. INTRODUCTION

Transparent conducting oxide films have been widely studied in recent years. ZnO is the most preferable material over other oxide thin films. Its main advantages are low cost of precursor materials, relatively low deposition temperature, non-toxicity, stability in hydrogen plasma atmosphere [1-3]. Moreover, zinc oxide thin films have been used for various applications, such as solar energy conversion [4, 5], gas sensors [6-7] and light emitting devices [8]. ZnO is an n-type semiconductor with a wide band gap. This can be doped with a wide variety of elements to meet the requirements of the field of application. Preparation of ZnO thin films with dopants like Mg, Al, B, Ga, In, Sn, F, [8-15] by using chemical spray technique was reported by many investigators. In many of these investigations, the authors reported their work using zinc acetate dihydrate (Zn $(CH_3OOH)_2 .2H_2O$) as the precursor for zinc. But, in the present work we used zinc chloride ($ZnCl_2$) as the precursor with Mo-dopant [16]. Molybdenum is the potential dopant material for improving conductivity and transparency of zinc oxide thin films. Mo-doping in ZnO lattice is very beneficial because of a valence difference of 4 between Mo^{6+} and Zn^{2+}, thus enabling each dopant atom of dopant to contribute 4 free electrons to the electrical conductivity. Mo-dopant appears to be very successful because of its smaller ionic radius 0.06nm [17]. Mo-doped ZnO films have been grown using different methods such as RF and DC sputtering [18-19] and the ion beam sputtering deposition [20]. In comparison of the films grown by spray pyrolysis, it is quite simple and the required experimental set-up is less expensive and flexible for process modification. Furthermore to produce large area films, spray pyrolysis is easily adoptable. There are less investigations on Mo-doped ZnO films by spray pyrolysis method in literature. In this work we report on the growth of Mo-doped ZnO (MZO) films by chemical spray process and the results on film characterization.

II. EXPERIMENTAL

Mo-doped ZnO thin layers were prepared by the spray pyrolysis method on corning 7059 glass substrates at a constant substrate temperature of 400^{o}C. Zinc chloride ($ZnCl_2$, Aldrich 98%) and molybdenum chloride ($MoCl_5$, Aldrich 95%) were used as precursors for of zinc and molybdenum respectively. Methanol was used as solvent for preparation of precursor solutions. The Zn molarity was varied in the range 0.01M - 0.2M, to investigate its effect on the preparation of MZO thin films. The solution was sprayed at a flow rate of 6ml/min and compressed air was used as the carrier gas with a flow rate of 8l/min. A distance of 25cm was maintained between substrate and the nozzle. The solution was sprayed for 15s and paused for 1min to overcome cooling of the substrates. The deposition was carried out using automated stepper motor system to get uniform coating of the film on the substrate. The structural properties were studied using a Siefert X-Ray diffractometer (XRD) with a CuK_α radiation source (λ=1.542 Å). Raman studies were carried out using Horiba Lab Ram HR spectrometer using a laser of wavelength 532nm for excitation. FSI serion scanning electron microscope was used for surface morphology studies. The optical properties were determined using UV-Vis-NIR spectrophotometer (Perkin Elmer lamda –950). The photoluminescence properties of the films was studied by YVON Florolog-3 (model:FL3-22) with xenon flash lamp as source.

III. RESULTS AND DISCUSSIONS

The as-grown MZO films were uniform, pin hole free, pale whitish in appearance and strongly adherent to the substrate surface. The film surface was found to be rough. The X-ray diffraction spectra of MZO films formed using different Zn-concentrations with 2 at. % Mo-doping are shown in fig 1. All the films were polycrystalline in nature and showing a structure with the appearance of (100), (002) and (101) peaks. The crystal structure of the grown films was evaluated to be hexagonal wurtzite. With the increase of solution molarity, the intensity of the (002) peak increased up to the molarity of 0.1M and afterwards it is decreased. When the Zn concentration in the solution was higher than 0.1M, the (102), (103) and (112)

reflections also appeared in the XRD spectra and their intensity increased with increase of Zn-concentration. This might be due to (more amount of) Mo incorporation with increasing molarity, results in disorder. No change in preferred orientation is noticed, this clearly shows the perfect substitutional incorporation of Mo in Zn sites.

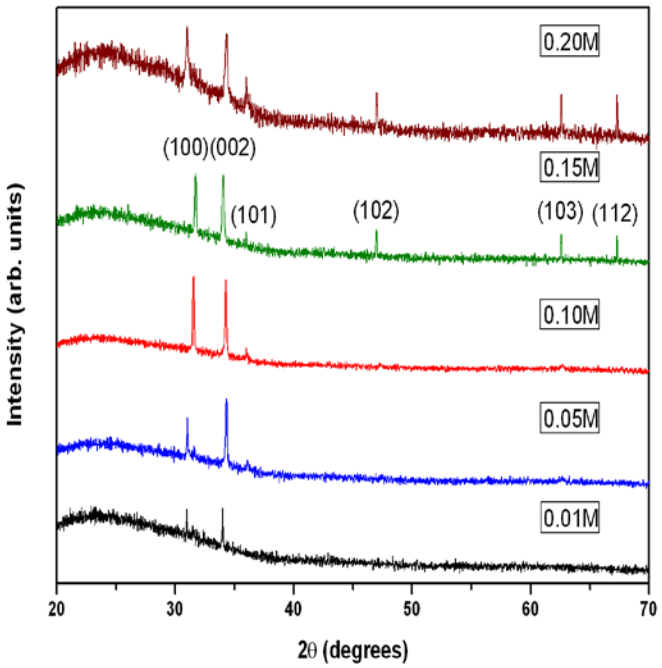


Fig. 1. XRD pattern of MZO films formed at a substrate temperature of 400°C using different Zn- molar concentrations.

The crystallite size (*D*) of MZO films prepared at different molar concentrations calculated using full width at half maximum (FWHM) for preferred orientation, (002) using Scherrer formula [21],

$$D = \frac{c\lambda}{\beta \cos\theta} \quad \ldots\ldots\ldots \quad (1)$$

where β is the full width at half maximum in radians, θ is diffracting angle and λ is the wavelength of X-rays and C is the correction factor, which is taken as 0.9. Fig.2 shows the change of crystallite size with Zn- molar concentration in the starting solution. As Zn molar concentration increases, the crystallite size also increased up to 0.1M and on further increase of Zn-molarity the crystallite size starts decreasing.The dislocation density (δ) was estimated from the following relation [22],

$$\delta = \frac{1}{D^2} \quad \ldots\ldots\ldots \quad (2)$$

and the variation of dislocation density with Zn-content in the starting solution is shown in fig. 2. It shows a sharp decrease of dislocation density with increase of Zn-molar concentration up to 0.05M and seems stable afterwards. A minimum dislocation density of 2×10^{-8} Å^{-2} was observed at 0.1M. This was due to the higher crystallite size observed at this concentration.

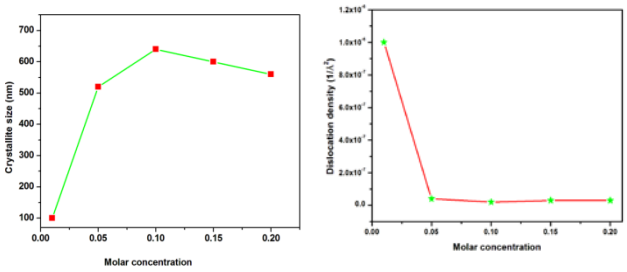


Fig.2.Variation of crystallite size and dislocation density of MZO films.

The lattice parameters, '*a*' and '*c*' were calculated using the relation [21],

$$\frac{1}{d^2_{(hkl)}} = \frac{4}{3}\left[\frac{h^2 + hk + k^2}{a^2}\right] + \frac{l^2}{c^2} \quad \ldots\ldots\ldots\ldots \quad (3)$$

where *d* is the inter planar spacing, determined using Bragg's equation and *h*, *k*, *l* are the Miller indices of the lattice planes. The evaluated lattice parameters for the films grown at 0.1M, Zn-doping were *a* = 3.25 Å and *c* = 5.19 Å. In order to investigate the vibrational properties of MZO films and the influence of solution concentration on their micro structure, phase and other related parameters, Raman spectra recorded in the range of 150–800cm^{-1} and are shown in Fig. 3. In general the wurtzite crystal structure of ZnO belongs to C^4_{6v} space group with two formula unit primitive cells where all the atoms are occupying the C_{3V} sites [23]. According to group theory, the corresponding zone centre optical phonons are of the following symmetry modes: $A_1 + 2B_1 + E_1 + 2E_2$. The $A_1 + E_1 + 2E_2$ modes are Raman active, while $2B_1$ phonons are silent. The A_1 and E_1 modes are split into longitudinal optical (LO) and transverse optical (TO) components [23]. The peak at about 438cm^{-1}can be assigned to E_2 mode (E_2 high) of ZnO. At low starting solution molarity value the Raman peak related to E_2 mode appears very broad and weak, indicating low crystallinity. This result is in agreement with the XRD data. The peak at about 573cm^{-1} can be assigned to A_1 longitudinal optical (LO) mode. In the same spectra a weak peak is observed at 342cm^{-1},which corresponds to low frequency E_2 second order phonon.

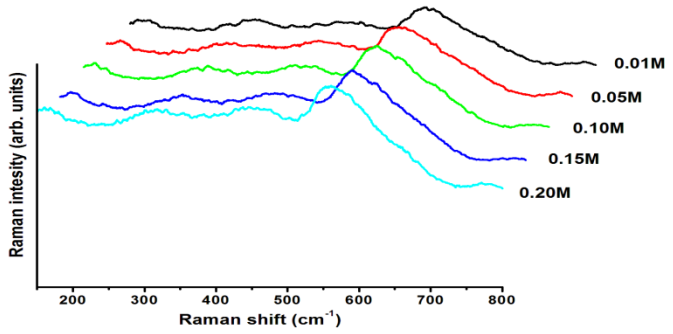
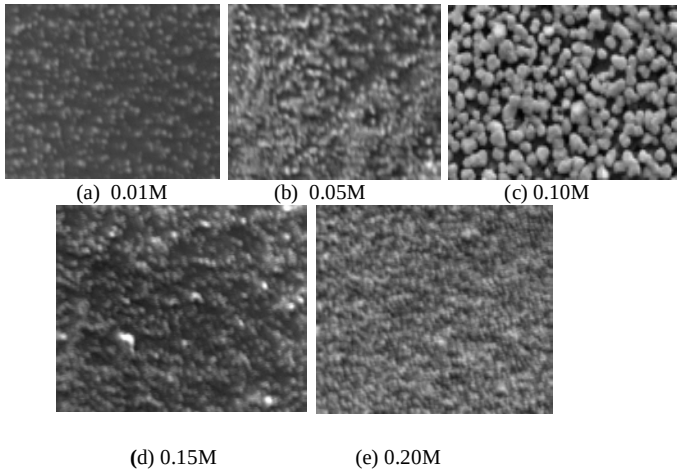


Fig. 3. Raman spectra of MZO films grown with different Zn-molar concentrations.

SEM micrographs of MZO films with different Zn-molar concentrations are shown in fig.4. A clear change in the crystallinity of the films is observed with increase in Zn molarity

in the starting solution. As solution molarity increased, the crystallinity has been increased for the films having molarities up to a value of 0.1M and then decreased for higher molarities. The evaluated grain size of the layers formed with molarity of 0.1M is 650nm.This result is very good in agreement with XRD results.



(a) 0.01M (b) 0.05M (c) 0.10M

(d) 0.15M (e) 0.20M

Fig. 4. SEM pictures of MZO films grown with different Zn-molar concentrations.

Fig.5 shows the transmittance versus wavelength plots of the films grown at different starting solution molarities. An average transmittance of 80% was exhibited by all the films. It is clear from the plots that higher molar concentration films showed lower transmittance compared to the layers formed using lower solution molarities. The decrease in transmittance at higher concentration is because of increasing thickness of the film (0.01M-120nm; 0.05M-200nm; 0.1M-340nm; 0.15M-390nm;0.2M-500nm). Also then high surface roughness of the layers could be the reason for the low transmittance as rough surface increases the light scattering and reduces the transmittance.

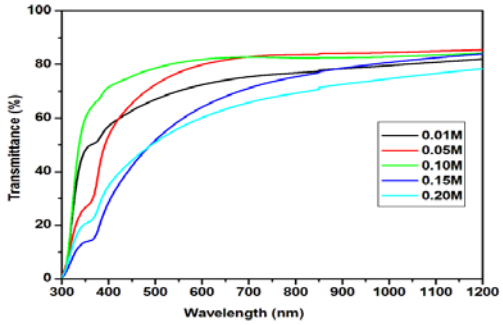


Fig. 5. Optical transmittance versus wavelength spectra of MZO films.

The absorption coefficient, α was calculated using the relation [21],

$$\alpha = \frac{1}{t} \ln \frac{1}{T} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where t is the film thickness and T is the transmittance of the film. The dependence of absorption coefficient, α on the photon energy, hν gives the information regarding the electronic transition between the valence band and conduction band in semiconductors. The energy absorbed by the sample for direct/indirect optical transition from the incident photon energy, hν is calculated using the relation,

$$\alpha h\nu = A(h\nu - E_g)^m$$

where A is a constant, E_g, the energy band gap, hν, the incident photon energy and 'm' is the nature of the optical transition involved between the parabolic bands in the material. Here m = 1/2 indicates direct allowed transition; m = 3/2 reveals direct forbidden transition, m = 2 shows indirect allowed transition and m = 3 infers indirect forbidden transition. In this study, the data followed the above relation with m = ½, indicating the presence of direct allowed transition in the layers. Fig.6 shows the variation of energy band gap with molar concentration of the starting solution. The band gap varied from 3.31eV to 3.5eV and the observed values are in agreement with the literature values [24].

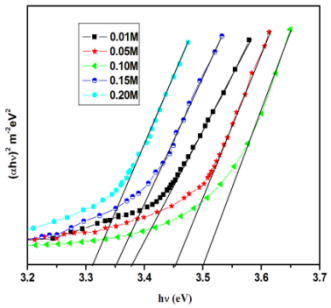


Fig. 6. $(\alpha h\nu)^2$ versus hν plots of MZO films.

Fig.7 gives the comparison of photoluminescence spectra of MZO films prepared with different starting solution molarities. A strong peak was noticed at wavelengths between 360nm and 390nm that corresponds to the energy band gap of the layers. With the increase of solution molarity in the ZnO crystal lattice, the intensity of the peak centered at 410nm gradually increased and the peak became strong. This is in good agreement with the optical data observed in the study, which confirms that optical behaviour of Mo-doped ZnO layers was increasing with solution molarity. Further, a low intensity broad peak was observed at 525nm that was related to green emission, which originates from the oxygen vacancies.

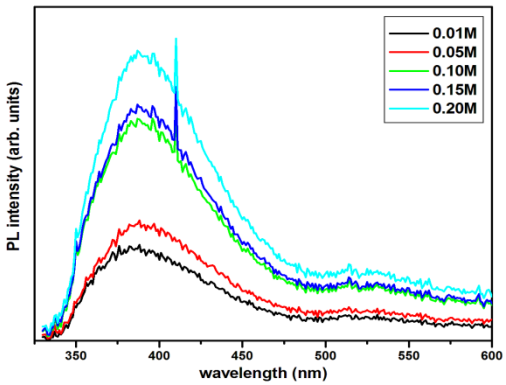


Fig. 7. Photoluminescence spectra of MZO films grown with different precursor concentrations.

IV. CONCLUSION

ZnO thin films with different Mo-doping concentrations have been prepared at a substrate temperature of 400^0C. The X-ray diffraction studies showed good crystallinity at 0.1M molar concentration that showed a strong (002) plane as preferred orientation. The Raman studies revealed only ZnO phase. The morphological studies indicated better grain size of 650nm for the films formed at 0.1M molar concentration. The optical results identified that films with 0.1M concentration showed optical transmittance of 80% in the visible region and the energy band gap varied between 3.31eV to 3.5eV. The photoluminescence data supported the change in band gap with solution concentration. These crystalline, single phase and transmissive Mo-doped ZnO layers could be used as window layers in solar cells.

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An Exploration of Splits in African Independent Churches in Zimbabwe (2012-2014)

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Abstract- Zimbabwe is a religious country with freedom of worship, yet it has seen itself with mushrooming dubious African Independent Churches (AICs). This article investigates the reasons for division. Furthermore, the research study addresses how the Apostolic and Zion churches can predict the likely-would of church split so that the church leaders can prevent such splits in a biblical manner that benefits the spiritual health and growth of the church.

An extensive literature was reviewed from textbooks, the internet, newspapers, journals and others and aimed at putting perspectives to ensure that it identifies the gap in the actual research.

The researcher adopted a qualitative approach which utilized questionnaires, administrative court cases, interviews and non participatory observation as research tools to gather data. The information gathered was checked for completeness and accuracy of answers recorded. Data were presented using tables, figures, and charts and then analyzed. The research noted that greed, power hunger, spiritual doctrinal differences and false prophesy have high levels of effect on church splits, whilst politics, lust, financial squabbles, personalization and God calling have low levels of influence on church splits. The warning signs discovered help to identify and prevent church splits before they happen.

Index Terms- Church splits, African Independent Churches, Apostolic Churches, Apostolic Christian Council of Zimbabwe (ACCZ), Zimbabwe

I. Introduction

The Christian Church started in 33 A.D with Day of Pentecost, continued as one with one faith and one baptism (Eph 4:5) throughout the whole world for about five centuries. During this period if a new teaching would appear, representatives from all the churches would meet to discuss the new teaching and either accept it or reject it. The church was one apostolic Catholic Church, according to Church History (2015). Apostolic refers to its establishment by the apostles of the Lord, and catholic refers to is universality.

After about 500 years operating as one apostolic Catholic Church, the church split into two camps: the Oriental Orthodox Churches and Western Churches as a result of misunderstanding and miscommunication as one group used Greek theological idioms while another used Latin expressions. For the next 500 years in 1054 A.D. The Western Churches split into Roman Catholic (Western) Church and Eastern Orthodox Churches because of procession of the Holy Spirit. The Eastern Church which had been around the 400s, stated that the Holy Spirit came out of the Father only. The Western church, using verses as John 16:13-15, Galatians 4:6 and Romans 8:9 affirmed the double procession that the Holy Spirit comes out of the Father and the Son (Mark Nickens 2009). Then after another 500 years, the Roman Catholic Church in 1517 A.D. suffered another severe schism by 'Reformation' who opposed purgatory, sacraments and indulgencies and used authority of the bible. The corruption was to the extent that Pope Leo X needing money for completion of St Peters Church in Rome permitted John Tetzel to go through Germany selling certificates, signed by the Pope himself. Whoever buys these certificates for the friends living or dead, all their sins would be pardoned without confession, repentance, penance or absolution by a priest (Hurbut 1970). The church splits continued into Church of England to Protestants to Methodist then to Pentecostals and so on.

When the gospel spread to Africa, the mission churches could not be able to fully reconcile the traditional religious and cultural beliefs with their teachings of their church leaders (Reese 1981). As a result the splits and breakaways from their parent churches were inevitable. Beginning in the 1930s, there began to be splits and breakaways in Zimbabwe from mission churches sighting lack of africanization in the leadership of missionary churches. According to Oduro (2006), these African churches that are described as 'a place to feel at home' churches came to be classified as the African Independent Churches (hereinafter referred to by the acronym AICs which in fact could stand for synonymous terms such as, African Instituted Churches; African Indigenous Churches; African Initiatives in Christianity). However, the splits in Zimbabwe were quite few and justified unlike today where there are many funny people who just wake up in the morning, interpret their dreams and come up with their own new churches making the churches splitting up left right and centre. From a religious standpoint, the apostolic churches regard themselves as spirit-type churches and consequently base their religious beliefs and practices primarily on spirit, hence the abuse of spirit in form of dreams. The religious madness is likely to grip Zimbabwe if the expansion of dodgy religious groups is allowed to go out of hand (Chikamwe 2014). As a result, the objectives of this research are to assess the causes and impact on the African Independent Churches in Zimbabwe to split up left right and centre and how to predict that there is likely to be a church split or breakaway so that the church leaders can provide a biblical strategy and practical tools for use to prevent or minimize church split in a way that advances the churches toward growth spiritually and numerically. The remainder of this paper is organized into four sections: section 2 describes the sample and the data collection. In section 3 the validity and reliability of the data are presented.

Then in section 4 the research results are given and section 5 concludes the paper.

II. SAMPLE AND DATA COLLECT ION PROCEDURE

The study was collected primarily from the Bishops whose churches are affiliated to Apostolic Christian Council of Zimbabwe (ACCZ) and administrative court cases of Apostolic and Zion Churches in Zimbabwe. Religion in Zimbabwe's 2012 estimates Christianity to be at 85%, about 10,200,000 of which Apostolic has the highest at 33%, followed by Pentecostal at 17%. About 700 apostolic churches in Zimbabwe are affiliated to ACCZ, followed by Union for the Development of Apostolic Churches and Zionist in Zimbabwe Africa (UDACIZA) that has about 70 churches affiliated to it (Maguranyanga 2011). The period covered is from 2012 when ACCZ started to collect data to current period of 2014.The main purpose of the study is being an exploration of splits in African Independent Churches in Zimbabwe (2012-2014). Talim Ministries noted seven church splits, but the researcher tested nine variables on church splits. The primary data collection instruments involved questionnaires, administrative court records, informal and one on one interviews. The researcher used qualitative approach to explore the complexity of splits in African Independent Churches in Zimbabwe and to become more experienced with this phenomenon of splits. Furthermore, the researcher used the descriptive survey design that began with a research question and then developed a theory during data collection. The descriptive survey design gives the researcher an opportunity to explore questions on church split which could not be examined through the experimental or quantitative approach.

In some instances, the researcher watched the ACCZ Administrative Court Proceedings during its formal meetings. The researcher would gather data through observation as they conduct their meetings and critically analyze the response of Apostolic and Zion church leaders in these meetings.

The research targeted at Apostolic and Zion churches in Zimbabwe. The target population of this research study consists of Arch-Bishops or Senior Pastors, Bishops or Pastors, Ministry Heads and the ACCZ Chief Registrar and ACCZ Peace and Commission Committee members. A sample was picked from the churches that represented the ACCZ. Random systematic sampling was done to ensure that all churches were fairly represented as different churches.

In this study bishops were called to come to area of study at ACCZ offices and stratified random sampling was first used to ensure that different churches sizes with different leadership structures were all included. During the dais visit, the researcher made appointments to come and conduct a research with the chosen churches. The fact that the researcher is part of management team of ACCZ made the work accepted and easy to conduct the research.

The list was prepared before the questionnaires were sent. Because of limited time, people who were given questionnaires with limited time to fill and return. The research subjects were willing to take part and they were happy about participating in the study. A total number of 20 bishops whose churches are members of ACCZ were interviewed. The researcher made it a point that all the members had equal chance to be chosen within the sample to increase the reliability and validity of the research. Their response to this was superb and cooperated very well with the interviewer.

III. VALIDITY AND RELIABILITY

With this regard of the validity of the questionnaire the researcher judged this using face validity, construct validity and content validity. In essence, the questionnaire was given to the supervisor and co-supervisor and other academics in different disciplines to test its validity.

Although the questionnaire has a number of advantages, the researcher is aware of its limitations. The researcher used interviews as to make up for the limitations of the questionnaires and obtain up data that might have been left out by the administration of the questionnaires.

In a move to thoroughly obtain the required data about the phenomenon, the researcher also engaged in document analyst, that is, reading what has been written about the ACCZ Administrative Court in Zimbabwe, therefore by getting some valuable information that would be paramount importance to the study. There are incidences where the researcher employed all the three methods to collect the same data and this is called triangulation. This involved observation, interviews and questionnaires.

The researcher was fairly confident that the results derived from the sample size of the population could be generalized to the whole of that population. But to achieve such accuracy, a sample must be representative. Representative sampling that the researcher employed involved population as a whole. The sampling size was more complex that it seemed. Thus the statisticians developed various rules for working out the correct size and nature of samples.

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IV. FINDINGS

The researcher will present, analyze and discuss data using the response received from interviews and questionnaires and court records from ACCZ Peace Commission. The research will use descriptive procedures to describe the research findings since most of the data is qualitative. The researcher will use tables, graphs, percentages and pie chart to come up with patterns and relationships of research findings.

The researcher sought to explore how church splits be minimized in a Christian manner. The research considers the warning signs of possible splits and how they can be overcome. Report on church splits in this case study came from highest level of leadership. Researcher focused on avoiding church splits or minimizing such splits if unavoidable.

A. Reasons For Church Splits

Nine variables on church splits were tested on African Independent Churches intending to capture different church characteristics that can influence the degree of church split. The results of the variables are presented in table 1

Table 1: Reasons For Church Splits

The Table below shows the sample of 20 church leaders interviewed. The sample has been derived from members of Apostolic Christian Council of Zimbabwe (ACCZ). Questionnaire with 9 variables on church splits has been given to each church leader for his consideration. The number of church splits has been extracted from the answered questionnaires and has been also expressed as a percentage. The church leaders/Bishops have been categorized according to their answers pertaining to church splits

Reasons for Splits (Variables)	No. of Splits	% of Splits	Sample of 20 Bishops as%
Greed	7	17%	35%
Power Hunger	10	24%	50%
Policies/Doctrines	5	12%	25%
Politics	3	7%	15%
Lust	3	7%	15%
Fin .Squabbles	2	5%	10%
Personalization	4	10%	20%
False Prophesy	6	14%	30%
God Call.	2	4%	10%
Total	**42**	**100%**	
Average	**5**	**12%**	**25%**

The results show that the impact of church splits with number of splits 5 and above or 12% and above or supported by more than 24% of sampled bishops or churches have influence on church splits. Greed, power hunger, policies (doctrines) and false prophesy have high levels of effect on church splits. Conversely, those below the average of 5, namely, politics, lust, financial squabbles, personalisation and God calling have low levels of influence on church splits.

B. Cases Handled by ACCZ

The researcher also examined the ACCZ records of church disputes brought by bishops or churches themselves to ACCZ Peace Commission in year 2014 when the ACCZ Peace Commission was launched. The results are put in table below.

Table 2: Court Cases

The table below presents the 14 cases handled by ACCZ Peace Commission in year 2014, the year Peace Comm. was established. The commissioners are ACCZ members whose occupations are lawyers, policemen, economists and chief registrar.

Court Cases Handled by ACCZ in Year 2014			
		Church Disputes	
Specific Problem	**Main Dispute**	**Frequency**	**As a %**
leadership wrangle	Power Hunger	8	57%
satanism,sorcery	False Prophecy	2	14%
Adulterous	Lust	2	14%
marrying 2 wives	Policies	1	7%
Family & church	Personalization	1	7%
	Total	**14**	**100%**

Source: ACCZ Peace Commission Records of 2014

The table shows that 14 cases were brought before ACCZ Peace Commission for trial in 2014. According to court records cases, church splits are caused by power hunger which is the highest, followed by false prophecy and lust. However, lust is only featuring as a church split on court cases only. This is so because on court cases the churches are the ones that sometimes bring the bishops to court, whereas on the questionnaires the bishops would not report their lust as a cause to church split. Similar disputes have been grouped together and also presented as a percentage.

Table 3: Highest Church Splits Causes

The table shows the splits causes with highest church splits on each category

Description	Highest Variable	Frequency	% Freq.	No. of Bishops %
Leaders Age	Power Hunger	16	31%	45%
Church Age	Power	8	38%	40%

	Hunger			
Membership	Power Hunger	5	31%	25%
Education:				
Up to Secondary	Greed	4	25%	35%
Diploma	Power Hunger	3	33%	17%
Degree	Power Hunger	4	50%	20%
Overall	**Power Hunger**	**10**	**24%**	**50%**
Court Cases	**Power Hunger**	**8**	**57%**	**57%**

The research reveals that African independent Churches in Zimbabwe are too many, not that the leaders have been called by God to become Bishops but they just felt to become Bishops no matter what comes. Power Hunger has derived them to become Bishops. Zimbabweans are taking the work of Bishop as an occupation whereas the work of God can be served without tearing the Body of Christ, thus causing confusion by dividing Christians or apostles. Power hunger is not affected by the age of the leader, or his education, or the size of membership, or even the age of the church as according to this research.

It should be also noted that in table 3, there are 25% chances that people with no secondary education are fighting to be bishops to the extent that their greediness are causing church splits as 35% the bishops sampled highlighted this.

C. Warning Signs of Church Splits

It is important that church leaders should be in a position to predict the likely-would of church split before it happens and take corrective action before the church is divided. The results of the survey carried out are presented below in a table.

Table 4: Warning Signs of Church Split

The results below show the warning signs of church split as extracted from the questionnaires distributed to 20 Bishops of African Independent Churches in Zimbabwe. The survey was carried in 2014 to members of Apostolic Christian Council of Zimbabwe.

Warning Sign	**Frequency of Warning Sign**	**Frequency As %**
Unauthorised Meetings	6	23%
Not Attending Services/Events	5	19%
Disrespecting Leadership	5	19%
False Prophecy	1	4%
Disagreement with Leaders	8	31%
Preaches Targeted to Leaders	1	4%
Total	**26**	**100%**

Among the warning signs for church splits, the biggest warning sign is numerous disagreements with church leaders. This accounts for 31% of the warning signs. Out of the 20 churches sampled, 40% of the Bishops interviewed highlighted disagreements with church leaders as the main warning sign of possible church split. Such rebellion followers hunt for reasons to object whatever is put across by leaders.

Another second highest warning sign of possible church split is unauthorised meetings. The church members begin to do meetings not authorised or sanctioned by church leaders. The meetings would have hidden agendas with the intention of rebuking or counter-acting on the resolutions of the church leaders. About 30% of sampled churches admit that unauthorised meetings has led to church split if no correct action taken on such warnings. Church split is associated with 23% of warning signs on unauthorised meetings.

The other warning signs of church split are for not attending church services and events, and disrespecting leaders. Such members see themselves on the equal footing with the church leaders, assuming themselves holding the same positions as their leaders. Excuses after excuses are given as reasons for not attending the church services and events. Some even go to the extent of boycotting events. According to table above, the failing to attend services/events and disrespecting leaders account for 19% each on warning signs of possible church split.

False prophecy and targeted preaches to leaders have low levels of warning signs for church splits and each account for 4% with 10% of members. Instead of preaching the word of God, the verses are chosen in such a way that at the end of the day the church leaders are humiliated.

V. CONCLUSION

In respect of assessing the objectives of this research on the causes and impact on why the African Independent Churches split up left right and centre, the study concludes that power hunger, greed, policies (doctrines) and false prophesy have high levels of effect on church splits. The other conclusion that answers the final objective to this study is that if the church leaders see their members frequently disagreeing with them, or that the members are seen hold a number of unauthorised meetings, or that members are no longer attending services/events or even disrespecting their leadership, it means

there is a church split that is likely to happen. As a church leader it is important to take corrective action in a biblical manner that benefits the spiritual health and growth of the church before the church is divided.

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Interfacing Parallel Port Using Turbo C Programming

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Abstract- Hardware Interfacing Using Parallel Port Programming is designed to control electrical appliances using computer printer port. The electrical appliances are controlled by using software through an interfacing circuit. The software used in this is TURBO –C. A windows based program is used to control eight LEDs, through an interfacing circuit, by using computer printer port. The base address used is LTP1 (0378 H). The program accepts input signal from the keyboard, decodes the keyboard hit and accordingly send signal to the corresponding pins of the printer port which in turn controls the LEDs. It is further extended to the automatic control i.e. in random or sequential order of the LEDs. The LEDs will be controlled automatically according to some delays provided in the program. The purpose of this work is to reduce human effort in controlling large number of switches as in stadiums, buildings, apartments etc. This effort can also be extended to controlling up to 256 electrical switches by the use of proper interfacing circuits. By proper implementation, 256 electrical switches can be controlled using only eight keys from the keyboard.

Index Terms- Parallel Port, DB25 Connector, Register, LED, Circuit, White Board, Base Address and LTP

I. INTRODUCTION

COM (Communication port) [1] is the original, yet still common, name of the serial port interface on IBM PC-compatible computers. It might refer not only to physical ports, but also to virtual ports, such as ports created by Bluetooth or USB-to-serial adapters. Most PC-compatible computers in the 1980s and 1990s had one or two COM ports. As of 2007, most computers ship with one or no physical COM ports. As of 2014, most PC-compatible computers don't include any COM ports. After the RS-232 COM port was removed from most IBM PC compatible computers in the 2000s, an external USB-to-UART serial adapter cable was used to compensate for the loss. A major supplier of these chips is FTDI.[2] . In computers, ports are used mainly for two reasons: Device control and communication. We can program PC's Parallel ports for both. Parallel ports are mainly meant for connecting the printer to the PC. But we can program this port for many more applications beyond that Parallel ports are easy to program and faster compared to the serial ports. But main disadvantage is it needs more number of transmission lines. Because of this reason parallel ports are not used in long distance communications. In serial ports, there will be two data lines: One transmission and one receive line. To send a data in serial port, it has to be sent one bit after another with some extra bits like start bit, stop bit and parity bit to detect errors. But in parallel port, all the 8 bits of a byte will be sent to the port at a time and an indication will be sent in another line. There will be some data lines, some control and some handshaking lines in parallel port. Computer places the data in the data pins, and then it makes the strobe low. When strobe goes low, printer understands that there is a valid data in data pins. Other pins are used to send controls to the printer and get status of the printer. To use the printer port for applications other than printing, we need to know how ports are organized. There are three registers associated with LPT port: Data register, Control register and Status register. Data register will hold the data of the data pins of the port. That means, if we store a byte of data to the data register, that data will be sent to the data pins of the port.

II. LITERATURE SURVEY

The first parallel interface for printers was introduced with the Centronics Model 101 printer in 1970 [3] . The early calculators, which they used to create the Centronics interface on their computers, had 36-pin micro ribbon connectors Wang etal. The connector has become so closely associated with Centronics that it is now popularly known as the “Centronics connector”. The Centronics parallel interface quickly became an industry *de facto* standard; manufacturers of the time tended to use various connectors on the system side, so a variety of cables were required. For example, early VAX systems used a DC-37 connector, NCR used the 36-pin micro ribbon connector, Texas Instruments used a 25-pin card edge connector and Data General used a 50-pin micro ribbon connector. Before the advent of USB, the parallel interface was adapted to access a number of peripheral devices other than printers. Probably one of the earliest devices to use parallel was dongles used as a hardware key form of software copy protection. Zip drives and scanners were early implementations followed by external modems, sound cards, webcams, gamepads, joysticks, external hard disk drives and CD-ROM drives. Some of the earliest portable MP3 players required a parallel port connection for transferring songs to the device [4]. There are also some print servers that provide interface to parallel port through network. USB-to-EPP chips can also allow other non-printer device to continue to work on modern computers without a parallel port [5]. On almost all the PCs only one parallel port is present, but we can add more by buying and inserting ISA/PCI parallel port cards. The Pin outs of DB25 connector is as shown in figure 1 below.

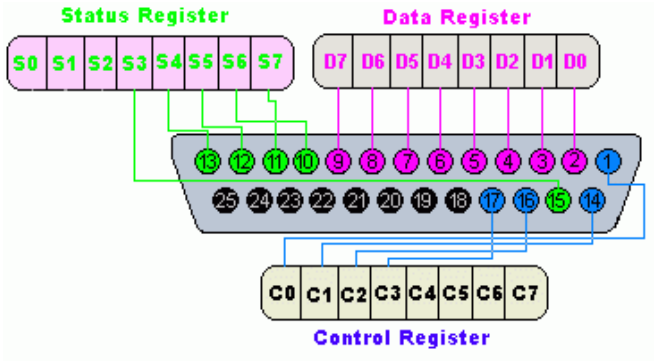

Figure 1: Pin-Out diagram of DB25 connector

The LEDs can be controlled by using simple interfacing circuit. The only component needed is one LED and one 470 ohm registers. In this circuit one end of the circuit is connected to the data pins from where the signal is to be sent to the LEDs and another end goes to the circuit as shown in the figure 2 below:

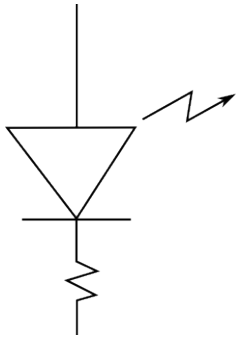

Figure 2: A Simple LED

In this hardware interfacing, we are using only first parallel port (LPT1); the following table lists the details of how the software interfaces to hardware port.

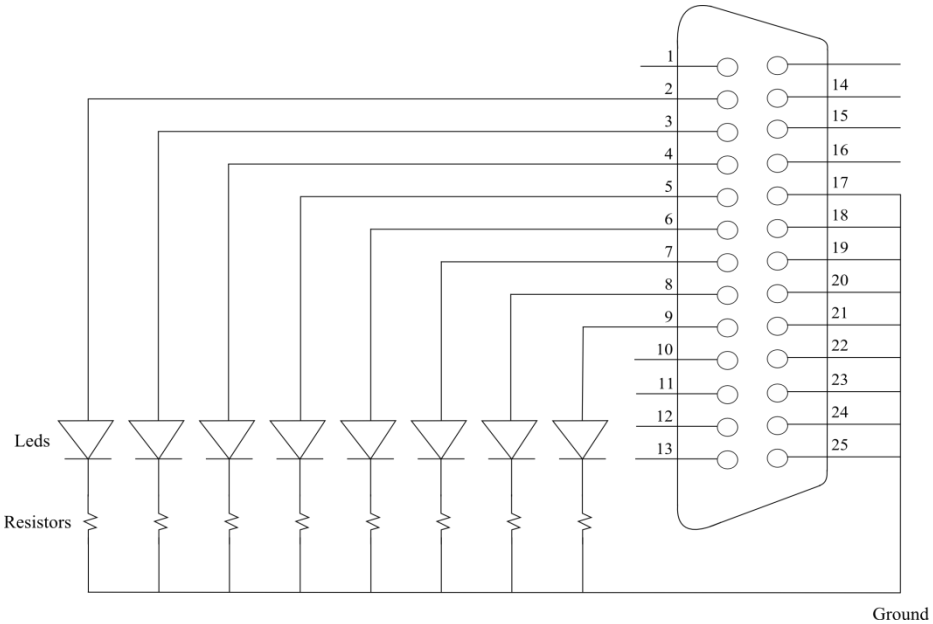

Figure 3: Circuit diagram used for controlling the LEDs

Table I: Printer Port and Address

Printer Port Addresses	
Printer Port	Base Address
LPT1	0x0378 or 0x03BC
LPT2	0x0278 or 0x378
LPT3	0x0278

Table II: Printer Port Registers

Printer Port Registers	
Register Name	Address
Data Register	Base+0x00
Status Register	Base+0x01
Control Register	Base+0x02

Table III: Registers bit definitions

Register Bit Definition									
Bit	Data Register	Status Register	Control Register	Data Low	Data High	Status Low	Status High	Control Low	Control High
7	D7	Busy	Not Used	0	1	Busy	Not Busy	-	-
6	D6	Acknowledge	Not Used	0	1	Nack	Ack	-	-
5	D5	Paper Status	Not Used	0	1	No Paper	Paper	-	-
4	D4	Selection Status	Interrupt	0	1	Not Selected	Selected	Interrupt Disabled	Interrupt Enabled
3	D3	Error Status	Select	0	1	No Error	Error	Selected	Not Selected
2	D2	Not Used	Initialize	0	1	-	-	False	True
1	D1	Not Used	Auto Feed	0	1	-	-	True	False
0	D0	Not Used	Strobe	0	1	-	-	True	False

III. SIMULATION RESULTS

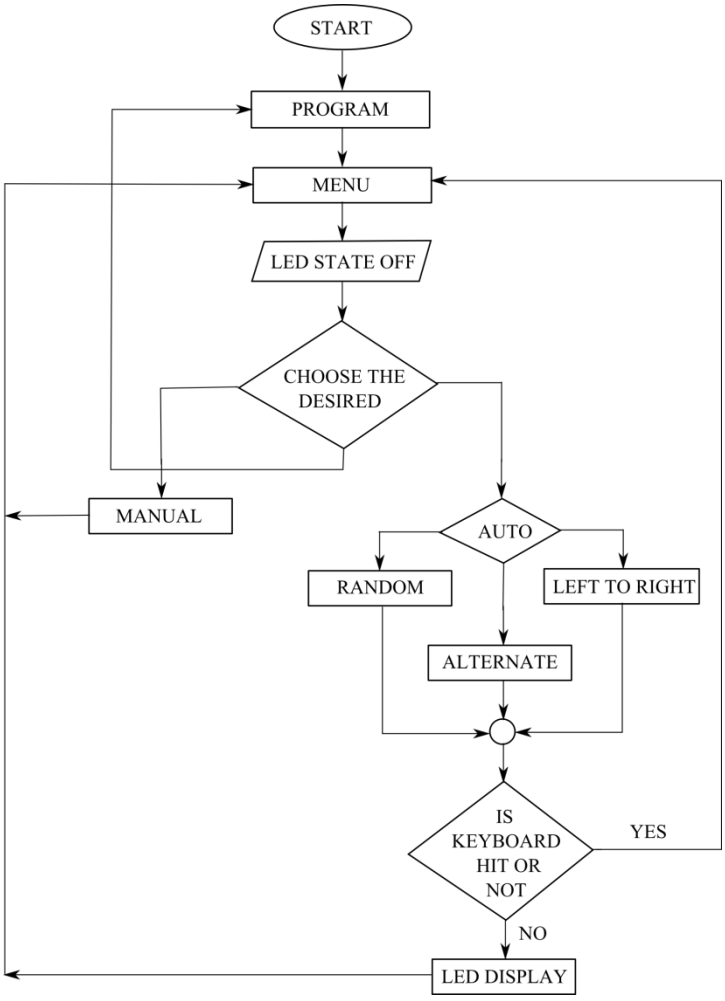

Figure 4. Flowchart showing the control flows

When the program is executed, a menu driven screen with the following options for selecting the choice for operation of LEDs is displayed.

a. Manual
b. Automatic
c. Exit

In the manual portion, the LEDs are lit as we press the corresponding key. In automatic three more options are made available i.e. Random, Left to Right and Alternate. In random mode, the LEDs are lit up in a random manner. In the left to right mode, the LEDs are lit up from left to right. In the alternate mode, the operation is made in an alternate fashion at a time. The flow chart of the program is as shown in figure 4.

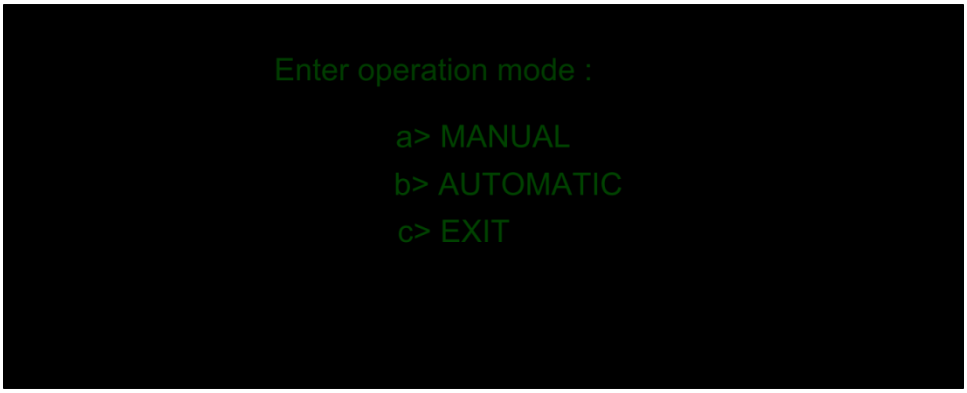

Figure 5. Snapshot of the Main Menu for Program operation

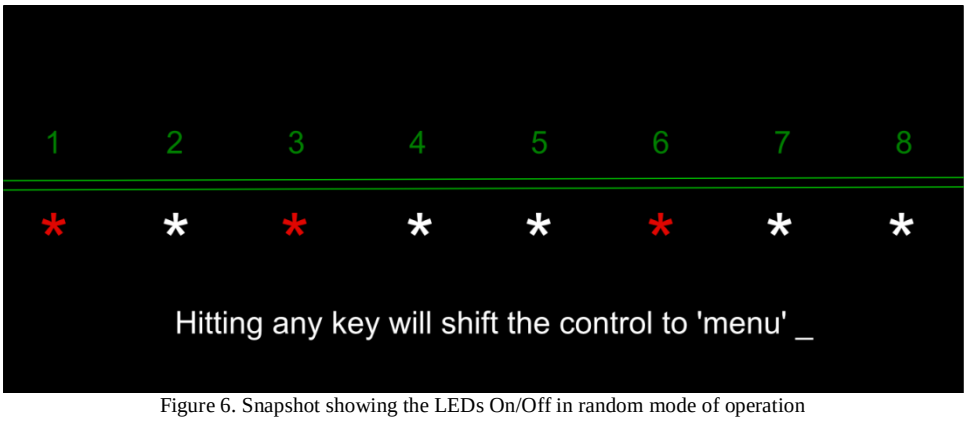

Figure 6. Snapshot showing the LEDs On/Off in random mode of operation

IV. CONCLUSIONS

The control of household equipment can be easily performed by replacing these LEDs with the household electrical appliance and also similarly in the case of big buildings like stadiums, offices etc., which will reduce effort and time and increase safety.

V. FUTURE SCOPE

The current model concerned with only controlling 8 LEDs, but it can be used to control as many as 256 electrical appliances by using decoder. It can be extended to control switching system of offices, apartments, and stadiums etc., where there is the need of controlling large number of electrical appliances.

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Study of Serum HDL Levels in Severe Sepsis Patients in Medical Intensive Care Unit

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***Abstract*- Background:** Sepsis, defined by an expert consensus definition as, the development of the systemic inflammatory response syndrome in presence of infection. (1) The current incidence of sepsis is at least 240 patients per 100,000 people in the United States population, whereas for severe sepsis it is between 51 and 95 patients per 100,000 people. The incidence rate for sepsis has been increasing over the past two decades, driving an increase in the number of deaths despite a decline in case-fatality rates. Sepsis is the tenth leading cause of death in the United States and accounts for more than 17 billion dollars in direct healthcare expenditures. (2) Sepsis has a high mortality rate, with estimates ranging from 20 to 50 percent. (3, 4) Mortality rates increase stepwise according to disease severity. In one study, the mortality rate of SIRS, sepsis, severe sepsis, and septic shock was 7, 16, 20, and 46 percent, respectively. (5)

Sepsis is one of the leading causes of death in the world. Delay in diagnosis and treatment may lead to septic shock, multi-organ failure and death. Persons with a weakened immune system are prone to develop sepsis, but the detrimental processes that may ultimately lead to the death of the patient are mostly caused by an exaggerated systemic response to an infection.

In 1993 Levine DM et al was the first to explain the protective effect of HDL-C against bacterial endotoxin. They showed, transgenic mice with high HDL-C had high levels of endotoxin bound to HDL-C, low levels of cytokine response and improved survival compared with mice having low HDL-C level.(6)

Lipoproteins have been implicated to play a role in innate immunity. (7) Knowledge of variations in blood lipid levels in patients with sepsis dates to 1980ʺs, when studies showed significantly low HDL-C levels with sepsis, which improved with improvement in sepsis. But studies lacked correlation of with severity of sepsis with decrease in HDL-C levels nor infections agent or underlying illness. (8)

METHODS:

- Study was a prospective cohort study conducted at Kasturba Hospital, Manipal.
- Total 111 patients of severe sepsis with varied diagnosis fulfilling the inclusion criteria were included in the study.
- STUDY PERIOD**:** Study was conducted from November 2012 to August 2014.
- Institutional ethical committee clearance was obtained.

FINDINGS:

- From our study it is observed that

1. There is significant association of low HDL value on day 1 with mortality.
2. HDL value of 9 mg/dl at admission had sensitivity of 89% and specificity of 73% predicting the overall mortality in patients with severe sepsis.
3. Risk of death in patients with day 1 HDL value <10mg/dl is 7.01 times the risk of death in patients with day 1 HDL value ≥10mg/dl [95% confidence interval 2.46 - 21.81].
4. Trend of HDL correlated with clinical outcome of patients. Raising trend favours improvement in clinical condition and decreasing trend implied worsening of the clinical condition.
5. Baseline HDL value correlated with APACHE 2 score in predicting mortality in ICU Patients.

INTERPRETATION:

HDL cholesterol on day of admission can be viewed as a significant predictor of mortality in patients with severe sepsis in medical ICU patients.

FUNDING: None

I. Introduction

Sepsis is defined as the presence (probable or documented) of infection together with systemic manifestations. (9)

The incidence of sepsis and the number of sepsis-related deaths are increasing, although the overall mortality rate among patients with sepsis is declining. There are also disparities among races and between men and women in the incidence of sepsis. Gram positive bacteria and fungal organisms are increasingly common causes of sepsis. (1)

The incidence of severe sepsis in India was 16.45% of all admissions. Mean age of the population was 58.17 years (SD 18.66), of which 57.71% were male. The median APACHE II score was 13 (IQR 13 to 14) with predominant (90.93%) medical admission. Intensive therapy unit mortality of all admissions was 12.08% and that of severe sepsis was 59.26%. Hospital mortality and 28-day mortality of severe sepsis were 65.2% and 64.6%, respectively. Median duration of stay in the ICU for the severe sepsis cohort who survived was 13 days (IQR 11 to 17). The number of episodes where infection was the primary reason for

admission to the ITU (Intensive Therapy Units) was 86.32%. Culture positivity was found in 61.6%. The lung was the predominant source of sepsis (57.45 %). (10)

In 1993 Levine DM et al was the first to explain the protective effect of HDL-C against bacterial endotoxin. They showed, transgenic mice with high HDL-C had high levels of endotoxin bound to HDL-C, low levels of cytokine response and improved survival compared with mice having low HDL-C level.(6)

Lipoproteins are macromolecular complexes used by the body to transport lipid-rich molecules. (11)

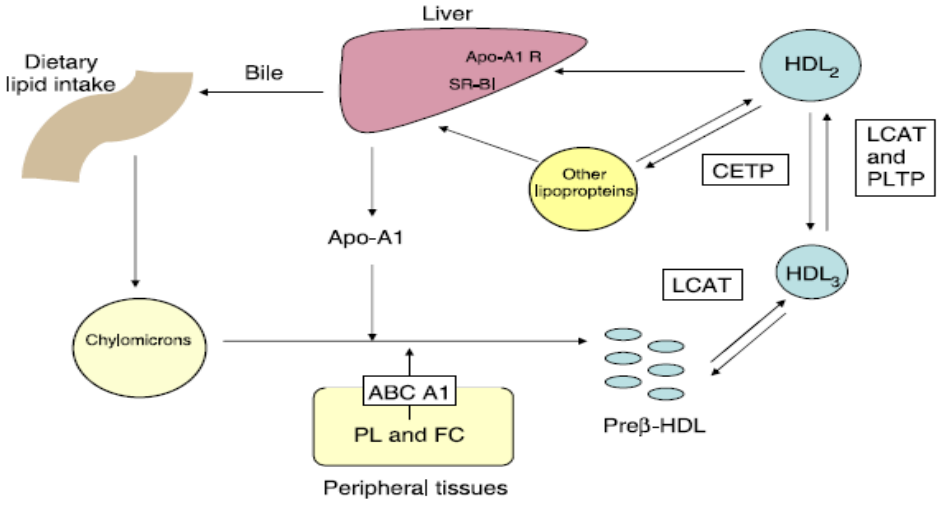
Lipoproteins are classified into five groups according to their relative density:

Chylomicrons
Very low density lipoprotein (VLDL)
Intermediate density lipoprotein (IDL)
Low density lipoprotein (LDL) and
High density lipoprotein (HDL)

HDL CHOLESTEROL: HDL is a heterogeneous group of lipoproteins, varying in both composition and size, falling into a density range between 1.063 and 1.21 g/ml.(12) The major Apo protein present in HDL that provides structural stability to the spherical molecule is Apo lipoprotein A1 (Apo- A1).(12)Primary function of HDL-C is reverse cholesterol transport. Lipid-free or low-lipid Apo proteins (for example, Apo-A1) released from the liver combine with lipids derived from dietary intake (chylomicrons). These accept phospholipids and excess free cholesterol from peripheral tissues in a process promoted by the pore-forming protein ATP-binding cassette A1 transporter, forming disk-shaped pre-β-HDL.

Free cholesterol is esterified by lecithin cholesterol acyl-transferase (LCAT) and the complex transforms into a spherical structure, HDL3. HDL3 molecules continue to engulf additional lipid molecules and Apo proteins, thereby forming mature HDL 2. (13, 14)(Figure 1)

Figure 1: Shows reverse cholesterol transport and maturation of HDL-C.



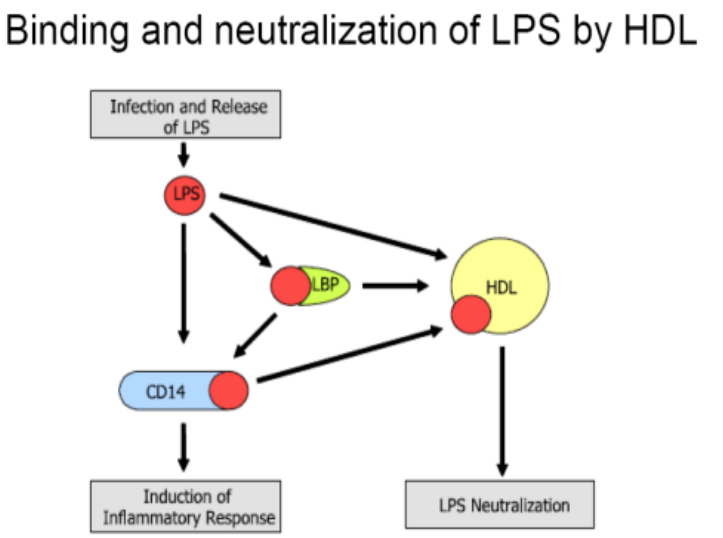
LIPOPROTEINS IN SEPSIS:

Lipoproteins have been implicated to play a role in innate immunity.(7) Knowledge of variations in blood lipid levels in patients with sepsis dates to 1980's, when studies showed significantly low HDL-C levels with sepsis, which improved with improvement in sepsis. But studies lacked correlation of with severity of sepsis with decrease in HDL-C levels nor infections agent or underlying illness.(8)

Mechanisms of low HDL in severe sepsis are multifactorial:

1) Neutralizing of toxic bacterial substances

Figure 2: Binding of LPS to LBP or sCD14 (soluble CD14) then being transferred to HDL.



2) Suppression of lipoprotein synthesis and LCAT activity
3) Rapid clearance of LPS bound HDL-C
4) Decreased activity of ABC 1 activity
5) Increased Human secretory phospholipase A2 (sPLA2) activity
6) Dilutional effect due to resuscitation fluids.

II. MATERIALS AND METHODS

- Current study was a prospective cohort study conducted at Kasturba Hospital, Manipal.
- Total 111 patients of severe sepsis with varied diagnosis fulfilling the inclusion criteria were included in the study.

STUDY PERIOD: Study was conducted from November 2012 to August 2014.

The following inclusion and exclusion criteria were used:

INCLUSION CRITERIA:

- Patients with age greater than 18 years and satisfying the criteria for severe sepsis according to International guidelines for management of severe sepsis and septic shock: 2012(10), were included in the study and not received parenteral antibiotics in outside hospitals.

EXCLUSION CRITERIA:

- Patients on treatment with statins
- Chronic liver disease, chronic kidney disease, thyroid dysfunction, diabetes, severe anaemia and malignancy
- Patients with known chronic inflammatory condition like Human immunodeficiency virus disease, SLE (Systemic lupus erythematosus) and RA (Rheumatoid arthritis)
- Patients diagnosed to have malabsorbption disorders
- Patients who were discharged against medical advise.

METHODOLOGY:

- A total of 111 patients satisfying inclusion criteria were included in our study after obtaining informed consent.
- All the patients were followed prospectively during their entire course of stay in the hospital. Serum HDL levels were done on the day of admission and repeated on day 5. APACHE 2 score was calculated for all patients on day of admission to estimate the risk of death.

- Early morning serum samples were collected on day 1 of admission and day 5 for HDL cholesterol measurement. Cholesterol measurement was done by ROCHE COBAS C systems clinical chemistry automated analyser. The concentration of HDL cholesterol was measured after precipitation of beta lipoproteins with dextran sulfate and magnesium chloride.

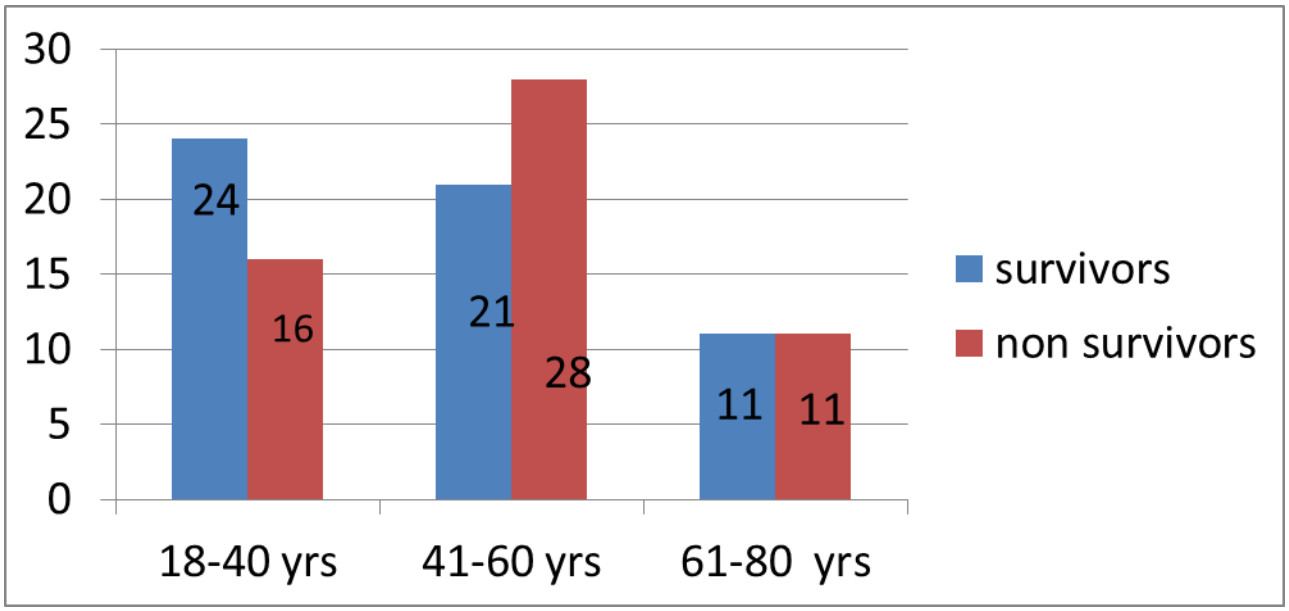
III. OBSERVATIONS AND ANALYSIS

- Current observational study included 111 patients with varied disease presentations admitted to medical intensive care unit with diagnosis of severe sepsis according to International guidelines for management of severe sepsis and septic shock: 2012(10).

Table 1: Shows baseline characteristics of survivors and non survivors.

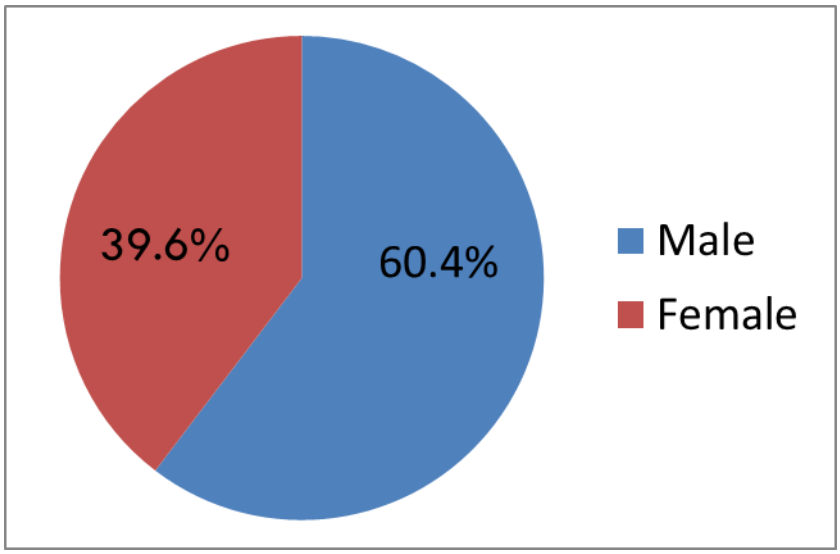
Characteristic	All patients(n=111)	Survivors (n=56)	Non survivors (n=55)	P value
Age (yr)	47.58+/-14.99	46.04+/-14.66	49.15+/-15.29	
Males	67 (60.4%)	28 (50%)	39 (70.9%)	
Females	44 (39.6%)	28 (50%)	16 (29.1%)	
APACHE II score	16 (11-21)	14 (8-18)	22 (17-27)	<0.003
Albumin	2.7 (2.2-3)	2.65 (2.2-3)	2.7 (2.4-3)	NS
Bilirubin	3.5 (1.6-5.9)	2.85 (1.02-6.17)	3.7 (2.0-5.6)	NS
INR	1.18 (1.02-1.49)	1.13 (1.02-1.36)	1.23 (1-1.6)	NS
Positive blood culture	17	6	11	NS
MODS	78 (70.3%)	34 (43.6%)	44 (56.4%)	NS
Thrombocytopenia	72 (64.86%)	35(48.6%)	37 (51.4%)	NS
Acute kidney injury	69 (62.16%)	31(45%)	38 (55%)	NS
Hypotension	54 (62.16%)	18 (33%)	36 (67%)	<0.002
Acute lung injury	89 (80.18%)	40 (45%)	49 (55%)	NS
Dialysis	35 (31.53%)	18 (51%)	17 (49%)	NS
Gram negative bacteria	26	11	15	NS
Gram positive bacteria	5	3	2	NS
Scrub typhus	21	12	9	NS
Leptospirosis	8	3	5	NS
Dengue	2	2	0	
Malaria	1	0	1	

Figure 3: Age distribution



Maximum number of people 49 out of 111 (44.1%) were in the age group of 41-60 yrs.

Figure 4: Gender distribution



Our study had total of 111 patients, of which 67(60.4%) were males and 44(39.6%) were female.

Others parameters like presence of acute lung injury, acute kidney injury, acute liver Injury (raised bilirubin levels and coagulopathy), baseline platelet count, baseline serum albumin levels and frequency of dialysis used as renal replacement therapy were comparable in numbers among survivors and non survivors and not found to have effect on mortality to reach statistical significance.

Low HDL at admission and association with mortality in severe sepsis:

In current study low HDL levels were noted in patients with severe sepsis so, we studied the association of day of admission HDL with mortality.

Table 2: Association between day1 HDL and survival.

		FREQUENCY	Mean HDL VALUE	Std. Deviation
Day 1 HDL	Non survivors	55	5.76	2.937
	survivors	56	11.79	5.714

P<0.001, there is significant difference in DAY 1 HDL value between survivors and non survivors. Independent samples T test.

Relative risk of death: After noting the significant difference of mean HDL between survivors and non survivors in current study, we calculated the relative risk of death among two groups HDL<10 mg/dl and HDL≥10 mg/dl on day of admission.

Table 3: Comparison of mortality between HDL≤10mg/dl and HDL≥11mg/dl

			survivors	Non survivors	Total
Day 1 HDL	<10mg/dl		21	50	71
			29.6%	70.4%	100.0%
	≥10 mg/dl		35	5	40
			87.5%	12.5%	100.0%
Total			56	55	111
			50.5%	49.5%	100.0%

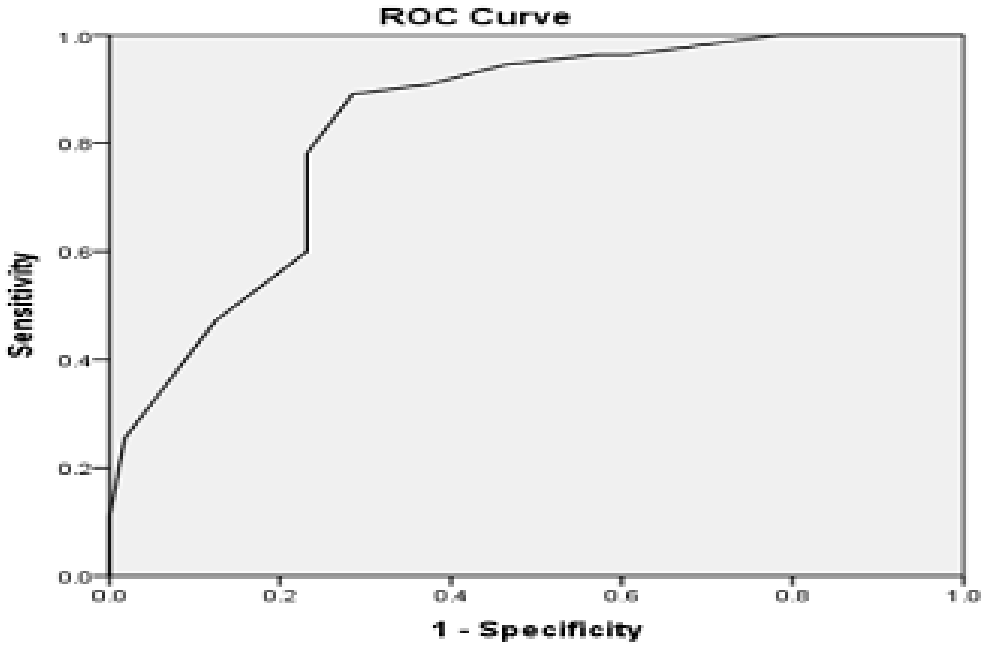
Significant association was seen between mortality and <10 mg/dl HDL level on day 1. Pearson Chi-Square =30.75 with 1dof, P<0.001.

Relative risk of death in patients with day 1 HDL value <10mg/dl was 7.01 times higher than patients with day 1 HDL value ≥10mg/dl [95% confidence interval 2.46 -21.81].

Receiver Operator Characteristic curve:

After calculating the relative risk of death between two groups (HDL<10 mg/dl and HDL≥10 mg/dl) as above, we tried to estimate a single value of HDL on day of admission that can predict overall mortality with reasonable sensitivity and specificity by Receiver Operator Characteristic curve.

Figure 13: Receiver Operator Characteristic curve



The area under the Receiver Operator Characteristic curve for HDL cholesterol was 0.83 (95% confidence interval 0.75–0.90) with standard error 0.03.

A HDL cholesterol cut off value of 9 mg/dl at admission has a sensitivity and specificity of 89% and73% respectively for predicting the overall mortality.

HDL on day of admission and APACHE 2 score:

As we use mortality scores for calculating the risk of mortality at admission to ICU, we compared day of admission HDL with APACHE 2 to find any correlation.

Table 5: Correlation of Day 1HDL with APACHE 2 score at admission.

SURVIVAL		DOAHDL
Survivors	APACHE2	-.450
Non survivors	APACHE 2	-.163

Current study shows that, among non survivors APACHE 2 score showed significant negative correlation with admission HDL values (pearson correlation -0.163), meaning as the APACHE 2 score is increasing the admission HDL cholesterol was decreasing, both implying increased chance of mortality. Similarly in patients survived, as APACHE 2 score decreased there was increasing trend in admission HDL value, which translates into low risk of mortality.

Trend of HDL cholesterol:

HDL is an acute phase reactant, we compared day of admission HDL with day 5 HDL, to assess for trend in survivors and non survivors.

Table 6: Comparison of day of admission HDL and day 5 HDL cholesterol with outcome:

DIED		DOAHDL	D5HDL
NO	Mean	11.79	18.34
	N	56	56
	Std. Deviation	5.714	7.681
YES	Mean	5.76	4.91
	N	55	22
	Std. Deviation	2.937	2.308
Total	Mean	8.80	14.55
	N	111	78
	Std. Deviation	5.450	8.977

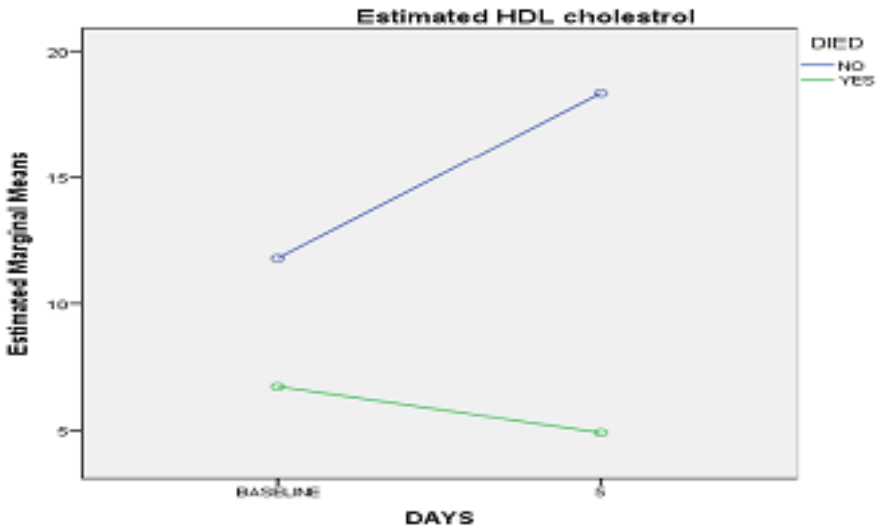
Above table shows that among survivors, the mean value of HDL on day 5 was increased compared to mean HDL on day of admission (18.34 versus 11.79 respectively), but among non survivors the mean HDL on day 5 was lower than that seen on the day of admission (4.91 versus 5.76 respectively). So, among survivors, rising trend of HDL was observed in our study.

This can be explained logically, as with clinical improvement the burden of bacterial endotoxin in patient's decreases. So less of HDL will be used for neutralization and decrease in levels of cytokines also may play a role resulting in improvement in serum HDL levels.

Similarly among non survivors, decreasing trend of HDL was seen, implies that as the clinical condition worsens there will be uncontrolled increase in burden of bacterial endotoxin that uses up more HDL for neutralization and persistently raised cytokine levels that suppress HDL production, so the lower levels persisted.

The same trend of HDL among survivors and non survivors is shown below graphically.

Figure 14 shows HDL as negative acute phase reactant.

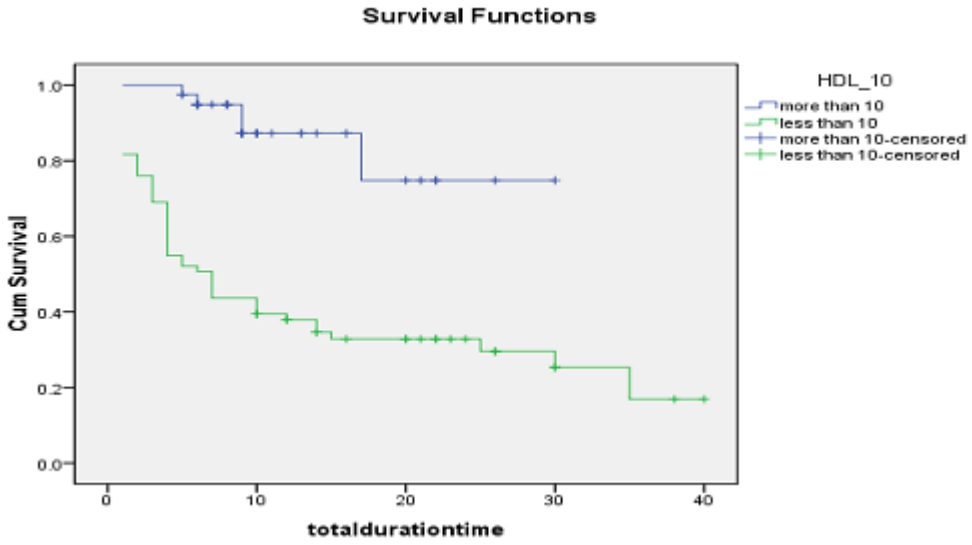


REPEATED MEASURES ANOVA F (df1, df2), 109.961(1, 76), p<0.001 this graph shows, days of illness on X-axis and

mean HDL value on Y- axis. Upper curve for survivors shows that, as the days progressed the mean HDL value was rising and lower curve for non survivors shows decreasing value with time.

Survival analysis: After studying that the relative risk of death, which was higher in patients with day of admission HDL <10 mg/dl compared to ≥10 mg/dl, we further studied survival analysis between these groups as showed below in figure 15.

Figure 15: Survival analysis - Kaplan Meier curves.



The above figure shows two curves, Upper curve is for HDL ≥ 10 mg/dl with only 5 deaths out of 40 patients and better survival, lower curve is for patients with HDL<10mg/dl with more number of deaths and prolonged duration of hospital stay.

Association of day 1 HDL with organ dysfunction:

After showing the association between level of HDL on day of admission and mortality, we studied whether HDL level of day of admission also varied among single organ dysfunction versus multi organ dysfunction.

Multi organ dysfunction may be any combination of acute lung injury, acute kidney injury, hypotension, thrombocytopenia and acute liver injury.

Table 7: Association of Organ dysfunction with day1HDL levels.

	Organ dysfunction	Number of patients	Mean HDL on day1	Std. Deviation	Std. Error Mean
DOAHDL	single	33	11.45	5.815	1.012
	2 and more	78	7.68	4.908	.556

Difference in mean HDL value on day of admission was noted between patients presenting with single and multi-organ dysfunction, but p value was not statistically significant. (p<0.186)

IV. DISCUSSION

- Sepsis is one of the leading cause of mortality worldwide.
- Inspite of the availability of biomarkers for sepsis and mortality scores, the mortality for sepsis still has not decreased significantly. So, there is need for development of more sensitive biomarkers for early detection of sepsis.
- Lipoproteins are an important part of innate, non-adaptive immune response to infection. (7) HDL-C is the major plasma lipoprotein (15), present in higher concentrations that all other lipoproteins combined.
- To calculate APACHE 2 score we need many parameters like hemodynamic variables which can be readily assessed and laboratory values like haematocrit, WBC count, serum creatinine, acute renal failure, urine output, serum BUN, serum

sodium, serum albumin, serum bilirubin, serum glucose and arterial blood gas analysis many of which may not be available at peripheral community care hospitals. So, measurement of a single value of HDL may be more useful in such setting.

- Any marker which is a part of innate immunity will serve better as an early marker as it has to be breached before full blown sepsis occurs.
- As lipoproteins are an important component of innate immunity and HDL was the main component of lipoproteins highest in concentration in serum and has highest affinity to bind against bacterial endotoxin (LPS in gram negative bacteria and LTA in gram positive bacteria), we studied the role of HDL cholesterol in patients with severe sepsis in medical ICU at a tertiary care hospital as a prognostic marker.

Baseline characteristics:

- Current observational study included 111 patients with varied disease presentations admitted to ICU with severe sepsis after fulfilling the inclusion criteria and exclusion criteria.
- Maximum number of people, 49 out of 111 (44.1%) were in the age group of 41-60 yrs and, 67(60.4%) were males and 44(39.6%) were female.
- All patient's baseline characteristics were comparable. Only high APACHE 2 score and presence of hypotension at admission were more frequently associated with mortality and was statistically significant between survivors and non survivors.
- Others parameters like presence of acute lung injury, acute kidney injury, acute liver Injury (raised bilirubin levels and coagulopathy), baseline serum albumin levels and frequency of dialysis used as renal replacement therapy were comparable in numbers among survivors and non survivors and not found to have effect on mortality to reach statistical significance.
- Number of patients with culture positive infection (blood culture and sputum/ET aspirate culture) (14 in survivors and 17 in non survivors) and positive serology (17 in survivors and 15 in non survivors) were also comparable among two groups.
- Mean HDL on day of admission among culture positive infection patients was 7 mg/dl compared to 9 mg/dl in patients with culture negativity, statistically not significant.
- Similarly difference in mean HDL value among culture positive infection patients didn't reach statistical significance among survivors and non survivors also. So, culture positive infection didn't show statistically significant effect on mortality in current study.

Low HDL at admission and association with mortality in severe sepsis:

- The reason for the low HDL cholesterol value in sepsis is multifactorial, but most important of all is the neutralization of LPS and thus preventing its immune activation and cytokine response.
- Among all lipoproteins, HDL –C has the highest affinity for LPS of gram negative bacteria (16) and LTA of gram positive bacteria (17).
- Studies on plasma HDL-C protecting against bacterial endotoxin dates back to 1993 when Levine DM et al showed that transgenic mice with high HDL-C had high levels of endotoxin bound to HDL-C, low levels of cytokine response and improved survival compared with mice having low HDL-C levels.(6)
- Parker ts et al showed that r-HDL (recombinant HDL) is a potent inhibitor of the induction of TNF-alpha by LPS from gram-negative bacteria in whole human blood. (18)
- Low admission HDL cholesterol levels in patients with sepsis were found in studies conducted by Gordon et al (19) and Shor R et al.(20) Gordon et al study comprised of 32 patients divided into two groups, 12 patients with infection and 20 patients without infection in surgical ICU. The mean HDL value was significantly lower in infected group (19 mg/dl) compared to non-infected group (28 mg/dl). Among infected patients, the mean HDL among survivors and non survivors was not found to be statistically significant, probably because of small size of the sample studied.(65)
- Shor R et al (20) conducted retrospective analysis of patients admitted at Edith Wolfson Medical Centre during a period of 1 year (January 1st 2005-December 31st 2005) and analysed data. They divided patients into two groups, group 1 with HDL≤20 mg/dl (108 patients) and group 2 with HDL ≥65 mg/dl (96 patients). Out of 204 patients 32 had sepsis and all were in group 1, showed association of sepsis with low HDL level. Similarly 42 patients died, of them low HDL was observed in 42.6% of patients who survived vs. 92.9% of those who died ($P < 0.0001$). By using logistic regression analysis, they showed low HDL (≤20 mg/dl) was associated with a 17.5-fold increase in odds for death compared to HDL ≥ 65 mg/dl (OR 17.5 95% CI, 5.2–59.04, $P < 0.0001$). Current study noted that there was statistically significant difference in mean admission day HDL cholesterol between survivors (5.76 mg/dl) and non survivors (11.79 mg/dl), $p<0.001$.

Relative risk of death:

- Shor R et al(20) retrospective analysis of 204 patients showed low HDL (≤20 mg/dl) was associated with a 17.5-fold increase in odds for

death compared to HDL ≥ 65 mg/dl (OR 17.5 95% CI, 5.2–59.04, P < 0.0001).

- Current prospective study showed that low HDL at admission ≤10 mg/dl was associated with a 7.01 fold increase in odds for death compared to HDL≥11 mg/dl [95% confidence interval 2.46 - 21.81, P<0.001].
- The difference in relative risk observed in current study compared with Shor R et al was because of the difference in HDL values of the two groups compared (<10 mg/dl and ≥10 mg/dl in current study whereas HDL≤20 mg/dl and ≥65 mg/dl by Shor R et al(20).

Receiver Operator Characteristic curve:

- With the above data showing the relative risk of death between two groups (HDL<10 mg/dl and HDL≥10 mg/dl), we further studied HDL as a continuous variable and tried to detect a single HDL value with which we can predict mortality with reasonable sensitivity and specificity by receiver operator characteristic curve.
- The area under the receiver operator characteristic curve for HDL cholesterol was 0.83 (95% confidence interval 0.75– 0.90) with standard error 0.03. A HDL cholesterol cut off value of 9 mg/dl at admission has a sensitivity and specificity of 89% and73% respectively for predicting the overall mortality.
- On comparison, study by Chien JY et al(21), showed HDL ≤20 mg/dl had a sensitivity of 92%, a specificity of 80% in predicting overall mortality. Cut off value for Day 1 HDL in the current study was lower than that observed by Chien JY et al.
- Lower sample size (63 in Chien JY et al compared to 111 in current study), and difference in the baseline HDL values provides the best explanation. Baseline HDL values were different among Indian population studied in current study from Chinese population studied by Chien JY et al.
- Studies on baseline HDL values showed that Indian population have lower value as shown in study by Sawant AM et al (22) compared to higher baseline HDL value of Chinese population showed in study by Cai HJ et al. (23)

HDL on day of admission and APACHE 2 score:

- In current study we compared HDL on day 1 value with APACHE 2 score for prediction of mortality.
- Pearson correlation analysis showed significant negative correlation (-0.163 Pearson coefficient) between HDL at admission with APACHE 2 score on admission in non survivors, correlation was more with survivors (-0.450 Pearson coefficient).
- Patient with low initial HDL value had higher APACHE 2 score which implies high risk of mortality, as the p value was significant.

Trend of HDL cholesterol:

- Van Leeuwen HJ et al (7) and Dunham CM et al (24) observed finding of rapidly changing HDL levels in severe sepsis patients, but statistical association with mortality was not found, probably because of smaller sample size (17 and 28 patients respectively) compared to the current study with a small sample size of 111.
- Dunham CM et al (24)study involved 28 patients, upon admission to the surgical intensive care unit the mean total cholesterol level was only 119 ± 44 mg/dl, as compared with the expected normal cholesterol level (taken from a database) of 201 ± 17 mg/dl (P < 0.001). The 25 survivors had higher total cholesterol at SICU discharge (143 +/- 35 mg/dl) relative to admission (112 +/- 37 mg/dl; P < 0.0001). In the three patients who died, the admission cholesterol was 175 +/- 62 mg/dl and the cholesterol at death was 117 +/- 27 mg/dl. Van Leeuwen HJ et al (20) studied dynamics of plasma lipoproteins in 17 patients with sepsis and observed dynamic nature of HDL cholesterol, they found low HDL value on day 1(32 mg/dl ±4), lowest on day 3(16.2 mg/dl±3) and gradually increased up to 4 weeks in survivors, but there was no correlation of HDL value with mortality. They looked at the trend of HDL but comparison of trend among survivors and non survivors was not analysed in the study.
- Both the studies [Van Leeuwen HJ et al (7) and Dunham CM et al (24)] showed HDL acts as acute phase reactant during sepsis (values change dynamically), but though patients had low cholesterol levels in both studies (total cholesterol in Dunham CM et al and HDL in Van Leeuwen HJ et al) statistical difference between survivors and non survivors was not found, probably because of small sample size and heterogeneity of population involved in both the studies.
- Similar to above studies, current study demonstrated that HDL-C acts as negative acute phase reactant in sepsis, HDL-C values varied with time in both survivors and non survivors. There was increase in HDL-C value, as patient was improving in survivor group but HDL-C remained same or decreased in non-survivors group.
- But current study showed the difference with time among survivors and non survivors was statistically significant. (p<0.001, repeated measures ANOVA).

Survival analysis:

- Kaplan-Meier estimates of survival in patients of severe sepsis showed significant difference in survival between two groups (HDL<10 mg/dl and HDL ≥10 mg/dl group).
- Group with HDL≥10mg /dl had significantly improved chance of survival compared to group HDL <10 mg/dl shown in figure 15 by the gap between the groups. The plot also shows the less

number of events (death) in group with HDL≥10 mg/dl and also they were discharged more early than patients in HDL <10 mg/dl group.

- Our results were similar to study done by Chien JY et al where survival analysis was done between two groups HDL>20 mg/dl and HDL<20 mg/dl.(21)

Day of admission HDL with organ dysfunction:

- Difference in mean HDL value was noted between patients with single organ failure and multi organ failure but it was not statistically significant in the current study. (p <0.186)
- Multi organ dysfunction in current study may be any combination of acute lung injury, acute kidney injury, hypotension, thrombocytopenia and acute liver injury.

V. CONCLUSION

- Most common cause for origin of sepsis was acute lung injury, found in 89 patients (80.18%), seventy eight patients (70.2%) had atleast two organ dysfunction. Septic shock was present in 69 patients (62.16%)
- Gram negative organisms were isolated in 30% of patients commonest being Escherichia coli, whereas gram positive were found in only 8% of patients with commonest being Enterococcus.
- Number of patients with culture positive infection (blood culture and sputum/ET aspirate culture together) (20 in survivors and 22 in non survivors) and positive serology (21 in survivors and 18 in non survivors) were also comparable among two groups.
- Mean HDL on day of admission among culture positive infection patients was 7 mg/dl compared to 9 mg/dl in patients with culture negativity, statistically not significant. Similarly difference in mean HDL value between survivors and non survivors among culture positive infection patients didn't reach statistical significance. So, culture positive infection didn't have statistically significant effect on mortality in current study.
- There is significant association of low HDL value on day 1 with mortality.
- HDL value of 9 mg/dl at admission had sensitivity of 89% and specificity of 73% predicting the overall mortality in patients with severe sepsis.
- Risk of death in patients with day 1 HDL value <10mg/dl is 7.01 times the risk of death in patients with day 1 HDL value ≥10mg/dl [95% confidence interval 2.46 -21.81].
- Trend of HDL correlated with clinical outcome of patients. Raising trend favours improvement in clinical condition and decreasing trend implied worsening of the clinical condition.
- Baseline HDL value correlated with APACHE 2 score in predicting mortality in ICU Patients.

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Seepage Rate through Concrete Rectangular Canal Sections with Different Levels of Partial Substitution of Rice Hull for Sand

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Abstract- This study was conducted to quantify the effect on the seepage rate through rectangular concrete canal sections with partial substitution of rice hull materials for sand and to evaluate its economic feasibility when practiced.

A 2x4 factorial experiment in randomized complete block design with four levels of partial substitution and two rice hull materials in three (3) replication was employed to assess the variation in seepage rate resulting from the partial substitution of rice hull materials for sand in concrete made into rectangular canal sections. The result showed that the average seepage rate of rectangular canal sections increases as the level of partial substitution increases. Furthermore, the results also confirmed the pre-experimental hypothesis of the researcher that the seepage rate through canal sections with partial substitution of rice will always be lower than the seepage rate through canal sections with partial substitution of whole rice hull for sand.

The analysis of variance revealed that the variation in the average seepage rates of different treatment combinations and the control treatment are significant. On the other hand, the economic analysis revealed that only the 15% level of partial substitution of rice hull chips generated a positive net savings for a 90-day annual canal usage.

The researcher concluded that rice hull chips are better substitute for sand than whole hulls. Hence, if there is a need to do partial substitution of rice hull chips for sand, a 15% level of partial substitution is highly recommended.

Index Terms- Seepage rate, rice hull chips, canal sections, partial substitution, block design

I. INTRODUCTION

Rice hull abounds in the rice producing areas of the country. This is now becoming an agent of pollution and so its utilization as a source of energy or as a concrete stabilizer/admixture would turn this agricultural waste material into something useful.

This study will prove the desirability of rice hull as a concrete admixture when pressed or crushed into smaller chips. This study was generally aimed to investigate into the seepage rate in rectangular canals made from concrete with partial substitution of whole rice hull and rice hull chips for sand. Iqbal, as cited by Fortuno (Fortuno, 2003), stated that seepage, in irrigated agriculture, has been defined as the movement of water in and out of earth canals through the pores in the bed and bank material. He stressed out that the seepage is not only a waste of water, but also lead to other problems such as water logging and salinization. Morever, Franzini et al (Franzini, 1992) stated that if water is expensive and the soil in which canal is constructed is quite permeable, it might be economical to provide a canal lining to reduce seepage from canal. They stressed that, in addition to reduction seepage, canal lining may permit higher water velocities and smaller cross sections in the canal, resulting in cost savings.

Mindess and Young (Mindess S., 1981) reported that the possibility of using solid wastes as aggregates in concrete has received increasing attention in recent years as one promising solution to the escalating solid waste disposal problems. According to him, an admixture is also a component sometimes added to concrete mixture for the purpose of creating or for neutralizing a normal characteristic of concrete or to correct the deficiency of mixture.

Should this study yield positive results, the mixing of pressed or crushed rice hull with concrete can be recommended to government agencies for adoption in their construction activities. Aside from converting rice hull into useful material, this technology of mixing rice hull chips in concrete will also reduce the cost of construction of concrete structures.

II. MATERIALS AND METHODS

2.1 Research Design

The complete randomized block design (CRBD) was employed to quantify the effect of partial substitution of whole rice hull and rice hull chips for sand on the seepage rate of rectangular concrete canal sections with four levels of partial substitution of whole rice hull and rice hull chips in three replications. The different levels of substitution were 15% (LS1), 30% (LS2), 45% (LS3), and 60% (LS4). A control treatment with mixing proportion of 1:2:4 (cement; sand; gravel) or without substitution was included for comparison purposes.

Figure 1. Experimental layout

The mixing proportion of concrete rectangular canals for the different levels of partial substitution are tabulated below.

LEVEL OF SUBSTITUTION	VOLUME OF CONCRETE AGGREGATES (ft^3)				MIXING PROPORTION
	Cement	Sand	Gravel	Rice Hull*	
0 (Control)	1	2.0	4	0	1:2:4
15% (L1)	1	1.70	4	0.30	1:1.85:4:0.30
30% (L2)	1	1.40	4	0.60	1:1.70:4:0.60
45% (L3)	1	1.10	4	0.90	1:1.70:4:0.90
60% (L4)	1	0.80	4	1.20	1:1.40:4:1.30

2.2 Production of Rice Hull Chips

The rice hull chips were produced by manually pounding the whole rice hulls until they are broken into chip. The densities of the rice hull materials were determined by measuring the air-dried and oven-dried masses of a pre-determined volume of sample rice hull materials. The whole rice hull had a bulk density of 160.5 kg/m^3 and a particle density of 824 kg/m^3, while the rice hull chips were found to have a bulk density of 253.5 kg/m^3 and a particle density of 1,020 kg/m^3.

2.3 Fabrication of Forms and Making of Rectangular Canal Sections

The forms used to mold the concrete-rice hull mixture into rectangular canal sections were fabricated using 6.35 mm ordinary plywood and 25 mm x 50 mm coconut lumber. The different constituents of concrete were mixed according to the different mixing proportions included in this study and was poured into the fabricated forms. All the experimental canal sections were subjected to a 28-day curing period as recommended by the American Concrete Institute.

2.4 Conduct of Experiment

The experiment was started by filling a particular rectangular canal section with water up to its rim. Then, the depth of water remaining in the canal section was monitored for 36 hours at predetermined observation times from the start of the experiment. In each of the observation times, after the depth in the canal section has been determined, water was added to the canal section to fill it up with water again up to its rim. The canal section under experiment was covered throughout the observation period to avoid untimely addition of water from rainfall. All the experiments were conducted in three trials.

2.5 Statistical and Economic Analysis

In this study, three (3) statistical procedures were employed. F-test ANOVA was employed to test whether the average seepage rates of the different treatment combinations were significantly different from each other. Duncan's Multiple Range Test (DMRT) was used to identify which treatment combination/s are significantly different from each other. Finally, linear and non-linear regression method were employed to relate the average seepage rate and the level of partial substitution.

Using the data on the average seepage rate, the cost of materials and the estimated labor cost, a simple economic analysis to evaluate whether the partial substitution of rice hull materials for sand is beneficial was undertaken. To be beneficial, the reduction of in the material cost of concrete rectangular canals should be greater than the cost of additional volume of water lost due to increase in seepage rate brought by rice hull substitution.

III. RESULTS AND DISCUSSION

3.1 Seepage Rate

The highest seepage rate of 0.4929 m^3/m^2/day was measured from the rectangular canal sections with 60% partial substitution of whole rice for sand (RHW +LS4).

The analysis of variance revealed that the variation in the seepage rate of rectangular canal sections with different levels of partial substitution of whole rice hull and rice hull chips for sand is highly significant. The DMR further revealed that the average seepage rate of rectangular canal sections with 15% and 30% level of partial substitution of both whole rice and rice hull chips for sand were not significantly higher than that of the control treatment. This implies that a lower level of partial substitution, the mixing of both whole rice hull and rice hull chips do not increase so much the porosity of concrete. However, at higher levels of partial substitution, especially 60%, the average seepage rate of rectangular canal sections made from concrete with whole rice hull is almost four times the average seepage rate from rectangular canal sections with rice hull chips; hence, it is more advantageous to use rice hull chips at that level of partial substitution.

3.1.1 Seepage Rate in Rectangular Canal Sections Made from Concrete with Different Levels of Partial Substitution of Whole Rice Hull and Rice Hull Chips

Table 1. The average seepage rate of rectangular canal sections made from concrete under different treatment conditions (type of rice hull material substituted for sand + level of partial substitution

TREATMENT CONDITIONS	AVERAGE SEEPAGE RATE * ($m^3/m^2/day$)
RHW +LS4	0.42936^{a}
RHC + LS4	0.12174^{b}
RHW +LS3	0.06592^{c}
RHC + LS3	0.06038^{c}
RHW +LS2	0.04195^{cd}
RHC + LS2	0.03197^{cd}
RHW +LS1	0.02256^{d}
RHC + LS1	0.01872^{d}
0% (Control)	0.01625^{d}

*Means followed by the same letter are not significantly different from each other at 5% level (DMRT).

3.1.2 Relationship Between the Average Seepage Rate and the Level of Partial Substitution of hole Rice Hull and Rice Hull Chips for Sand

In this study, average seepage rate (ASR) is a function of the level of partial substitution (LS). However, this idea is not enough. There is a need to discover the kind of relationship that exists between ASR and LS. The data on the average seepage rate and the level of partial substitution fitted into exponential form:

$$Y = \alpha e^{BX}$$

which can be linearized into:

$Y' = \alpha' + B X^2$, where $Y' = \ln Y$ and $\alpha' = \ln \alpha$. Assigning the average seepage rate data as the Y values and the level of partial substitution as the X values in the linearized regression equation, the following equations were derived at:

$$ASR_w = 0.01688\, e^{0.000853\,(Ls)} \quad (1)$$

$$ASR_c = 0.01790\, e^{0.000553\,(Ls)} \quad (2)$$

Where ASR_w and ASR_c represent the average seepage rate of rectangular canal sections made from concrete with partial substitution of whole rice and rice hull chips, respectively, and LS stands for the level of partial substitution (%). The computed correlation coefficients for the linearized equations (1) and (2) are 0.985 and 0.994, respectively.

3.2 Economic Analysis

3.2.1 Assumptions

In this analysis, the following assumptions were made: Economic life of the canal = 5 years; Rice Hull chips cost = PhP 30/m^3; Rice hull whole cost = PhP 20/m^3 and water rate = PhP 10/m^3.

3.2.2 Material cost per meter length of rectangular concrete canal with different levels of partial substitution of rice hull for sand

Table 2 clearly shows that as the level of partial substitution of rice hull material increase, the estimated cost of materials for the construction of rectangular canal section decrease.

The analysis of variance revealed that variations in the estimated cost of materials are highly significant. The DMR test further revealed that the material cost of the different treatment combinations differ from each other. This means that a 15% increase in the partial substitution of whole rice hull or rice hull chips for sand in concrete is enough to significantly lower the material cost.

Table 2. The material cost (per meter length) of rectangular canal sections made from concrete under different treatment combinations (type of rice hull materials substituted for sand + level of partial substitutions

TREATMENT CONDITIONS	MATERIAL COST * (PhP per meter length)
RHW +LS4	206.20^{i}
RHC + LS4	206.45^{h}
RHW +LS3	208.30^{g}
RHC + LS3	208.49^{f}
RHW +LS2	209.89^{e}
RHC + LS2	210.53^{d}
RHW +LS1	212.56^{c}
RHC + LS1	212.62^{b}
0% (Control)	214.67^{a}

3.2.3 Cost of Seepage water lost per year from rectangular canal sections of the different treatment combinations

To be able to compute the cost of seepage water lost per meter length of the rectangular concrete canal per year, two values of annual canal usage were used: 90 days and 180 days. These values were chosen based on farmer's estimates of the number of days that irrigation canals are used to convey water to farmlands for one and two croppings per year, respectively.

Table 3 shows the average cost of seepage water from rectangular canal sections for the different treatment combinations for both 90 and 180-day annual canal usage. As expected, the control treatment had the lowest average costs of seepage water while treatment combination RHW +LS4 (partial substitution of 60% whole rice hull for sand) had the highest average costs of seepage water. The data in Table 3 clearly showed that as the level of partial substitution of rice hull material for sand increase, the average cost of seepage water increase also.

The analysis of variance of the data on the cost of seepage water for the different treatment combinations revealed that variations are highly significant. The DMR test further showed that only the treatment combination RHC +LS1 (15% partial substitution of rice hull chips for sand) had an average cost of seepage water that was not significantly different (higher) from the average cost of seepage water of the control treatment for both 90 days and 180 days annual canal usage.

Table 3 Estimated average cost of seepage rate from rectangular canal sections of the different treatment combination for annual canal usage of 90 and 180 days

TREATMENT CONDITIONS	ANNUAL CANAL USE * (PhP per meter length)	
	90 days	**180 days**
RHW +LS4	251.18[a]	502.36[a]
RHC + LS4	71.21[b]	142.42[b]
RHW +LS3	38.56[c]	77.12[c]
RHC + LS3	35.32[d]	70.64[d]
RHW +LS2	24.54[e]	49.08[e]
RHC + LS2	18.70[f]	37.40[f]
RHW +LS1	13.20[g]	24.40[g]
RHC + LS1	10.95[h]	21.90[h]
0% (Control)	9.53[h]	19.06[h]

3.2.4 Reduction in Material Cost, Cost of Additional Seepage Water, and Net Savings Resulting from the Partial Substitution of Rice Hull Materials for Sand in Concrete Made into Rectangular Canal Sections

The partial substitution of rice hull materials for the sand in concrete mixture is economically justified if the reduction in cost of materials used in concrete exceeds the cost of additional seepage water. The reduction in the cost of materials used for a particular treatment was computed by subtracting the material cost of said treatment combination from that of the control treatment. The cost of additional seepage water for a particular treatment combination was computed by subtracting the cost of seepage water for the control treatment from the cost of seepage water for that particular treatment combination.

Table 4 and 5 present the average values of the gross savings, cost of additional seepage water, and the net savings for the different treatment combinations assuming 90 and 180-day annual canal usage, respectively. With a 90-day annual canal usage, there was only one treatment combination (RHC + LS1) having a positive average net savings. This means that only the 15% partial substitution of rice hull chips for sand is economical since its gross savings exceeded the cost of additional seepage water.

On the other hand, with a 180-day annual canal usage, all the treatment combinations had negative net savings. This means that at longer annual canal usage, the cost of additional seepage water exceeds the gross savings. However, if water is cheaper than P10.00 per cubic meter, the net savings for the 180-day annual canal usage for the treatment combinations with 15% and 30% levels of partial substitution may be positive.

Table 4 The average gross savings, average cost of additional seepage water and the average net savings of rectangular concrete canals of the different treatment combinations, assuming a 90-day annual canal usage

TREATMENT CONDITIONS	AVERAGE GROSS SAVINGS (pesos per meter length)	AVERAGE COST OF ADDITIONAL SEEPAGE WATER (PhP/m length)	AVERAGE NET SAVINGS (PhP/m length)
RHW +LS4	8.49	241.65	-233.16
RHC + LS4	8.24	61.68	-53.44
RHW +LS3	6.38	29.03	-22.65

RHC + LS3	6.20	25.79	-19.49
RHW +LS2	4.80	15.01	-10.21
RHC + LS2	4.16	9.17	-5.01
RHW +LS1	2.13	3.67	-1.54
RHW +LS1	2.07	1.42	0.65

Table 5 The average gross savings, average cost of additional seepage water and the average net savings of rectangular concrete canals of the different treatment combinations, assuming a 90-day annual canal usage

TREATMENT CONDITIONS	AVERAGE GROSS SAVINGS (pesos per meter length)	AVERAGE COST OF ADDITIONAL SEEPAGE WATER (PhP/m length)	AVERAGE NET SAVINGS (PhP/m length)
RHW +LS4	8.49	483.30	-474.81
RHC + LS4	8.24	123.36	-115.12
RHW +LS3	6.38	58.06	-51.68
RHC + LS3	6.20	51.58	-45.38
RHW +LS2	4.80	30.02	-25.22
RHC + LS2	4.16	18.34	-14.18
RHW +LS1	2.13	7.34	-5.21
RHW +LS1	2.07	2.84	-0.77

Best Treatment Combination

Table 6 presents the average seepage rate and the net savings considering two annual canal usage for the different treatment conditions.

The table clearly shows that as the level of partial substitution increase, the average seepage rate also increase while the net savings decrease, especially at higher levels of partial substitution.

Table 6 The average seepage rate and average net savings for the different treatment combinations

TREATMENT CONDITIONS	AVERAGE SEEPAGE RATE * ($m^3/m^2/day$)	ANNUAL CANAL USE * (PhP per meter length)	
		90 days	**180 days**
RHW +LS4	0.42936	-233.16	-474.81
RHC + LS4	0.12174	-53.44	-115.12
RHW +LS3	0.06592	-22.65	-51.68
RHC + LS3	0.06038	-19.49	-45.38
RHW +LS2	0.04195	-10.21	-25.22
RHC + LS2	0.03197	-5.01	-14.18
RHW +LS1	0.02256	-1.54	-5.21
RHC + LS1	0.01872	0.65	-0.77
0% (Control)	0.01625	0	0

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, the following conclusions were formulated:

a. Generally, the canal sections of the control treatment still had the least average seepage rate compared to the average seepage rate through the canal sections of the other treatment combination.
b. Generally, the average seepage rate of canal sections made from concrete with rice hull chips are always lower than the average seepage rate of canal sections made from concrete with whole rice hull.
c. An exponential function exists between the level of partial substitution and average seepage rate for both whole rice hull and rice hull chips.
d. The economic analysis revealed that only the 15% partial substitution of rice hull chips for sand resulted to a positive net savings for a 90 day annual canal usage. Hence, this could be the best treatment combination.

e. The economic analysis further showed that at longer annual canal usage (180 days), partial substitution of rice hull materials is no longer economical.

Therefore, the researcher highly recommend, that in the conduct of studies involving concrete mixing, a concrete mixer should be used o mix aggregates to avoid significant variations in the compositions of concrete; also, a vibrator should be used in order to obtain equal distribution of the concrete mixture within the molder; and, if there is a need to do partial substitution of rice hull chips for sand, a 15% level is recommended.

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Laparoscopic ventral hernia repair –Early Experience in 25 patients

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***Abstract*- Background** -Laparoscopic Ventral hernia repair now days is a method of choice. It has benefits of shorter hospital stay, lesser pain and fixation of a large sized mesh apart from the cosmetic benefit. Although, it remains a challenging procedure more so in re operative abdomen and malignancy. The procedure is expensive, as the mesh used is costly along with its fixation devices. The aim of this study is to evaluate our experience of Laparoscopic ventral hernia repair on various parameters. **Material and Methods**- Ventral and incisional hernia was repaired by Laparoscopic intra peritoneal onlay mesh repair (IPOM) in 25 patients at a single centre within 2 years between January 2013 to December 2014. This was done at a tertiary care centre by a single operating team standardizing the procedure and evaluating the learning curve. **Results**- 25 patients underwent laparoscopic intraperitoneal onlay mesh repair (IPOM) of which 15 were females and 10 males. The average age was 52 years (35-72) with the size of defect ranged from 4-12 cm. Dual mesh with ePTFE used in all patients. 12 case were incisional hernias, 10 paraumblical hernia, 3 case umbilical hernia. Of these 7 were recurrent incisional hernia after open mesh hernioplasty, 1 case was post laparoscopic IPOM. Mean operative time was 60-130 minutes. There were no conversion to open technique. The average Hospital stay 2-3 days. 1 patient had post operative Richters' hernia which was managed by re laparoscopic reduction and transfascial closure of the defect. 3 patient had post operative ileus, minor wound infection in 1 patient, seroma in 1 patient. The average follow up period was around 12months. **Conclusion**-Laparoscopic intraperitoneal onlay mesh ventral hernia (IPOM) repair is feasible and safe in most cases with benefits of rapid recovery and better overall patient outcomes more so in large recurrent incisional hernias and malignancy.

***Index Terms*-** Laparoscopic, Ventral hernia, IPOM, Incisional Hernia

I. INTRODUCTION

Laparoscopic intraperitoneal onlay mesh Ventral and incisional hernia repair (IPOM) now days is a method of choice. It has benefits of shorter hospital stay, lesser pain and fixation of a large sized mesh apart from the cosmetic benefit. Although, it remains a challenging procedure more so in re operative abdomen and malignancy. The procedure is expensive as the mesh used is costly along with its fixation devices. Laparoscopic incisional and vental hernia repair was first reported by Le Blanc and Booth in 1993. There is considerable learning curve of the procedure and the the surgery is not without problems. When the hernia is repaired by open technique without mesh, the hernia recurs in about 50 % and when open repair is done with mesh insertion, recurrence rate 20 %. At our centre the recurrence is about 0-4 % with an average follow up of 12 months; although long term follow up is required. The recurrence rate is usually higher initially when surgeons are gaining experience as is the risk of enterotomy, which is probably related to the learning curve.(1)

II. AIM-

The aim of this study to evaluate the our experience of Laparoscopic ventral hernia repair on various parameters such as post operative pain, requirement of post op. analgesia, time of hospital stay, recovery and overall outcome. The size of mesh and ease in its placement vies a vies operating time to assess the learning curve.

III. MATERIAL AND METHODS

A total of 25 patients with ventral hernia underwent laparoscopic intraperitoneal onlay mesh (Laparoscopic IPOM) repair between January 2013 to December 2014 in the department of Surgical Gastroenterology at Dr.Ram Manohar Lohia Institute of Medical Sciences, Lucknow by a single surgical team standardizing the procedure and evaluating the experience. 15 female and 10 male patients with the mean age of 52 years (range 35-72) underwent surgery . 12 cases had incisional hernia and 10cases of paraumbilical and 3 umblical hernia. Of these 7 were recurrent incisional hernia after open mesh hernioplasty, 1 case was post laparoscopic IPOM (Table –I). The mean body mass index BMI was 35 (range 25-45) . Single hernia defect was in 22 patients and multiple in 3 (14.1%) cases. All cases were repaired by dual mesh (parietex, covidien, Germany) and tackers were used to fix it after transfascial sutures (Absorbatack, Covidien, Germany). Most of patients were with medical Comorbid diseases such as diabetes mellitus, hypertension, obesity and pulmonary disease. The learning curve was assessed by ease of placement and fixation of the large sized mesh and overall estimation of time taken. The time was divided into time for initial dissection and then for the mesh placement and fixation.

Inclusion criteria- Any patient with ventral hernia who was fit for general anaesthesia. **Exclusion criteria**- Patient unfit for

general anaesthesia, incarcerated bowel loops or any evidence of vascular compromise on imaging and with pregnancy were excluded.

Preoperative preparation- All patients had detailed medical history documented, underwent a through physical examination with estimation of the hernia defect. All routine blood parameters including, complete blood counts, renal and hepatic function tests, coagulation profile were evaluated. Patient with medical co morbidities like diabetes, hypertension, underlying malignancy etc., were evaluated and declared fit by them for surgery by specialists physicians. CECT abdomen was done to every patient to confirm the size of defect and its contents and other associated hernia missed on physical examination. (Figure 1)

Surgical technique-

The patient was placed supine position with arm adducted and after induction of general anesthesia single dose of Inj. Augmentin 1.2 gm I/V was given as routine after sensitivity testing. Pneumoperitoneum was created with veress needle at variable position mostly away from hernia (opposite side) depending on the site of defect. Umbilicus or 2 cm below left costal margin in the midclavicular line (palmer's point) were also utilized for initial access(2). Port were introduced in previously non operated area. In case the defect was in lower abdomen the operative surgeons position at head end and when defect site is in upper abdomen the operating surgeons were in between both legs. Usually we used 3 ports, 5 mm visual port for 30 degrees telescope. It was usually the port converted to 12 mm for the placement of large size of mesh. Another two 5 mm port for working were utilized depending on site and size of ventral hernia.(Figure 2) Preoperatively, the margins of hernia defect were marked. Gentle reduction of content and adhesiolysis was done with harmonic scalpel or electrocautery with a combination of blunt and sharp dissection. The margins and periphery of hernial defect was evaluated by direct vision and palpation after complete reduction of contents. (Figure 3) After complete reduction of hernial contents the abdomen was defleted and the margins were reconfirmed. Suitable sized mesh was prepared by placing preplced non absobable sutures for transfascial fixation. We routinely used 1 central and 4 peripheral sutures of prolene or nylon. The largest mesh was 30x20 cm mesh and minimum size used in our study was 20 x 15cm. In all patients we used Parietex dual mesh (polyester with collagen-polyethylene glycol–glycerol coating, manufacutured by Covidien, Germany). Prepared mesh was rolled then introduced into abdomen through 12 mm port. This was usually the optic port although any port could be exchanged with 12 mm based on the surgeons' preference. The time was recorded starting from placing the mesh in the abdomen and its final fixation. Initially we used 10 mm scope to pass the rolled mesh but over a period of time 12 mm was less cumbersome and incorportaed even the biggest mesh easily. The mesh unrolled inside the abdomen taking care of the orientation before fixation. Oxidised cellulose side was kept on visceral surface. The pr eplaced sutures at the periphery and center were pulled out using transfascial fixation needle (Aesculap, Germany) after very small skin incision. We usually pick the central fixation first as it helps in orientation of a larger sized mesh. These sutures are ligated subcutaneously and required no skin sutures. Mesh is then duly fixed with 5 mm absorbable tackers (covidien) in 2 layers. (Figure 4)

IV. RESULTS-

In our study Laparoscopic intraperitoneal onlay mesh (Laparoscopic IPOM) ventral hernia repair was performed for 25 patients . Out of which 15 were women and 10 were male with the mean age of 52 year (range 35-72) year .In this study hypertension, diabetes, asthma and hypothyroidism was common medical co-morbidity but they have no relation to presence of hernia.

There were 12 incisional and 10 paraumbilical along with 3 umblical hernias. 7patients had a recurrent ventral hernia after open mesh hernioplasty and 1 recurrent incisional hernia after laparoscopic intra peritoneal onlay mesh (Laparoscopic IPOM repair) (Table –I) . The mean body mass index BMI was 35 (range 25-45).Single hernia defect was in 22 patients and multiple in 3 (14.1%) cases .The maximum diameter of defect range from 4-12 cm. We used 20 x15cm for small and 30 x20 cm for large defects. Intra operative blood loss was not significant and there were no conversion to open method. Operative time ranged from 60-130 minutes which decreased with time, overall it revealed that mesh fixation after placement required around 30 minutes and variable time was required for adhesiolysis depending in previous surgeries and adhesions. Umbilical and paraumblical ventral hernia with minimal adhesions only required 60 minutes of operative time. There were no iatrogenic bowel injuries during procedure. One patient had feeding jejunostomy following a gastrojejunostomy for a benign gastric outlet obstruction. The weitzel loop of bowel had to be brought down for placement of mesh, which was done succesfully incising a bit of parities. Post operative heaviness in abdomen and mild pain was the most common complaint, post operative ileus developed in 3(12%) patients which resolved by conservative treatment. 1 patient developed Richter's hernia through the 12 mm port. She was obese lady with diabetes, hypertension and had treatment for Non Hodgkins lymphoma with multiple abdominal surgeries and failed open mesh repair. This was diagnosed on day 4 and was managed by re laparoscopy and reduction of bowel loop. The defect was fixed transfascially under vision. This rare complication has been published. The post operative hospital stay ranged 2-3 days. The average follow up period was 12 months.

V. DISCUSSION-

Ventral and incisional hernias are common long term postoperative complications following abdominal surgery and have an incidence of 3-20 %(3). It is more common in females. Early studies to describe laparoscopic repair of incisional hernia was published in 1993 by Le Blanc and Booth. It offers early recovery, decreased hospital stay, minimal morbidity and very low recurrence. It allows clear identification of multiple hernia defect which could be missed during open hernia repair (4). Minimum mesh overlap should be 4-5 cm from the edge of defect, although; it is suggested that if transfacial sutures were used it could be at least 3 cm (5). This encourages tension free repair and proper overlap of the defect. We used minimum mesh overlap of 4-5 cm on all sides. This was fixed with transfascial

preplaced sutures and absorbable tackers in 2 layers. This allows proper mesh placement and reduces early folding or dislodgement of the mesh, which may be a cause of recurrence. In principle, laparoscopic repair of ventral hernia utilises the same concept as open repair popularised by by Stoppa , Rives et al (6,7,8). These include using large mesh prosthesis, adequate overlap of hernia defect with tension free repair. Operating time of laparoscopic ventral repair is longer than open ventral hernia repair although some authors have reported no difference. Laparoscopic ventral hernia repair may be a challenging procedure with long standing defect, incarcerated small bowel, morbid obesity , multiple previous repairs and placement of prosthetic mesh but offers significant benefits of less postoperative pain, shorter hospital stay, early return to work and placement of a large sized mesh which have been confirmed in the various studies. Our study confirms that patient required analgesia routinely on need basis up to 12 hours. Thereafter, only mild discomfort required oral NSAIDs on need basis. They all were mobilised early and tolerated the surgery well. Minor wound infection in one patient, seroma in 2 patients , ileus in 3 patients were complications. Only one patient had significant problem as post operative Richter's hernia through the 12 mm defect which was diagnosed and early relaproscopy with repair of defect was done successfully. (14) . Mesh shrinkage is greater in the tack group as compared with suture group when used indivdually. Recurrence of hernia following repair is a problem and is reported variably with the usage of different mesh fixation techniques(9,10,11) Carbajo et al mentioned a recurrence rate of 4.4% during a follow up period of 44 months although another study has reported a recurrence rate of 1 % during mean follow up of 27 months(11). In our study there was no major morbidity and no operative mortality. Significantly, in our early experience there were no major complications except occurrence of the port site Richter's hernia in immediate post operative period. We used standardised protocol and similar technique in each case and documented the operative time after adhesiolysis and mesh fixation. This revealed that more or less the time taken for fixation of a large sized mesh was standardized and the time taken for adhesiolysis was dependent on presence of adhesions of previous surgery or mesh placements. In case of simple umbilical hernias the operative time was around 60 minutes for the entire procedure. The placement of large sized prepared mesh was easier through 12 mm port as compared to 10 mm port and we shifted to 12mm after initial 4 cases. The mesh handling was better and preserved the collagen layer from being torn etc. Parietex dual mesh was used in each case. In our scenario, the cost is important and laparoscopic ventral hernia repair is expensive using costly mesh and fixation device. But, the procedure was more patient friendly, with less morbidity, shorter length of hospital stay, no need of drain, less chance of infection and over all similar operative time as compared to open surgery. More so, obese patients with medical co morbidities and recurrent hernias tend to benefit more. Overall there was no early recurrence in the average follow up of 1 yr. We routinely applied abdominal binder for 6 weeks following surgery. 1 patient had excision of redundant skin excision under local anaesthesia after umbilical hernia repair. Therefore, Laparoscopic repair may be termed as better then open repair (12). Pooled data analysis of 45 published series, representing 5340 patients (4582 laparoscopic,758 open) demonstrate a significantly lower recurrence rate with laparoscopic ventral hernia repair compared with open ventral hernia repair series(13). Although, recurrence still remains an important problem after laparoscopic ventral hernia repair, it does not surpass 5% to 10 % in most of series. Overall, the laparoscopic ventral hernia repair offer significant benefits in our setting .

VI CONCLUSION

In this study our early experience was that the Laparoscopic ventral hernia (Laparoscopic IPOM) repair is feasible, safe in most cases with benefits of rapid recovery and better overall patient outcomes more so in large recurrent incisional hernias and malignancy

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Table 1. Demographics and characteristics of the patients.

Patient characteristics	
Sex (male/female)	10/15
Age,mean	52 (35-72)
Type of hernia	
Incisional: 12	
Midline	12
Right paramedian	0
Appendectomy	0
Right subcostal	0
Paraumblical hernia :10	
Primary with divercation recti	3
Recurrent	7
Umblical hernia : 3	3
Epigastric : **0**	0
BMI, Mean	35 (25-45)
Comorbidity	20
Defect size,(cm)	4-12
Operating time,(min)	60-130
Hospital stay (days)	2-3
Average follow up (months)	12
Total No. Of cases	**25 (100%)**

Table 2. Intra and postoperative complications.

Complications	**Number (Percent)**
Intraoperative complication	
Bowel injury	0
Bleeding	0
Difficult dissection	10 (40%)
Conversion to open	0
Postoperative complications	0
Haematoma	2 (8%)
Seroma	1 (4 %)
Wound infection	1 (4%)
Chest infections	0
Early Recurrence	3 (12%)
Ileus	1 (4)
Port site Richter's hernia	**25 (100%)**
Total cases	

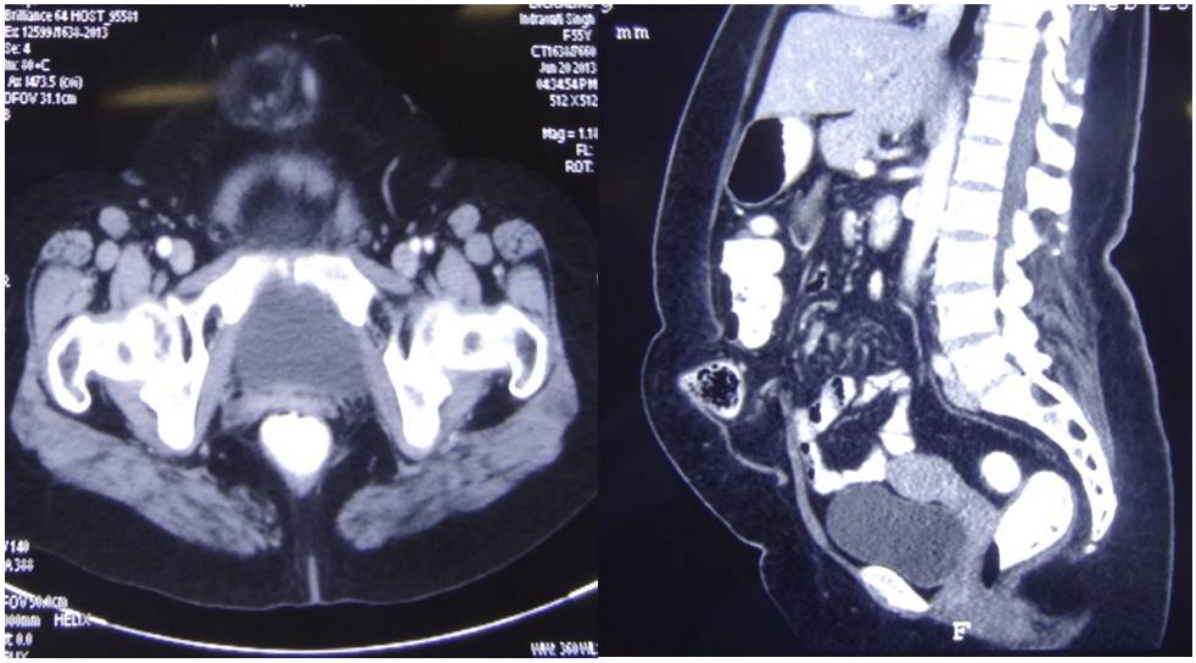

Figure 1. CECT Whole abdomen for the size of defect and content.

Figure 2. Marking for the port placement for working and one camera port

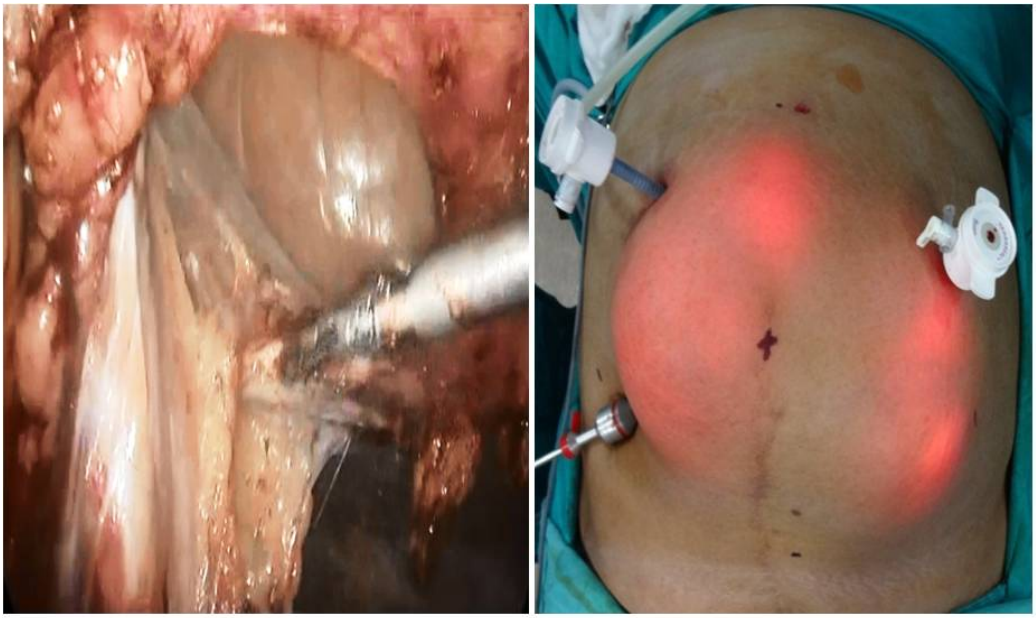

Figure 3. Reduction of the content, transillumination after reduction

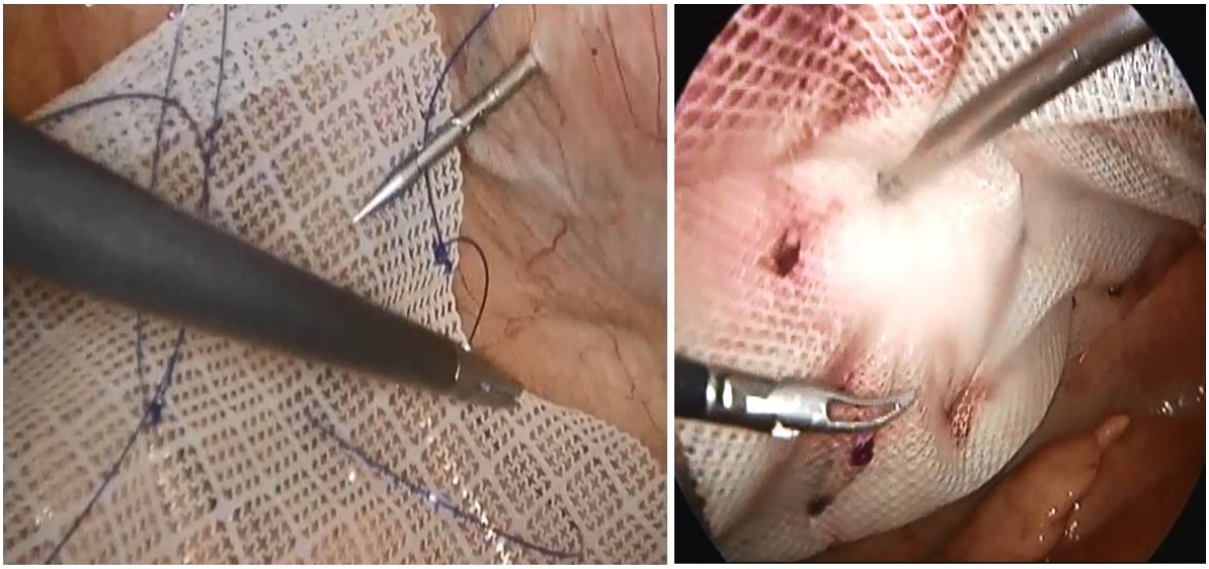

Figure 4. centralization of the mesh with transfascial suture, mesh fixed with absorbotacker

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Accelerometer Based Trajectory Motion Recognition for an Intelligent Environment

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Abstract- In this paper an accelerometer based portable device for digit and gesture recognition is being presented. The recognized data will be displayed on the monitor. A speech module is also embedded. The system finds its application in assisting patients. Apart from its HCI and gaming applications, it can be incorporated to assist the communication of deaf and dump with the visually challenged people. The digital pen consists of a tri-axial accelerometer, a microcontroller and a display unit. The system operates with microcontroller as its heart. The system is capable of identifying the digits written on air, display it on PC and also give a voice corresponding to the digit written. Users can use the pen to write digits or make hand gestures, and the accelerations of hand motions measured by the accelerometer are transmitted to a computer for online trajectory recognition. The digital pen can also control the operation of other devices. Here a fan and light are made to turn on and off with the aid of gestures made by the digital pen. As a future application more devices can be controlled with its aid.

Index Terms- Accelerometer, gesture recognition, intelligent environment, microcontroller, trajectory motion recognition.

I. INTRODUCTION

There are a number of technologies thriving for human computer interaction or human machine interaction such as speech recognition, vision-based gesture recognition and tablet types of devices. These devices facilitate the intercommunication between humans and machine more freely and without the use of traditional keyboards or mouse or remote controls. Gesture or trajectory recognition based on inertial devices is an original, direct human-computer interacting way, because the motion of limbs is driven by the force from muscles and the inertial devices could detect the outcome of the force, say acceleration and angular velocity, directly, so people could even use them without any distraction all the time.

A significant advantage of inertial sensors for general motion sensing is that they can be operated without any external reference and limitation in working conditions. However, motion trajectory recognition is relatively complicated because different users have different speeds and styles to generate various motion trajectories. Thus, many researchers have tried to narrow down the problem domain for increasing the accuracy of handwriting recognition systems [1].

II. PROJECT DESCRIPTION

This paper presents a digital pen based system to find out the trajectory of the written digits and gestures. As a HMI application to this device, various gestures are used to turn on and off other devices.

Microcontroller is the heart of this system. AVR ATmega32 is the microcontroller used in this paper. Microcontroller is being programmed in embedded C language and is being simulated in AVR Studio 5. The input device to this microcontroller is a three axis accelerometer. The accelerometer is used to measure the acceleration signals with respect to x, y and z axis. The acceleration values are displayed on the LCD Display.

The working of the system is as follows. The entire working can be said to have two parts - Digit recognition part and the device control part. The digital pen can identify the digits from zero to seven and display it on a PC. Also a voice module and loud speaker is being attached to the system to give a voice output of the digits written and displayed. The single APR module can only store and output eight signals. So the recognition of only eight digits – zero to seven are only carried out in this paper. The trajectories of the digits are shown in Table 1. This system facilitates the communication between deaf, dumb and the blind.The device control part aims at giving a further application to this pen. So it aimed of a human machine interaction one. The digital pen can be used to control other machines like fan, light etc. Four gestures where used – up, down, right and left. Table 2 shows the various gestures used.

These gestures can turn on and off a light and fan respectively. In future further more devices can also be incorporated. This can thus find application in assisting disabled or physically challenged people to communicate easily with the surroundings. This device thus provides a tool for an intelligent environment.

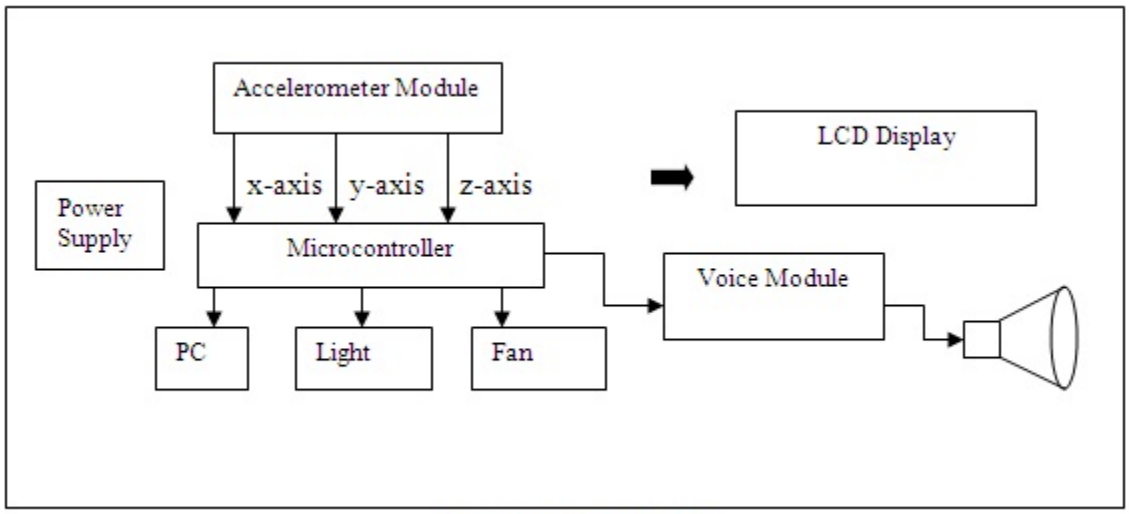


Figure 1 Block Diagram

Table 1 Trajectory of digits

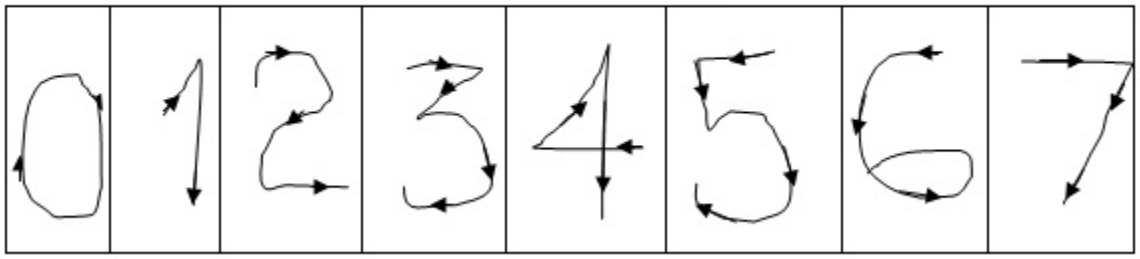
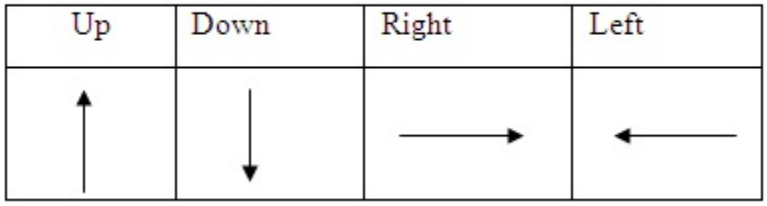


Table 2 Trajectory of Gestures



III. RESULTS

The programming language used in this project is Embedded C. The code was written and simulated in AVR Studio 5. The code was loaded to the microcontroller. The device successfully recognized digits zero to seven. The digits were displayed on the PC. The four gestures used in this project turned on and off the light and the fan. A survey was conducted among 20 people (10 male and 10 female) to check the efficiency and accuracy of the system. Table 3 and 4 gives the survey report and the accuracy rates.

Table 3 Survey Report

Digit/Gesture	Male	Female	Total
0	9	10	19
1	10	8	18
2	8	9	17
3	8	9	17
4	7	8	15
5	8	8	16
6	8	10	18
7	8	9	17
→	10	10	20
←	10	10	20
↑	10	10	20
↓	10	10	20

Table 4 Accuracy Rates

Digit/Gesture	Accuracy (%)
0	95
1	90
2	85
3	85
4	75
5	80
6	90
7	85
→	100
←	100
↑	100
↓	100

IV. CONCLUSION

This paper has presented an accelerometer based framework that can that can be utilized for acceleration-based handwriting and gesture recognition. The proposed system is utilized for digit and gesture recognition and thus it is an effective tool for HCI applications.

Users can use the pen to write digits or make hand gestures as shown in Table 1 and 2, and the accelerations of hand motions are measured by the accelerometer. The recognized digits are displayed on a computer for further applications. So, by changing the position of accelerometer users can show the numerical characters on the PC. The voice recognition system identifies the digits that are being identified. The voice recognition module and the loud speaker output the digit that is being recognized.

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A study of performance appraisal system in unscheduled cooperative Banks in Noida region and its effect on employee's and organisation's growth and performance

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Abstract- Performance appraisal is a systematically aligned process that accesses the individual's performance in the job responsibilities given to him .It is a holistic process which brings together many activities which in a combined way contribute to the high levels of organisational performance. It helps the organisation to make the effective and efficient utilisation of their resources towards attaining their strategic goals by providing feedback to the employees. This study is focussed on current scenario of performance appraisal system of cooperative banks and its implication to employee's performance and organisational growth as a whole.

The respondents of this study are the on roll employees of the Bank. The purposive sampling technique was used in the selection of the respondents. Interview, focus group discussion and survey questionnaire were the main instruments used for this study. The result of the study showed that the Performance appraisal system needs improvement. The main factors resulting in effectiveness of the current appraisal system are-

1. The goals are not set in the beginning of the financial year. The evaluation criteria are a threat and at the same time surprise element for the respondents
2. No feedback is given to the employees for further improvements

It is recommended that the Bank should revamp and redesign its appraisal in a more futuristic and effective manner otherwise this system will lead only to de-motivation of employees and wastage of time and resources

Index Terms- Employee Performance Appraisal System, Employee Motivation, organisational development

I. INTRODUCTION

The appraisal system in any cooperative Bank depends upon many factors like –

a) Size of the Bank
b) Importance and role of HR in policies formulation
c) Perception of senior management of the Bank about the performance appraisal
d) Future predictions in terms of growth and expansion
e) Current status of Business growth

Banks are service oriented organisations and the way staff members behave and conducts themselves in public defines the graph of growth of the Bank and increment in customer base directly. Als (1999) has defined performance appraisal as a process involving deliberate stock taking of the success, which an individual or the organisation has achieved in performing assigned tasks or meeting set goals over the period of time. Wise (2005) said that performance appraisal system helps an employee to discover his strengths and weaknesses and helps him in decision making about his career choices. Cooperative Banks in India are regulated by the Reserve Bank of India through the Banking Regulation Act 1949 as applicable to cooperatives. These Banks have special roles to play for the economic development of rural areas which directly leads to development of poor class. These Banks play a major role in empowering rural India and hence strengthens concept of financial inclusion.

Cooperatives Banks mainly focuses on Branch Operations, Credit and advances, Technology up gradation and HR in decreasing order of priority.

HR department is a supporting department and is also a driving force for the staff to keep themselves motivated enough by focussing on the staff recruitment, retention, engagement, training and development, staff welfare etc. Performance appraisal system is the building block of the organisation's growth. By optimum use of the same any organisation can find out the hidden talent to provide them better job responsibilities and results in growth of the individual and the organisation both.

Performance Management is the most critical function for human resource managers which incorporate the disciplines of organisation structure, strategy and elements of operations management. The integrated approach to performance management has become the trend amongst HR managers. Hence Bank's management needs to think and revamp to monitor that how they are performing and how are their competitors performing.

The tacit mission of any unscheduled Cooperatives Bank is to become a Scheduled Cooperative Bank and it can only be achieved by

a) Motivating the staff to perform better by surpassing the targets and goals set for them

b) By performing the duties with loyalty and sincerity. Before any task they

should think whether this activity is in accordance with the policies and principles of the Bank.

By doing a fair performance appraisal Bank's can motivate their staff and boost them for better growth and job opportunities

From, the above discussion it can be inferred that the performance appraisal is a very effective tool of HR by which a platform for improvement can be provided to the staff and in turn it will pave the road for the developments of the unscheduled Cooperative Banks and fulfilling the strategic goals and objectives to strive for excellence.

II. Literature review

Performance appraisal system provides information to management about employee's performance which can be used for succession planning by identifying people with potentials. It helps the management to take administrative decisions such as , pay increase, promotion, placement ,transfer and lay off to help supervisors know their subordinates and gives an opportunity to the subordinates to know where they stand with the boss (Spriegel and Mumma, 1961 Rudrabsavaraj 1969; Levinson 1970; Monapa 1974 Caroll, 1982 Saiyadain, 1985; Mufeed 1995; Robberts, 1995; and Mufeed, 1998), Unfortunately, the early development of appraisal systems relied on informal judgments of personality traits. These personalities were difficult to measure objectively and supervisors tended to evaluate subjectively according to their own preconceived biases, rating errors rampant, feedback wars viewed as punishment by employees.

Attempt to improve ratings, to increase the extent to which they are valid indicators of difference in performance, have proved extremely difficult. A major reason for this, according to Carrol and Schiner (1990) is that very little is still known about the cognitive processes that underlie the act of judging the performance of others. They argue that improvements in performances appraisal rest on a better understanding of such processes. In the recent past, research studies witness that only few organizations are satisfied with their existing performance appraisal systems and the dissatisfaction is greater enough. This is mainly due to the fact that existing system is not effective, reason being the objective of this system are not spelled out nor made known to the employees.

Many managers view that performance appraisal system occupies too much of their productive time. Many organizations are in need of a perfect performance appraisal system for their organization to promote and inculcate a performance culture among the employees. In the present research efforts will be made to find the factors involved for discontent among the on roll employees of the Bank about the process of the performance appraisal system that is followed and to find the gaps in the same. Action plan can be devised for bridging the gaps. The present piece of work is also an attempt to identity the factors responsible from the employees and organisational point of view to make the appraisals more effective , acceptable and an example to be followed by other organisation as well.

III. Performance Management

Performance Management includes strategic Management. Strategic Management incorporates strategy formulation, devoting adequate resources, defining the structure within which organisational members would function, design and monitor workflows to ensure that the activities in the organization are aligned to its strategic goals (Dessler 2008). All organisational processes that determines how well employees, teams and ultimately, the organisation perform are included in performance Management (Mondy and Noe, 2007).The performance management is conceptualised as consisting of following two distinct components-

a) Performance Management process: It is the process by which a company manages its performance and meets the corporate and functional objectives and goals. Also it helps to identify, prioritize, make corrections and reinforce activities to achieve the results
b) Performance Information system: This integrates present relevant information regarding goals and objectives of the organisation with future corrective measures. This system can provide insights and information on all the variable related to Bank's development including external factors like changing customer's preference, evolution of new segments of customers, level of customer service expectation from the staff, changes in Banking needs etc.

Performance Management facilitates the effective output of operational and strategic goals of the organisation. The benefits of employing the Performance Management are –

a) Growth in profit
b) Optimum use of resources
c) Elimination of project run outs
d) Improved Time Management
e) Improved control by supervisors
f) Creating transparency during goal setting
g) Increases employee engagement

IV. Performance appraisal in Unscheduled Cooperative Banks

Performance appraisal is a tool to monitor and restructure the HR practices in accordance to the data obtained from the appraisal. Appraisal should be such which provides the accurate picture of the HR practices being followed in the Bank so that if these require any revamping it should be started by the HR Manager. The following details can be analysed from the appraisal forms if it can take recommendations from the Supervisor-

a) To start stress management training for managerial staff
b) To provide coaching on interpersonal skills development

c) Setting of an employee grievance redressal system
d) Providing mentoring sessions to staff dealing with personal issues
e) Finding new ways of rewarding the employees

To provide the correct picture of the performance as done by the staff –

Every employee, irrespective of the designation and the age wants feedback for the work done, which should be fair enough to be accepted. A fair feedback increase motivation and loyalty of the employee towards the Bank. Staffs are always grateful when the supervisor does the fair trail and unfair feedback leads to higher level management and HR intervention if the employee writes in Grievance redressal cell. It totally reflects the management's interest in the employee's career graph.

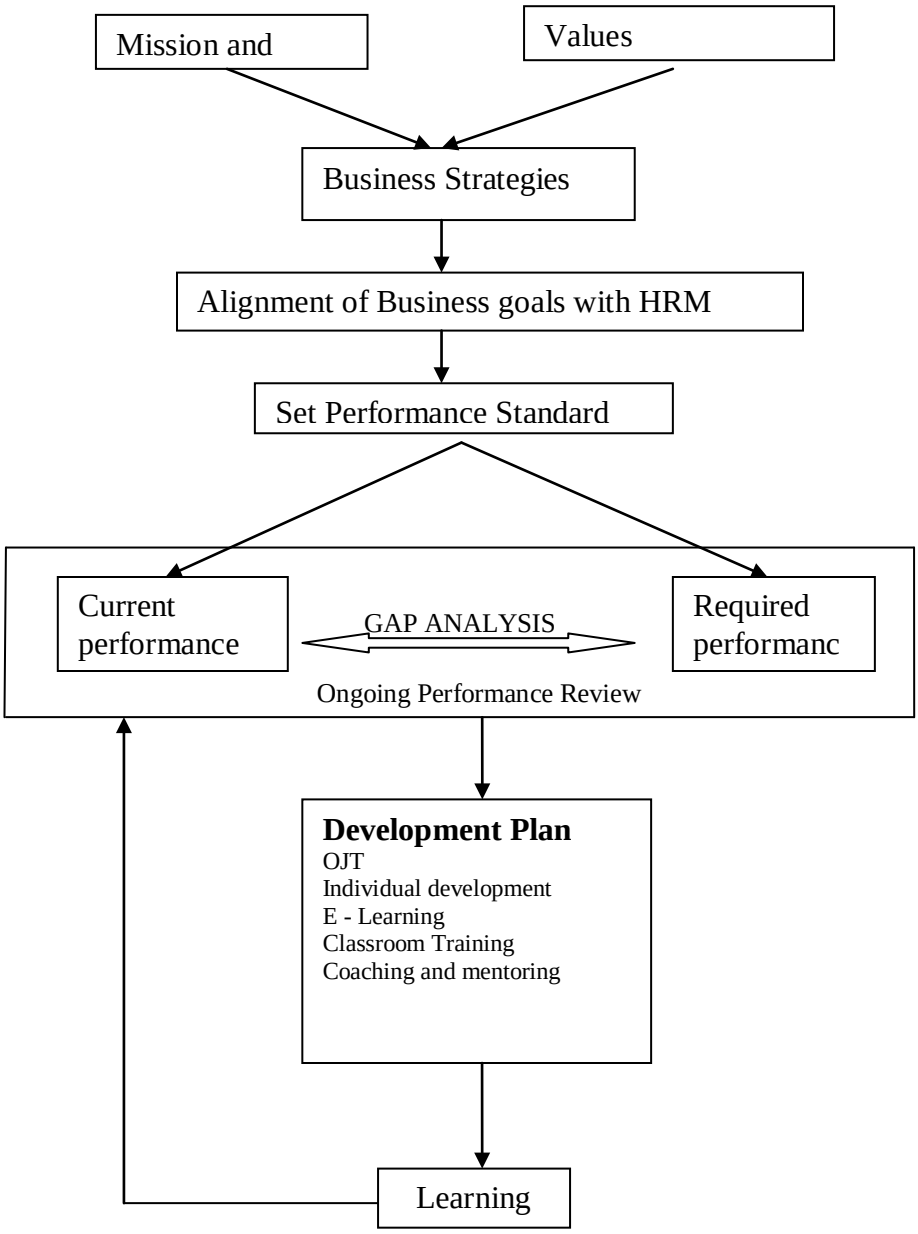
V. Objective of the Study -

Following are the main objectives from the study which can be analysed -

1. To find the perception of the employees regarding the current appraisal system
2. Its implications on the employees motivation for improvement and self development
3. Recommendations proposed for improvements of the Bank's appraisal system

VI. Conceptual Framework –

The below framework is intended to demonstrate the broader view of the flow of information within the functions to enhance the employees output to achieve the organisation goals.



Performance appraisal is not just a HR practise. Rather it's a very powerful tool to define the action plan for the individual and the organisation as a whole for improvement and positive growth. With the help of above framework I want to draw attention towards setting performance standard and gap analysis to find out the degree of skewness from the desired behaviour at work and the measures of correcting the same.

VII. Research Methodology –

In depth literature review and available secondary data from various sources has been used to develop this paper. A purposive sampling technique was utilised in the selection of 35 respondents. The survey was done to analyse the current status of the appraisal system as followed by the Bank, the post appraisal effect on the employees of the Bank, analysation of the gaps in the appraisal system.

VIII. Discussion

a) Current status of the appraisal system – The respondents moderately agree that the appraisal system is fair and accurate. Since the goal setting is not done in the beginning of the financial year it leads to surprise and threats on the evaluated parameters at the end of the year. There is not any well defined objective for appraisal. The biggest drawback is that no feedback is provided to the employees for further improvements. There is only discussion on the rating which leads to

increase in salary which is also not being treated as fair appraisal by the staff.

b) Post appraisal effects of the system- The current appraisal system is not effective as no changes are seen in the employee's performance. Since it lacks feedback and healthy discussion at the end of the appraisal it is not effective enough to lead to improvements. Employees are sometimes led to grapevine discussions on reasons of promotions, reasons of grades given by the appraiser, percentage increase in the salary etc.

c) Gaps in the current system – Gaps in the current system and not many. As per the respondents if the parameters of evaluation are shared by the appraiser with the appraisee in the beginning of the year then the sabbatical officer will be aware about the important things to work on .Also it does not discusses on recommendations for training either from the appraise or the appraiser.

IX. Suggestions for Improvements of the Appraisal System-

The performance appraisal system should involve development of Human resource as the building block. It should be actively used for planning and increasing employee's performance by finding the training needs for them, building good relationships among the working colleagues by making the system transparent and reducing the grapevine discussions. Though employees can make guesses regarding the evaluation parameters on which they shall be judged as per job responsibilities they are involved in and working in the system but the employees should have prior understanding of the evaluation parameters on which they shall be evaluated so that these parameters are not a threat or a surprise for them.

The input of all the staff ranging from managers to clerks should be taken when the process of review is taking place since it affects the staff of all strata. By defining performance tasks and goals, by providing avenues for the quality of informal and formal feedback, by providing transparency in the promotion, transfer, career planning system the employees will feel the importance of their presence in the system and which directly effects their loyalty and motivation to perform better and results in full filling of the organisational strategies and organisation growth.

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Study the Response of Drought Stress Inducing by Mannitol in Germination to Seedling Stage of Mung Bean (*Vigna Radiata L.*) Variety MI5 and Variety Harsha

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Abstract- Mung bean (*Vigna radiata* L.) is one of the most important grain legumes cultivated in Sri Lanka. Drought is a major abiotic stress on Mung bean in the sub-humid, dry and intermediate zones of Sri Lanka. The present reveals the response of mung bean for the drought stress at germination to seedling stages. The major beneficiaries of the intervention are the poor, especially children and women, whose diets lacked much needed protein and iron. Supplementation with improved Mung bean recipes has effectively improved low body iron stores in children and women. Both urban and rural consumers now have access to improved quality mungbean at reasonable cost. The drought is a major environmental factor that determines the growth, the productivity of crops which is estimated to be one of the most serious yield reducing stresses in crops. Surface sterilized seeds were introduced to hormone free Murashige and Skoog (MS) basal medium with different concentrations of mannitol (0%, 10%, 20%, 30%, 40% and 50%). Seedlings heights, length of the roots and number of germinated seeds were recorded after 2nd weeks of culture. Completely Randomized Design (CRD) with five replicates was used for study. Statistical analysis was performed with Duncan's multiple range test using SAS software (version 9.1.3). Results showed that highest seed germination (100%) from Mung bean variety MI 5 and Harsha in all mannitol concentrations. Reduction of seedling height and increasing the root length was observed while increasing the mannitol concentration in both varieties.

Index Terms- Drought stress, Mannitol, Mung bean, Seed germination

I. INTRODUCTION

Among the pulse crops, Mung bean has a special importance of intensive crop production due to its short growth period (Ahmed *et al*., 1978). The Mung bean (*Vigna radiata*), alternatively known as the Moong bean, Green gram, and Golden gram is a plant species in the legume family (Fabaceae).Native to the Indian subcontinent the Mung bean is mainly cultivated today in India, China, and Southeast Asia. It is also cultivated in hot, dry regions in Southern Europe and the Southern United States. It is used as an ingredient in both savory and sweet dishes in Sri Lanka about 150,000 acres of cultivation lands are in danger of getting destroyed due to the drought in certain parts of the country, especially in the North Central, North and North Western provinces. The main limitation in rice production is abiotic stress caused by salinity, drought, extreme temperature and submergence. To overcome this problem, we can use Mung bean in drought season.

Mannitol (also referred to as mannite or manna sugar) (Chaves and Oliveira, 2004) is a white, crystalline solid (Zidenga, 2006) with the chemical formula $C_6H_8(OH)_6$ which is a member of sugar alcohols, is an osmotic adjustment chemical to control osmotic potential in the culture media or nutrient solutions in order to induce water deficit conditions for protein expression or proteomics studies (Chaves and Oliveira, 2004). In plants, it is used to induce osmotic stress.

Mungbean is a major legume crop that supplements the largely cereal-based diets of the poor in Asia. When consumed together, cereals and legumes (also known as pulses) contribute significantly to a healthy and balanced diet. Cereals are deficient in the amino acid lysine, which legumes provide, whereas legumes are low in sulphur-rich amino acids, which cereals provide. High in protein and easy to digest, Mung bean consumed in combination with cereals can thus significantly increase the quality of protein in a meal. Mung bean also promises other health benefits for consumers, especially poor women and children, who are most vulnerable to the effects of poor nutrition and a lack of micronutrients in their diets. In this situation the main objective of this study were to evaluate the response of seed germination and seedling growth of Mung bean (*Vigna radiata*) variety MI 5 and variety Harsha to the drought conditions which was induced by Mannitol.

II. MATERIALS AND METHODS

Plant materials and drought treatment

Seeds of Mung bean (*Vigna radiata* L.) variety MI 5 and Harsha cultivar were obtained from Department of Agriculture, Sri Lanka. First, seeds were rinsed with soap and washed with distilled water. Then seed coats were removed using forceps and sterilized seeds using 70% (v/v) ethanol for 3 min. Thereafter, the seeds were soaked in 20% (v/v) Chlorox solution (Sodium hypochlorite) for 20 min. Those seeds were rinsed in sterile distilled water for 3 times. They were dried using sterilde filter papers. Surface sterilized seeds were introduced to test tubes (2 seed per tube) containing 3ml of Murashige and Skoog (MS) basal medium with different mannitol concentrations (0%, 10%, 20%, 30%, 40% and 50%). The culture medium used for all the experiments was based on MS medium with 30 gL^{-1} sucrose and solidified by corn flour (100gL^{-1}). Medium was autoclaved for 21 minutes at 121°C after adjusting the pH to 5.8 (Dahanayake *et al*, 2012).

Culture condition: Seeds were inoculated in prepared culture medium. Cultures were incubated for 2 weeks in the culture room with light intensity of 1000 µmol/m2/sec and at 25±1°C and 70-80% relative humidity with a 16/8 hrs light/dark photoperiod.

Experimental design: The numbers of seeds germinated were recorded after 2nd week. End of the 2nd week, length of the root and height of the seedling. All experiments reported here were done five replicates for each mannitol treatment. Statistical analysis was performed with Duncan's multiple range test using SAS software (version 9.1.3). The germination percentage was performed using the following formulae;

$$\text{Germination percentage (\%)} = \left[\frac{\text{Germinate seeds}}{\text{no. of total seeds}} \text{ X } 100 \right]$$

III. Results and Discussion

Seed germination percentage: All the seeds were given 100% germination in all different mannitol concentrations. Germination percentages of Mung bean variety MI 5 and Harsha were not reduced when increasing of mannitol concentration. But the survival percentage of seedlings (rice) cultivated in salt-induced osmotic stress was greatly reduced, and to a higher degree than those under mannitol-induced stress (Nishimura *et al.*, 2011).

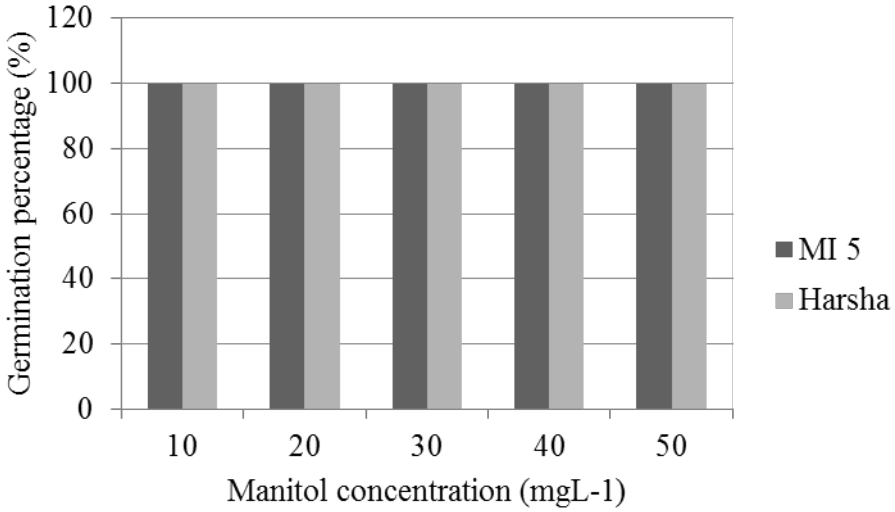

Figure 1: Effect of mannitol on seed germination percentage

Seedling height was influenced by different mannitol percentages: Mung bean variety MI 5 and variety Harsha seedling height was reduced significantly when increasing the mannitol concentration (Figure 2).The data of mean height of seedlings of table 1 shows that height is significant with each mannitol concentrations. Shoot length was higher in seeds treated with water, mannitol and lower concentration of K_2HPO_4 and KNO_3 as compared to seedlings grown from no treated Chickpea seed (Nighat, Sumaira and Farhat, 2006).

Mean Root length as influenced by different mannitol percentage: The data (Table 2) reveal that all length are significant from each mannitol concentration and Both Mung bean cultivars root lengths increasing along the high mannitol percentage shows in figure 2. From current findings; root length and dry root mass increase with mannitol in rice is confirming the previous results of many scientists practiced in different crops (Nighat *et al.*, 2006; Nishimura *et al.*, 2011; Hoekstra *et al.*, 2001).

Table 1: Effect of different mannitol concentrations on mean height of the seedlings and mean length of the roots in Mung bean variety MI 5 and variety Harsha

Mannitol Percentage	Mean height of the seedling (cm)		Mean length of the root (cm)	
	MI 5	Harsha	MI 5	Harsha
0%	15.70^{a}	14.88^{a}	1.73^{f}	2.20^{c}
10%	14.64^{b}	11.84^{b}	2.40^{e}	2.68^{bc}
20%	14.38^{c}	11.50^{b}	2.75^{d}	2.94^{ab}

30%	14.14[d]	11.08[b]	3.12[c]	3.25[ab]
40%	13.42[e]	10.70[b]	3.37[b]	3.27[ab]
50%	12.00[f]	10.27[c]	3.53[a]	3.38[a]

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05).Values in same column with same letter denoted non- significant difference

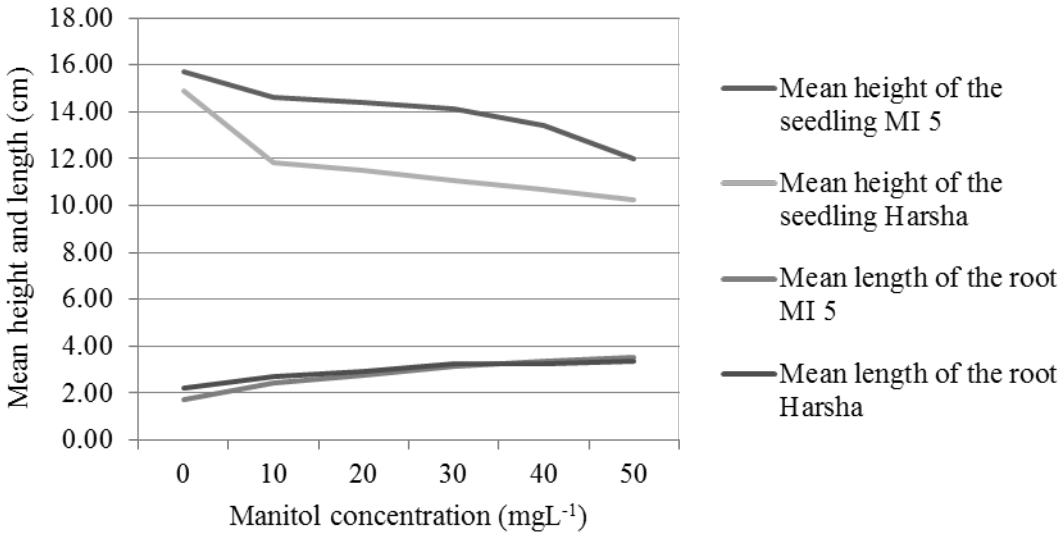

Figure 2: Effect of different mannitol concentrations on mean seedlings height and mean length of the roots in Mung bean variety MI 5 and variety Harsha

In particular, it is predicted that water deficit will continue to be a major abiotic factor affecting global crop yields. One third of the world's population resides in water stressed regions, and with elevated CO_2 levels in the atmosphere and climatic changes predicted in the future, drought could become more frequent and severe. In tolerant plants, there are many defense mechanisms such as osmoregulation, ion homeostasis, antioxidant and hormonal systems, helping plants to stay alive and development prior to their reproductive stages (Hasegawa, 2000). The seedlings of drought-tolerant cultivars showed lesser reduction of both growth characteristics and better stability of photosynthetic pigments than those of drought-sensitive cultivars. This could suggest that seedlings of drought-tolerant cultivars may have better adaptive responsibility such as the controlling stomatal pore and the stability of organelles within the cell (Setter and Flannigan, 2001). Above results focus on drought stress in seedlings and it triggers many common reactions in plants and leads to cellular dehydration which causes osmotic stress and removal of water from the cytoplasm into the extracellular space. The degree of plant growth inhibition due to osmotic stress is dependent on the stress exposed times, the particular tissues and the plant species (Smirnoff, 1998). In Mung bean water stress significantly effects on root system, shoot bio mass production and final yield (Ranawake *et al.*, 2011). From former details mentioned in above shows Mung bean variety MI 5 and Harsha has ability to adopt and to tolerance above conditions on drought by current findings.

IV. Conclusion

Drought tolerance response of Mung bean was showed that increasing in mannitol percentages were significantly affect for mean seedlings height which were decreased while mean length of the roots were increased. Above facts reveal that Mug bean variety MI 5 and Harsha respond to drought tolerance in seedling stage.

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Incidence and Trend of Antibiotic Resistance among *Streptococcus pneumoniae* Isolated from Pediatrics in Ekiti and Ondo States of Southwestern Nigeria

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Abstract- The incidence of *Streptococcus pneumoniae* isolated from pediatrics admitted into various hospitals in Ekiti and Ondo States from the months of January 2009 to July 2010 were investigated. It was observed that out of the 400 samples collected from children in both states, 57 (14%) were positive for the isolates, while 295 (74%) were negative. Indicating a low incidence in both states but higher in Ondo State. Out of the 57 positive samples, 44 (77%) were isolates from sputum, 4 (7%) from urine, 1 (2%) from blood and 8 (14%) from ear swab. The highest number of positive isolates were 41 (68%) from males while 16(32%) were from females. From sputum, 33 (97%) were susceptible to Ciprofloxacin and 5(14%) to Cloxacillin. From urine, 3(75%) isolates were susceptible to Ofloxacin. The isolates from blood samples were susceptible to both Ciprofloxacin and Gentamycin. The isolates from ear swab were susceptible to Erythromycin and Ciprofloxacin but 1(50%) was susceptible to Ofloxacin, Clindamycin, Gentamycin, Cotrimoxazole Ampicilin and Cloxacillin. All isolates from urine samples show resistance to majority of the antibiotics. All isolates from blood showed resistance to all antibiotics tested except Ciprofloxacin and Gentamycin. Two isolates from ear swab showed resistance to Ceftriaxone and Argumentin. The most active antibiotics tested were Ciprofloxacin (92%), Gentamycin (78%), Erythromycin (70%), Ofloxacin (60%) and Clindamycin (46%).

Keywords- Antibiotic resistance, Incidence, Pediatrics, *Streptococcus pneumoniae*

I. INTRODUCTION

For the past 60 years, antimicrobial chemotherapy has been the mainstay of medical intervention against infectious diseases caused by bacterial pathogens. The continuous decline of therapeutic effectiveness as a result of extensive use of antimicrobial chemotherapy has been long predicted and seems inescapable (WHO, 2005). Many surveillance studies have over the last decade (1997-2007) drawn attention to this phenomenon (Mackenzie *et al*., 2007). At the same time, the once- abundant supply of new and improved antimicrobial compounds has worn thin, as drug development becomes increasingly challenging (Moel *et al*., 2007). It is therefore critical to realize that the effectiveness of antimicrobial agents has been challenged by resurgence of resistant microorganisms. This cannot be taken for granted because these substances are increasingly attaining the status of nonrenewable resources.

Streptococcus pneumoniae is a major human pathogen which causes pneumonia, sinusitis, otitis, bacterial meningitis and septicemia (Dorothea *et al.*, 2010). The bacterium is a serious cause of illness and death and a major etiologic agent of community-acquired pneumonia meningitis, and acute otitis media. The increasing global emergence and rapid spread of multidrug-resistant *Streptococcus pneumoniae* is a serious concern (Rahman *et al*., 2006). Clonal dissemination of problematic pneumococcal strains has created clinically important treatment problems (Bean and Klena, 2005). Pneumococcal resistant to antimicrobial drugs was first reported in the mid-1960s (Douglas *et al*., 2009). Since 1990, drug resistant isolates of the bacterium have spread rapidly throughout the United States (Byarugaba, 2004). In the early 1990s, high-level resistance to penicillin and other antimicrobial drugs appeared in the United States with a low prevalence (Nys *et al.*, 2004). Over the past decade, multidrug-resistant clones of *Streptococcus pneumoniae* have rapidly emerged (Pelton *et al*., 2007). Of 90 serotypes, 19A is one of the most common types found in children. It can cause disease and easily develop antimicrobial drug resistance (Tan, 2003). Before the introduction of the 7-valent polysaccharide- protein conjugate vaccine (PCV7), serotypes included in the vaccine were responsible for approx 90% of pneumococcal infections in children living in industrialized countries; in developing countries, coverage has been reported as low as

26% (Pelton *et al.*, 2007). Pneumococcal resistance to antimicrobial drugs (including β-lactams, macrolides, tetracycline, and cotrimoxazole) has become a worldwide problem. This work intends to investigate the trend of resistance of *Streptococcus pneumoniae* isolated from pediatrics in Ekiti and Ondo States to conventional antibiotics and their susceptibility to macrolides and using molecular epidemiologic methods, particularly multilocus sequence typing (MLST) to characterize the molecular type of multidrug-resistant strains of *Streptococcus pneumoniae* isolated from children.

II. MATERIALS AND METHODS

A. Collection of Isolates

Streptococcus pneumoniae were obtained from various clinical specimens like, sputum, urine, blood, and middle ear fluid from patients that visited the laboratory of the hospitals at Akure, Owo, Ondo, Idanre and Ore towns in Ondo- State and Ado Ekiti, Ido-Ekiti, Ikere-Ekiti, Iyin Ekiti, Aramoko-Ekiti and Ifaki-Ekiti in Ekiti State, Southwestern, Nigeria.

B. Culture of Samples and identification of bacteria

The samples were cultured on Nutrient agar by streaking method on Petri-dishes. The cultures were incubated anaerobically at 37^{o}C for 24h in an incubator. Discrete colonies were picked and cultured on Blood agar. The plates were incubated at 37^{o}C for 24h. Colonies showing greenish clearing zones around it were subcultured into a Nutrient agar slant. The colonies were identified by Gram staining, insulin fermentation, bile solubility, and optochin sensitivity (Rouff *et al*., 2003; CLSI, 2006).

C. Susceptibility Testing

Susceptibility testing was carried out by disk diffusion and confirmed with E- test according to Clinical and Laboratory Standard Institute (CLSI, 2006). A colony from stock was sub cultured into 5ml of nutrient broth (LAB) and incubated at 37^{o}C for 18h. About 0.1ml of the overnight broth of each organism was pipette into 9.9ml of the broth to yield a 10^{1} dilution. The procedure was continued to obtain a final dilution of 10^{3}. The bacterial suspension was spread onto a dried Nutrient agar and a multo-disk containing ofloxacin, erythromycin, Ciprofloxacin, Clindamycin, Gentimycin, Cloxacillin, Cotrimoxazole, Ampicilin, ceftriaxone and Argumentin was placed on the agar. Multidrug resistance was defined as non-susceptibility to ≥3 antimicrobial drug classes.

D. Multilocus Sequence Typing

This was employed using the method described in Qingfu *et al*. (2009). The internal fragments of 7 housekeeping genes (*aroE* Shikimate dehydrogenase), *gdh* (glucose-6-phosphate dehydrogenase), *gki*(glucose kinase), *recP*(transketolase), *spi*(signal peptidase1), *xpt*(xanthine phosphoribosyltransferase), and *ddl*(D-alanine-D-alanine ligase) were amplified from chromosomal DNA by PCR. Chromosomal DNA was extracted from subculture of *Strep pneumoniae* isolations recovered from middle ear fluid, urine, sputum and blood. PCR amplification was performed using primer pairs *aroE*- up, 5-GCCTTTGAGGCGACAGC-3' and *aroE*-dn, 5'-TGCAGTTCA(G/A)AAACAT(A/T)TTCTAA-3'; *gdh*-up, 5'-ATGGACAAACCAGC(G/A/T/C)AG(C/T)TT-3'; and *gdh*-dn, 5'-GCTTGAGGTCCCAT(G/A)CT(G/A/T/C) CC-3'; *gki*-up, 5'-GGCATTGGAATGGGATCACC-3' and *gki*-dn, 5'-TCTCCCGCAGCTGACAC-3'; *recP*-up, 5'-GCCAACTTAGCATTGTAAC-3'; and *rec*P-up, 5'-GCCAACTCAGGTCATCCAGG-3' and *rec*P-dn, 5'-TGCAACCGTAGCATTGTAAC-3'; and *spi*-up, 5'-TTATTCCTCCTGATTCTGTC-3' and *spi*-dn, 5'-GTGATTGGCCAGAAGCGGAA-3'. Pcr conditions were as follows; initial denaturation at 95^{o}C for 5min, followed by 30cycles of 95^{o} C for 30s; annealing at 50^{o} C – 55^{o}C for 30s; and extension at 72^{o} C for 30s. The amplified DNA fragments were purified by using QIAquick PCR Purification Kit (QIAGEN, Valencia, CA, USA) and were sequenced in each direction by using the same primers used for amplification and by using the BigDye Terminator v3.1 Cycle Sequencing Kit on an Applied Biosystems Prism 377 automated sequencer (Applied Biosystems, Foster City, CA, USA).

The sequences at each of the n7 loci were then compared with the sequences of all of the known alleles at those loci in the database at the pneumococcal MLST website (http:spneumoniae.mlst.net). The sequences identical to a known sequence were assigned the same allele number, and non-identities to any known allele sequences were assigned new allele numbers. The allele at each of the 7 loci defines the allelic profile of each strain, as well as its ST. New allelic number or new ST number was assigned by a curator of the pneumococcal MLST database. The relatedness of isolates and known similar strains in the database was determined by constructing a neighbor-joining tree using a program online, Draw Tree Using Own MLST Data, found at the pneumococcal MLST website.

E. Statistical Analysis

Statistical analysis was performed by using SPSS software version 13.0. The Mantel-Haenszel x^2 test was used for trend analysis.

III. RESULTS AND DISCUSSION

The results of this research work are shown in tables below. Table 1 shows the incidence of *Strep pneumoniae* from different samples between January 2009 and July 2010. A total of 250 samples were collected from children in Akure metropolis for isolation purposes and antibiotic surveillance among *Strep pneumoniae*, 41(16%) of the samples were positive while 209(84%) were negative. 34(82%) out of 41 positive samples were isolated from sputum, 4(9%) isolates were from Urine samples, 1 (2%) isolates from blood sample and 2 (7%) isolates from ear-swab. Sixteen 16(40%) were serotype 19A. this was the most common serotype isolated in the study. Table 2 summarized the sexes and age of patients from which positive sample were obtained. The highest numbers of positive samples are from male 28(68%) while isolates obtained from female sample are about 13(32%). Table 3 summarizes the susceptibility pattern of isolates from different samples. The result were interpreted according to the MIC breakpoint recommended by CLS were zones of inhibition >5.0 were assigned as sensitive and those <5.0mm were assigned as resistant.

From urine samples, 3 (75%) isolates were susceptible to Ofloxacin while 1(25%) was less susceptible to Argumentin. Out of 34 isolates from sputum sample 33(97%) were susceptible to Ciprofloxacin and 5(14%) were susceptible to Cloxacillin. The isolate from blood sample was susceptible to both Ciprofloxacin and Gentamycin. Finally, isolates fro ear-swabs were susceptible to Erythromycin and Ciprofloxacin but 1(50%) was susceptible to Ofloxacin, Clindamycin, Gentamycin, Cotrimoxazole, Ampicilin and Cloxacillin. Table 4 summarizes the resistance pattern of isolates obtained from different sample. All isolates from Urine samples showed resistance to Cotrimoxazole, Ampicilin Cloxacillin and Ceftriaxone but less resistance to Ofloxacin. (34)86% of the isolates from sputum samples showed resistance to only Ceftriaxone, (30)83% showed resistance to Cotrimoxazole, Ampicilin, Cloxacillin and Argumentin but they are less resistance to Ciprofloxacin (3%).

The isolates from blood sample showed resistance to almost all the antibiotics used except only Ciprofloxacin and Gentamycin. The two isolates from ear-swab showed resistance to Ceftriaxone and Argumentin while 1 (50%) showed resistance to five antibiotics out of the ten antibiotics tested. The susceptibility patterns of the first nine samples analyzed are shown in the tables below. Table 5 shows the incidence of *S. pneumoniae* isolated from sputum collected in Ekiti State. A total of 135 sputum samples were analyzed, but only 20(16%) of the samples were positive for *S. pneumoniae*. Table 5 shows the incidence of *S. pneumoniae* isolated from sputum collected in Ekiti State. A total of 135 sputum samples were analyzed, but only 20(16%) of the samples were positive for *S. pneumoniae*. Table 6 shows the sensitivity profile of the twenty isolates.

The whole twenty (20) isolates were sensitive to Erythromycin, 17(85%) were sensitive to ciprofloxacin, 15 (75%) were sensitive to Ofloxacin, 10(50%) were sensitive to Gentamycin, 9(45%) were sensitive to Ceftriaxone, 4(20%) were sensitive to Clindamycin, and 1(5%) was sensitive to Ampicilin. Table 7 shows the resistance pattern of the twenty isolates to ten antimicrobial agents used. All the twenty (20) isolates were resistant to Cotrimoxazole and Argumentin followed by Ampicilin, 16(80%) were resistant to Clindamycin, 11(55%) were resistant to Ampicilin, 10(50%) were resistant to Gentamycin, 5(25%) were resistant to Ofloxacin, and 3(15%) were resistant to Ciprofloxacin. All the isolates exhibit multi-drug resistance by showing resistance to more than one antibiotic.

Table 1: Incidence of *Streptococcus pneumoniae* in Ondo State from different sample (January 2009 and July, 2010)

Group	Samples	Total number collected	Positive Samples, n (%)	Negative Samples, n (%)
1	Urine	10	1(10)	9 (90)
2	Sputum	25	4 (16)	21 (84)
3	Sputum	25	3 (12)	22 (88)
4	Urine	10	1 (10)	9 (90)
5	Sputum	30	4 (12)	26 (88)
6	Sputum	30	3 (9)	27 (91)
7	Sputum	20	4 (20)	16 (80)
8	Sputum	30	7 (21)	23 (79)
9	Blood	10	1 (10)	9 (90)
10	Sputum	40	9 (22)	31 (78)
11	Urine	10	2 (20)	8 (80)
12	Ear-swab	10	2 (20)	8 (80)
Total		**250**	**41 (16)**	**209 (84)**

Table 2: Relationship between positive samples, sexes and ages of patients

Sample (n)	Sex n (%)		Age (years)	
	Male	Female	≤13	>13
Urine (4)	2 (50)	2 (50)	-	4 (100)
Sputum (34)	24 (70)	10 (30)	1 (2)	33 (98)
Blood (1)	1 (100)	-	-	1 (100)
Ear-swab (2)	1 (50)	1 (50)	-	2 (100)
Total	28 (68)	13 (32)	1 (2)	40 (98)

Table 3: Sensitivity pattern of *Streptococcus pneumoniae* isolated from Ondo State to convectional antibiotics n (%)

Sample Number	OF	E	CIP	CD	GN	CX	CO	AP	FX	AU
Urine (4)	3 (75)	2 (50)	2 (250)	2 (50)	2 (50)	1(25)	-	-	-	1 (25)
Sputum (34)	21(61)	25(73)	33 (97)	16 (47)	28 (82)	5 (14)	6 (17)	6(17)	12 (35)	6 (17)
Blood (1)	-	-	1 (100)	-	1(100)	-	-	-	-	-
Ear-Swab (2)	1 (50)	2(100)	2 (100)	1 (50)	1 (50)	-	1 (50)	6(17)	-	-

OF-ofloxacin, E- erythromycin, CIP- ciprofloxacin, CD- Clindamycin, GN- Gentimycin, CX, Cloxacillin, CO- Cotrimoxazole, AP- ampicilin, FX- Ceftriaxone, AU- Argumentin

Table 4: Resistant pattern of *Streptococcus pneumoniae* isolated from Ondo State to convectional antibiotics n (%)

Sample/ number	OF	E	CIP	CD	GN	CX	CO	AP	FX	AU
Urine (4)	1 (25)	2 (50)	2 (50)	2 (50)	2 (50)	3 (75)	4 (100)	4 (100)	4 (100)	3 (75)
Sputum (34)	13 (39)	9 (27)	1(3)	18 (53)	6 (18)	29 (86)	28 (83)	28 (83)	22 (65)	28 (83)
Blood (1)	1 (100)	1 (100)	-	1 (100)	-	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)
Ear-Swab (2)	1 (50)	-	-	1 (50)	1 (50)	2 (100)	1 (50)	1 (50)	2 (100)	2 (100)

OF-ofloxacin, E- erythromycin, CIP- ciprofloxacin, CD- Clindamycin, GN- Gentimycin, CX, Cloxacillin, CO- Cotrimoxazole, AP- ampicilin, FX- Ceftriaxone, AU- Argumentin

Table 5: Incidence of *Streptococcus pneumoniae* in sputum samples Ekiti State

Batch Collection	Total number Collected	Positive Sample %	Negative Sample %
1	11	2 (2)	9 (7)
2	15	3 (2)	12 (9)
3	20	2 (2)	18 (13)
4	10	1 (1)	9 (7)
5	25	4 (3)	21 (16)
6	23	4 (3)	19 (14)
8	19	3 (2)	16 (12)
9	12	1 (1)	11 (8)
Total	**135**	**16**	**86**

Table 6: Antimicrobial **susceptibility(S) and resistance(R)** of clinical isolates of *S. pneumoniae* isolated from Ekiti State (n=20)

Isolate	CIP	GN	CX	CO	FX	AP	CD	AU	OF	E
S	17	10	0	0	9	1	4	0	15	20
R	3	10	20	20	11	19	16	20	5	0
S%	85	50	0	0	45	5	20	0	75	100
R%	15	10	100	100	55	95	50	100	25	0

OF-ofloxacin, E- erythromycin, CIP- ciprofloxacin, CD- Clindamycin, GN- Gentimycin, CX, Cloxacillin, CO- Cotrimoxazole, AP- ampicilin, FX- Ceftriaxone, AU- Argumentin

Table 5 shows the incidence of *S. pneumoniae* encountered in sputum sample collected in Ekiti state. A total of 135 sputum samples were analyzed, but only 20(16%) of the samples were positive for *S. pneumoniae.*

Table 6 shows the sensitivity and resistance profile of the twenty isolates. The whole twenty(20) isolates were sensitive to Erythromycin, Seventeen(17) isolates were sensitive to ciprofloxacin, fifteen(15) isolates were sensitive to Ofloxacin ,ten (10)isolates were sensitive to Gentamycin, nine (9)isolates were sensitive to Ceftriaxone, four(4) isolates were sensitive to Clindamycin, and one(1) isolate was sensitive to Ampicilin . Table 6 shows the resistance pattern of the twenty isolate to ten antimicrobial agents used. All the twenty (20) isolates were resistant to Cotrimoxazole and Argumetin followed by Ampicilin sixteen (16) isolates were resistant to Clindamycin, eleven (11) isolates were resistant to Ampicilin, ten (10) isolates were resistant to Gentamycin, five (5) isolates were resistant to Ofloxacin, and three (3) isolates were resistant to Ciprofloxacin. All the isolates exhibit multi-drug resistance by showing resistance to more than one antibiotic.

Out of the135 sputum samples analyzed for *S pneumoniae,* only twenty (20) were positive for the bacteria. The twenty isolates were subjected to antimicrobial susceptibility test using ten antibiotics. The susceptibility of the 20 isolates to the ten antimicrobial agents is shown in table 6. Seventeen isolates (85%) were sensitive to ciprofloxacin, fifteen (75%) isolates were sensitive to Ofloxacin, ten (50%) isolates were sensitive to Gentamycin, one (5%) isolate was sensitive to Ceftriaxone, and the whole twenty isolates (100%) were sensitive to Erythromycin.

The resistance pattern shows that 19 (95%) isolates were resistant to Ampicilin, 16 (80%) isolates were resistant to Clindamycin, 11 (55%) isolates were resistant to Ceftriaxone, ten (50%) isolates were resistant to Gentamycin, 5 (25%) isolates were resistant to

Ofloxacin, 3(15%) isolates were resistant to ciprofloxacin, the whole isolates are resistant to Cotrimoxazole and Argumentin. From this work, the most active antibiotic tested was Ciprofloxacin (92%), Gentamycin (78%), Erythromycin (70%), Ofloxacin (60%) and Clindamycin (46%).

The organisms also show complete resistance to Cotrimoxazole and Argumentin followed by Ampicilin and Clindamycin. The majority (82%) of the isolates were from respiratory tract specimen, the remainder having been recovered from specimens from other sites. This correlates with the study of Kenneth (2008) who state that *Strep pneumoniae* is part of the normal inhabitant of upper respiratory tract flora. 83% of the isolates were resistant to Cotrimoxazole, Ampicilin, Cloxacillin, Argumentin and 71% to Ceftriaxone. According to the study carried out by Rohani *et al*. (2003), Ceftriaxone was recognized as the most active among the drugs evaluated which is concluded to be an alternative to penicillin. But this study shows that the rate of resistance to Ceftriaxone is very high (71%) this could result from abuse of Ceftriaxone. The high resistance of *S. pneumoniae* to some of the antibiotics used may result from the uncontrolled and frequent use of these antibiotics and its derivatives and/or non-compliance of patients with respect to antibiotics dosage and duration. It may also be because almost all the isolates were respiratory tracts isolates which have been found to be more resistant than isolates from other sources in previous studies. The increasing resistance rates may cause serious difficulties in the treatment of *pneumococcal* infections; therefore clinicians prescribing therapy for this infection should take into consideration the trend of decreased sensitivity to antibiotics among *pneumococcal*. Since the resistance of Ceftriaxone and some other antibiotics among *pneumococcal* increases in this study, a number of alternatives are available, the most active of those evaluated here being Ciprofloxacin and Gentamycin.

Multilocus sequence typing (MLST) of the 57 *S. pneumoniae* isolates showed that 38(67%) were ST-320; 8(14%) were ST-199; 5(9%) were unreported STs now assigned ST-2722 and ST-2704; 2(13%) were ST-1673; and 1(6%) each of the remaining 3 was ST-1451, ST2265, and ST-63. The total number of those typed as ST-320 were multidrug-resistant, however, 1 (2%) was the newly assigned ST2722. The ST-2722 strain appears to have resulted from a mutation identified in the *recP* gene that coincides with acquisition of multidrug resistance, including Ceftriaxone (Qingfu *et al.,* 2009). The clinical importance of such strain is potentially high because empiric treatment of suspected and even proven pneumococcal infections typically relies on the efficacy of Ceftriaxone. Continuous monitoring of serotype distribution in this population will ensure that available vaccines can provide adequate coverage of circulating pneumococcal serotypes.

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Cloud Computing Adoption in Nigeria: Challenges and Benefits

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Abstract- Growing number of IT industries in the world are fast adopting cloud computing which has created the access needed by users and business organisation to have on-demand access to shared resources and applications online. The developed economies have long embraced the sturdy and cost effective cloud technology into their businesses leaving behind the developing countries who are still struggling to reap the benefits of this technology. The objective of this paper is to highlight the benefits of adopting cloud comput¬ing and highlight the challenges in adopting and utilizing services offered by cloud computing. Recommendations were also made on how ease the adoption of the emerging technology in Nigeria.

Index Terms- Cloud, Computing, Internet, IT, Adoption, Technology

I. INTRODUCTION

The advent of cloud computing has greatly assisted most businesses and organisations to deliver quality services to their customers via the internet. The National Institute of Standards and Technology defines cloud computing as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell, 2009). Similarly, Priya (2011), also defined Cloud computing as a technology which provide you a service through which you can use all the computer hardware and software sitting on your desktop, or somewhere inside your network but they are not actually installed on your computer, it is provided for you as a service by another company and accessed over the Internet. Dave Cleveland (2012), in his definition defined Cloud computing as a technology that uses the Internet alongside the central remote servers to maintain data and application. Hence, cloud computing is a fast emerging technology that permits users to store files, share files and applications on the Internet.

Slaheddine (2012), states that the remarkable development of cloud computing in recent years is increasingly sparking the interest of Internet and IT users seeking to derive the greatest benefit from the services and applications available on line via the web in service-on-demand mode with per-usage billing. Cloud computing offers a new economic model for ICTs – a model which heralds new modes of investment in, and operation of, IT resources. With cloud computing, organizations, institutions and companies no longer need to invest heavily in such resources, which are of necessity limited and require burdensome and costly internal management, having instead the option to migrate to a cloud model enabling them to purchase or lease resources on line. This model frees them from internal management costs, the IT resources being administered by the cloud computing provider.

The accessibility of services such as storage, shared files and applications on the internet through cloud computing has ease the burden of users acquiring hardware components by simply paying for the services and resources used online. Cloud computing will be particularly more useful to companies yarning to provide quality services to their customers whenever it is demanded.

Cloud computing, considered by some to be the technological revolution of the twenty-first century, could go a long way towards resolving such issues, provided the corresponding technology is implemented on solid bases that inspire confidence in users both domestic and foreign (Slaheddine, 2012).

According to Puja (2012), there are various applications of cloud computing in today's network world. Many search engines and social websites are using the concept of cloud computing like www.amazon.com, hotmail.com, facebook.com, linkedln.com etc.

Heiser et al (2008), states that for an organization to be successful at using an external service (PaaS, IaaS, SaaS), proper risk assessment must be carried out to identify the security risks, privacy and compliance risks. The following should be evaluated when carrying out the assessment: privileged user access, compliance, location of data, data segregation, and recovery.

II. LITERATURE REVIEW

It is useful to think of a cloud as a collection of hardware and software that runs in a data centre and enables the cloud computing model (Armbrust et al, 2009).

According to Youseff et al (2008), Cloud Computing can be considered a new computing paradigm that allows users to temporary utilize computing infrastructure over the network, supplied as a service by the cloud-provider at possibly one or more levels of abstraction. Armbrust et al (2009), also states that Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. The services themselves have long been referred to as Software as a Service (SaaS). The data center hardware and software is what we will call a Cloud. When a Cloud is made available in a pay-as-you-go manner to the general public, we call it a Public Cloud; the service being sold is Utility Computing. We use the term Private

Cloud to refer to internal data centers of a business or other organization, not made available to the general public. Thus, Cloud Computing is the sum of SaaS and Utility Computing, but does not include Private Clouds (Armbrust et al, 2009).

The idea of cloud computing is not actually new as it goes back several decades. It was pioneered by Professor John McCarthy, a well-known computer scientist who initiated time-sharing in late 1957 on modified IBM 704 and IBM 7090 computers. McCarthy expected that some corporations would be able to sell computing resources through the utility business model. Soon enough, different organizations paid for their use of computing resources (storage, processing, bulk printing, and software packages) available at service bureaus cited in Qusay (2011).

Cloud computing is simply a medium for distributing on-demand services, infrastructure, and application software using the network. The major types of cloud deployment models as seen figure 1 are:

- *Public cloud*: Cloud infrastructure shared or accessible by all, with applications and services delivered through the Internet;
- *Private cloud*: Restricted cloud infrastructure operated by or on behalf of a specific organization, available exclusively to approved users affiliated with that organization; cloud services are delivered using a private network;
- *Community cloud*: Multitenant, private cloud infrastructure that supports a specific community, consisting of two or more organizations and
- *Hybrid cloud*: Combination of two or more of the preceding cloud types.

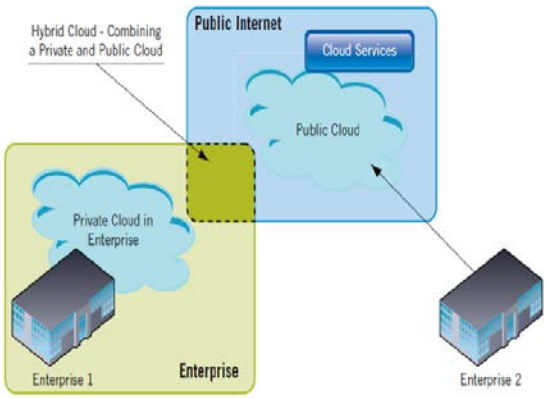


Figure 1: Cloud Computing Development Model

In the past few years there have been tremendous increases in use of cloud computing in both business, government and even educational sector, this increase was due to world wide availability of internet and high competition in the cloud market that brought about utilising computing resources at minimum cost (Rahimli, 2013).

Cloud computing is already been used by various internet users, from Yahoo mail, Google mail, Hotmail and free office applications such as Google apps, Gmail, drop box and numerous other software as a service (SaaS) (2009). Numerous organisations are now adopting cloud computing because of the cost effective on-demand services it delivers.

Buyya et al (2009) states that Cloud computing has been cited as 'the fifth utility' (along with water, electricity, gas, and telephone) whereby computing services are readily available on demand, like other utility services available in today's society. Similarly, Voas et al (2009) also identified cloud computing as the next computing paradigm that follows on from mainframes, PCs, networked computing, the internet and grid computing. These developments are likely to have similarly profound effects as the move from mainframes to PCs had on the ways in which software was developed and deployed.

In an article recently published in the journal "Les Afriques", Raphaël Nkolwoudou, Associate Counsel Azaniaway Consulting cited in Slaheddine (2012), explains that cloud computing is suited to the African continent by reason of the concentration of infrastructures, availability of IT competencies and ease of implementation. There is, however, one prerequisite, which is to speed up the development of electronic communication infrastructures. He adds that among the specific benefits of cloud computing in Africa, two in particular are liable to make a significant contribution to reducing the digital divide, namely:

i. The ability to have immediate access to the latest innovations;
ii. The possibility for an organization to do away with heavy investment in infrastructure, particularly where computation centres are concerned, given the unreliability of the electric power supply in Africa.

According to a survey carried out by Cisco and World Wide Worx (2013), the study found that 50% of South Africa's medium and large businesses were using cloud services, compared to 48% in Kenya and 36% in Nigeria. South Africa currently leads the continent in Cloud computing uptake, but appears to not be growing fast enough to retain that position in the years to come. For Kenya, in addition to the 48%, another 24% of organisations in Kenya were considering adopting within a short while.

Table 1: Cloud Service

Country	% Medium and Large businesses using Cloud Services
Kenya	48
Nigeria	36
South Africa	50

Cisco and World Wide Worx (2013) study also revealed that Private cloud was the most popular in 2013 among organizations surveyed currently deploying this compared followed by Hybrid cloud and the remaining companies opting for the Public cloud as seen in table 2. The most popular category for cloud use was storage (28% of companies). In 2014, this trend is set to continue with 32% of companies opting for the Private Cloud compared to 18% for Hybrid Cloud and 16% for Public Cloud.

Table 2: Cloud Usage

	% of Cloud usage
Hybrid	13
Private	25
Public	7

The most significant finding from the study was that, while South Africa currently leads the continent in Cloud uptake, it is about to be overtaken dramatically by Nigeria. A significant 44% of Nigerian businesses say they will embrace the Cloud in 2014, bringing the total in that country to 80% by the end of 2014. This compares to 24% of organisations in Kenya and only 16% in South Africa saying they will be taking up Cloud.

According to CompTIA 4th Annual Conference Full Report (2013), it states that as cloud components are becoming more prevalent in IT architectures, more companies are relying on cloud computing for business processes such as storage (59%), business continuity/disaster recovery (48%), and security (44%). This strong usage and strong market indicators show that cloud computing is becoming a default part of the IT landscape. Although adoption rates are high and market numbers are positive, there is still confusion related to cloud computing. This confusion will hinder end users and channel firms from fully transforming their IT practices and offerings. Only 46% of channel firms with cloud offerings described their cloud business as completely mature—an established, strategic part of business plans.

According to a white paper report from Dialogic (2010), cloud computing has a variety of characteristics, with the main ones being:

i. *Shared Infrastructure* — Uses a virtualized software model, enabling the sharing of physical services, storage, and networking capabilities. The cloud infrastructure, regardless of deployment model, seeks to make the most of the available infrastructure across a number of users.

ii. *Dynamic Provisioning* — Allows for the provision of services based on current demand requirements. This is done automatically using software automation, enabling the expansion and contraction of service capability, as needed. This dynamic scaling needs to be done while maintaining high levels of reliability and security.

iii. *Network Access* — Needs to be accessed across the internet from a broad range of devices such as PCs, laptops, and mobile devices, using standards-based APIs (for example, ones based on HTTP). Deployments of services in the cloud include everything from using business applications to the latest application on the newest smart phones.

iv. *Managed Metering* — Uses metering for managing and optimizing the service and to provide reporting and billing information. In this way, consumers are billed for services according to how much they have actually used during the billing period.

III. Architectures and Deployment Models

According to Kim-Kwang (2010), Cloud architectures can be broadly categorised into:

- *Infrastructure as a Service (IaaS)*: This is the foundation of cloud services. It provides clients with access to server hardware, storage, bandwidth and other fundamental computing resources. For example, Amazon EC2 allows individuals and businesses to rent machines preconfigured with selected operating systems on which to run their own applications.
- *Platform as a Service (PaaS)*: This is built upon IaaS and provides clients with access to the basic operating software and optional services to develop and use software applications (eg database access and payment service) without the need to buy and manage the underlying computing infrastructure. For example, Google App Engine allows clients to run their web applications (ie software that can be accessed using a web browser such as Internet Explorer over the internet) on Google's infrastructure.
- *Software as a Service (SaaS)*: This is built upon the underlying IaaS and PaaS provides clients with integrated access to software applications. For example, Oracle SaaS Platform allows independent software vendors to build, deploy and manage SaaS and cloud-based applications using a licensing economic model. Here, users purchase a license and support for components of the Oracle SaaS Platform on a monthly basis.

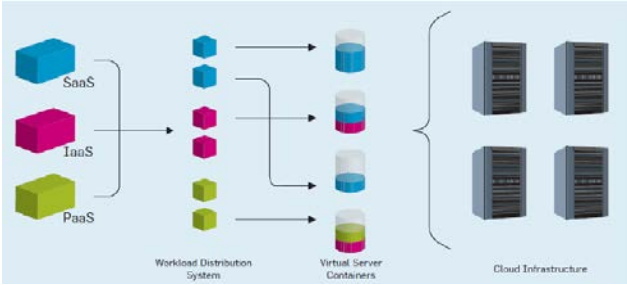


Figure 2: Service Delivery Model (Garrison et al (2012))

Table 3 below shows the different technologies used in different cloud computing service types.

Table 3: IaaS, PaaS and SaaS

Service Type	IaaS	PaaS	SaaS
Service Category	VM Rental, Online Storage	Online Operating Environment, Online Database, Online Message Queue	Application and Software Rental
Service Customization	Server Template	Logic Resource Template	Application Template
Service Provisioning	Automation	Automation	Automation
Service accessing and Using	Remote Console, Web 2.0	Online Development and Debugging, Integration of Offline Development Tools and Cloud	Web 2.0
Service monitoring	Physical Resource Monitoring	Logic Resource Monitoring	Application Monitoring
Service level Management	Dynamic Orchestration of Physical Resources	Dynamic Orchestration of Logic Resources	Dynamic Orchestration of Application
Service resource Optimization	Network Virtualization, Server Virtualization, Storage Virtualization	Large-scale Distributed File System, Database, Middleware etc	Multi-tenancy
Service measurement	Physical Resource Metering	Logic Resource Usage Metering	Business Resource Usage Metering

used in cloud computing are: automation, virtualization, dynamic orchestration, online development, large-scale distributed application operating environment, Web 2.0, Mashup, SOA and multi-tenancy etc. Most of these technologies have matured in recent years to enable the emergence of Cloud Computing in real applications (Jinzy, 2010).

In many respects cloud computing is a relatively new phenomenon, particularly in the consumer space where the small amount of storage available on mobile devices sparked a need for access to photos, music, videos and documents without necessarily storing them locally. For business, however, SaaS has been available for around 15 years in areas such as email and internet banking (Burton, 2014).

IV. Security Issues in Adopting Cloud Computing Model

Heiser et al (2008) identified seven security issues that need to be addressed before enterprises consider switching to the cloud computing model. They are as follows:

i. *Privileged user access* - Information transmitted from the client through the Internet poses a certain degree of risk, because of issues of data ownership; enterprises should spend time getting to know their providers and their regulations as much as possible before assigning some trivial applications first to test the water.

ii. *Regulatory compliance* - Clients are accountable for the security of their solution, as they can choose between providers that allow to be audited by 3rd party organizations that check levels of security and providers that don't.

iii. *Data location* – Depending on contracts, some clients might never know what country or what jurisdiction their data is located.

iv. *Data segregation* - Encrypted information from multiple companies may be stored on the same hard disk, so a mechanism to separate data should be deployed by the provider.

v. *Recovery* - Every provider should have a disaster recovery protocol to protect user data.

vi. *Investigative support* - If a client suspect's faulty activity from the provider, it may not have many legal ways pursue an investigation.

vii. *Long-term viability* - Refers to the ability to retract a contract and all data if the current provider is bought out by another firm.

V. Challenges of Cloud Computing Adoption in Nigeria

Armbrust et al (2009) highlighted some challenges in cloud computing that included technical challenges relating to the adoption of cloud computing, such as availability of service and

data lock-in. The lack of scalable storage, performance unpredictability and data transfer bottlenecks are also obstacles that could limit the growth of cloud computing.

There are numerous challenges that have hindered the acceptance and uses of cloud computing in Nigeria, prominent among them are:

i. Poor quality or unavailability of internet service can hinder prompt availability of data.
ii. Fear of hackers
iii. Companies are not contented that there records will be giving the utmost privacy.
iv. Lack of technical skills in the deployment of cloud computing service.
v. Lack of flexibility of the policy or legal framework for cloud computing is discouraging a number of companies to adopt cloud computing.
vi. Lack of detailed information and awareness of cloud computing services is hampering more clients going into cloud technologies.
vii. The need for current ICT infrastructures and social amenities needed to establish cloud computing data centres across the country.
viii. The current insecurity problem facing the nation will also hinder cloud technologies providers from investing in the country.

VI. Benefits of Cloud Computing in Nigeria

Angaye (2012) states that cloud computing services are categorized into Software service, Infrastructure service and Platform service. He further revealed that, Software service alone was estimated to generate over $21.3 billion globally by 2015, and that software developers in Nigeria could tap into it and transform the Nigerian economy, if given the right tools and the enabling environment in terms of putting the right infrastructure in place.

The developed countries now based their entire multi-billion dollar business models on putting information on the net, and storing the data in the cloud. Cloud computing offers worldwide access to virtually unlimited processing power, new storage capabilities and capabilities that are being used to create virtual web platforms, where humanity today and in the future will live out large parts of their everyday lives, educating, working, shopping and talking to private networks of friends and relatives (Uwaje, 2012).

Kuyoro et al (2012) states that cloud computing enables the measuring of used resources as is the case in utility computing which can be used to provide resources efficiency information to the cloud provider and can be used to provide the consumer a payment model based in “pay-per-use”.

Hinchcliffe (2009) states that, with Cloud computing, payment is made for only software used. Some software on the Cloud is free. For example, most SaaS solutions have a pay-as-you-go pricing model instead of a large up-front investment. Such pricing models allow end users to pay only for what they use thus freeing up resources such as time and money for other more important (core) business activities. It is obvious cloud computing has helped in reducing cost, ease IT intricacies and enhance the availability of update technology.

Cloud computing is fast having huge impact on businesses today (Sourya, 2012). According to International Data Corporation (IDC) 2012 report, by 2015 cloud computing would have created about fourteen million jobs globally. As at 2011, cloud computing generated $400 billion in revenue and created 1.5 million new jobs (IDC, 2012). From Figure 3, the proposed number of jobs by cloud computing will surpass 8.8 million.

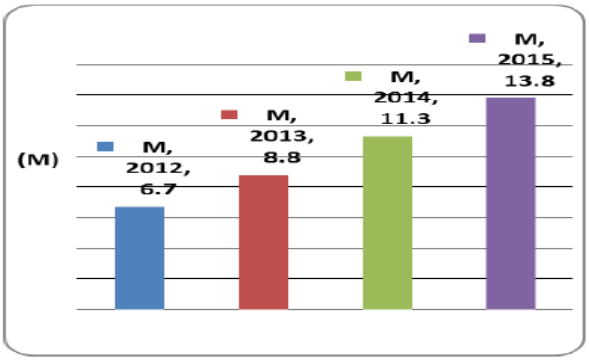
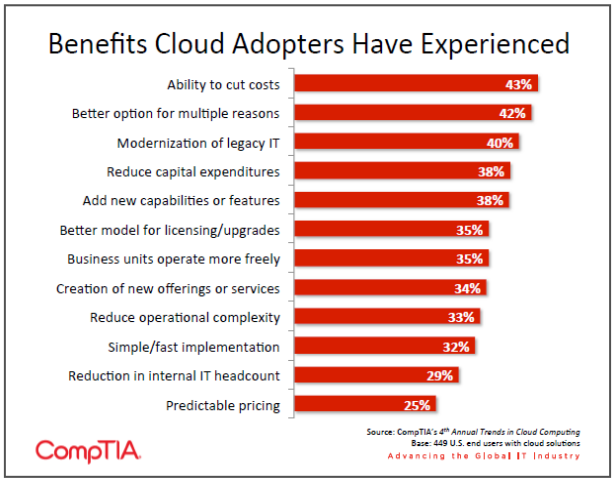


Figure 4: Projected Data for the Number of Jobs Created By Cloud Computing from 2012-2015: Source: IDC, 2012

Table 4 below reveals the result of the research conducted by CompTIA (2013) on the benefits cloud adopters have experienced after the adopting the technology.

Table 4: Benefits Cloud Adopters Have Experienced



VII. TRENDS IN CLOUD COMPUTING

According to an article in regalix.com cited in Raghavendra et al (2015), there are Five Cloud Computing Trends that will drive cloud strategies through 2015 and 2016 and they are:

i. *Hybrid Cloud Computing:* Hybrid Cloud means using a combination of public or private cloud services. As it is proved from some recent developments, hybrid cloud computing is set to become an imperative, in the form of a unified integrated cloud model, consisting both internal and external cloud platforms that can be leveraged based on specific business requirements. Data Scientists and Cloud Experts recommend that organizations should make immediate efforts on

integrating the application and dynamic data infrastructures to form a hybrid solution.

ii. *Cloud Services Brokerage:* Cloud Service Brokerage (CSB) has graduated from being an option to a key strategic factor for users and IT alike. CSB involves a service provider playing a key role in assisting the consumption of cloud computing. CSB as a trend is predicted to gather speed over the next couple of years as users choose to use cloud services, independent of IT bureaucracy.

iii. *Cloud Friendly Decision Frameworks:* Many data Scientists now agrees that Cloud Computing offers a platform of completely indispensible features and benefits, like cost-effective use-based models of IT consumption and service delivery, greater agility and lesser complexity. It also allows the IT to focus its resources on delivering new services that fuel innovation and accelerate the business.

iv. *Application Design Must Be Cloud-Optimized:* Now the way IT Sector go about cloud computing is to basically just transfer their whole organization work-loads to the cloud. This is a good technique where the workloads need a variable supply of resources. But to fully extract the potential of cloud model to deliver standard world class applications, we need to start developing applications that are cloud-optimized.

v. *Datacenters Need To Adopt Implementation Models of Cloud Service Providers:* In a cloud computing environment, the data center and other details are handled by the service provider while the organization only concerns itself with consumption of services. But as enterprises carry on building/expanding their own data centers, they will be far better served applying the cloud computing implementation models of Cloud Service Providers to increase performance, efficiency, and agility.

VIII. CONCLUSION

Cloud computing technology has no doubt changes the way both the private and public organisations deliver quality services to its teaming customers. This study revealed that the adoption of cloud computing in developing countries like Nigeria has numerous benefits which includes use of shared resources which has helped in lowering cost for most organisations using the cloud technology, provision of on-demand self-service, accessing numerous valuable applications from the cloud service provider, it is highly efficient, reliable and more secured. The major challenges in adopting this technology in the country is the problems of power supply, poor internet service, fear of hackers and the insecurity problem facing the country which has hindered cloud service providers to invest in the country and also businesses in adopting cloud computing.

IX. RECOMMENDATIONS

The following recommendations were made to enhance the adoption and growth of cloud computing usage in Nigeria:

i. Both the private and public organisations in the country should be thoroughly enlightened by the cloud service providers on advantages of cloud computing services and some of its shortcomings. This will help get rid of the fear of most organisations in adopting cloud computing.

ii. The security challenges Nigeria is currently facing should be checked to encourage more cloud service providers to invest in the country to complement the few already in place and increase competition.

iii. Better internet service and constant power supply is needed to have seamless access to the cloud service. This will also lessen the cost of services provided.

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An Analytical Study of Heavy Metal Concentration in Soil of an Industrial Region of Chhattisgarh, central India

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Abstract- Major generators of the industrial solid wastes are coal based thermal power plants and integrated iron and steel industries. A large amount of industrial solid wastes like fly ash and slag are yet to be utilized and still remains in the form of uncontrolled dumping sites in the study area. Leachate pollution should get appropriate attention as it may be a source of heavy and toxic metal in soil and it is possible to percolate and may lead to water pollution in the surroundings water sources. In the present investigation the soil samples were collected from the identified area for heavy metal analysis. The heavy metal pollution of the soil samples resulted that, concentration of certain heavy metals is above permissible limit. The heavy metals like Cr, Cd, Fe, Mn, and Pb, shows highest concentration, while metals such as Cu, Cd and Pb shows low concentration. The heavy metal pollution indicates that leachate produced by uncontrolled and unscientific disposal of industrial solid wastes contaminates soil samples of the identified area.

Index Terms- Industrial solid waste, Leachate, Heavy metals, Soil, Disposal, Fly ash

I. INTRODUCTION

In recent years, with the development of the global economy, both the type and content of heavy metals in the soil caused by human activities have gradually increased, resulting in the deterioration of the environment (Han et al., 2002; Sayyed and Sayadi, 2011; Jean-Philippe et al., 2012; Raju et al., 2013; Prajapati and Meravi, 2014; Sayadi and Rezaei, 2014; Zojaji et al., 2014). Heavy metals are highly hazardous to the environment and organisms. It can be enriched through the food chain. Once the soil suffers from heavy metal contamination, it is difficult to be remediated (Chao et al., 2014). Inorganic residues in industrial waste cause serious problems as regards their disposal. They contain metals which have high potential of toxicity. Industrial activity also emits large amounts of arsenic fluorides and sulphur dioxide (SO_2) (Richardson et al., 2006). Copper, mercury, cadmium, lead, nickel, arsenic are the elements which can be accumulated in the soil, if they get entry either through sewage, industrial waste or mine washings. Some of the fungicides containing copper and mercury also add to soil pollution. Smokes from automobiles contain lead which gets adsorbed by soil particles and is toxic for the plants. The toxicity can be reduced by building up soil organic matter, adding lime to soils and keeping the soil alkaline (Zorge et al., 1996).

Variety of trace elements, some of them are potentially toxic and are transferred to the surrounding environment through different pathways (Goodarzi et al. 2008). The disposal of such huge quantity of fly ash can be a major problem, which leads to the leaching of pollutants into surface water and soil. The impact of coal ash leachates on receiving surface waters sources, apart from increased elemental concentrations cause changes in water pH with implications for trace element mobility (Carlson and Adriano, 1993). Solid waste disposal sites are potentially serious sources of pollution to the environment, especially when located very close to water sources and operated haphazardly. The high pollution potential of these sites is due to the fact that they usually contain almost all types of pollutants from the source community. The contaminants can leach out through the soil, contaminating the soil itself, ground water, and surface water. In the study reported here, environmental pollution impacts of a solid waste disposal site were investigated (Gabriel et al., 2009).

About 70% of India's annual coal production is used in about 72 power generating plants and produce more than 90 million tons of coal ash per year. It is likely that it may cross over 100 million tons during 2001–2010 AD (Muraka et al., 1987). Major industrial regions of Chhattisgarh have become the power generation and steel hubs of central India. The disposal and dumping of the industrial solid wastes may leads to leaching problem and resulted in the heavy metal contamination of the soil (http://en.wikipedia.org). The major issues of concern for fly ash and steel slag wastes are unscientific dumping sites are surrounded very close to the populated area. These wastes are considered harmful and may create environmental hazard due to release of leachate to the human health and also soil and water. Utilization of fly ash and steel slag can reduce the extent of the Leachate problems (http://industries.cg.gov.in). Slag is generated in an integrated steel plant, 2 to 4 tonnes of wastes (including solid, liquid and gas) are generated for every tonne of steel production. With increasing capacities, disposal of large quantities of slag becomes a big environmental concern and a critical issue for steel makers. Also the leached metals uptake by the plants is affected by the soil properties (http://www.flyash.indiaflyash).The environmental impact of coal fly ash has been fully recognized. Most ash disposal methods ultimately lead to the dumping of fly ash on open land. Irregular accumulation and inappropriate disposal of fly ash will lead to its disposal over vast areas of land, with resultant degradation of the soil and danger to both human health and the environment (Z.T. Yao et al., 2015).

A leachate is a liquid that, in the course of passing through matter, extracts soluble or suspended solids, or any other component of the material through which it has passed (http://en.wikipedia.org). Leachate is the fluids generated by the release of excess water from solid waste, and by seepage of rain water through a stratum of solid waste that is basically found in a state of decay (Uguccioni and Zeiss 1997). Leachate production deals with the creation of contaminated liquid at the base of a landfill. It involves the elements of a water balance in which precipitation either runs off from the landfill or infiltrates. Some infiltration will evapotranspire, some may be stored within the landfill, and the balance becomes percolate and eventually leachate. Landfill technology has evolved from the open, burning dump to highly engineered sites designed which can minimize tile impact of contaminants in the waste on the adjacent environment (*Farquhar, 1988).* The key influences on leachate generation are rainfall and waste moisture content (Kortegast et al., 2007).

The landfill leachates have proved to be toxic and recalcitrant; land filling still remains one of the main methods for municipal and industrial solid waste disposal (Lopez et al., 2004). Furthermore, landfill leachate generation remains continuous when water comes in contact with the solid waste. The discharge of landfill leachate can lead to serious environmental problems, since leachate contains four groups of contaminants: dissolved organic matters; inorganic compounds such as ammonium, calcium, magnesium, sodium, potassium, iron, sulphates, chlorides and heavy metals such as cadmium, chromium, copper, lead, zinc, nickel; and xenophobic organic substances (Kjeldsen et al., 2002). Heavy metals present in leachate can migrate away from the disposal site boundaries and may constitute a serious pollution threat for the water table and the soil around the landfill (Matejka and Rinke, 1999 ; Zairi et al., 2004). The impact of landfill leachate on the surface and groundwater has given increase to a number of studies in recent years (Lopez et al., 2004). Soil is sink for the removal of contaminants from industrial wastes including FA, which may comprise of many of the toxic metals like As, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, V, Zn, etc. These elements are found either on the surface of the ash particles, in the aluminosilicate matrix phase, or in both (Smith, 1987). The toxic elements of concern in Indian FAs are generally present in lower concentrations than those found in ash from other parts of the world, and well within the limits prescribed for soil application of waste materials. Trace metals (e.g., As, B, Cd, Co, Cr, Cu, Hg, Ni, Pb, Se, V, Zn, U, Th, and Cs) in FA are considered as potential elements of environmental concern; their concentration level and mobility decide their concern, safe disposal, and utilization (Saraswat P. K. and Chaudhary K., 2014).

II. Materials and Methods:

The study area – Chhattisgarh

Chhattisgarh is a state in Central India. It is the 10th largest state in India, with an area of 135,190 km^2 (52,200 sq mi). With a population of 25.5 million, Chhattisgarh is the 16^{th} most-populated state of the nation. It is a source of electricity and steel for India. Chhattisgarh accounts for 15% of the total steel produced in the country. Chhattisgarh is one of the fastest-developing states in India. Chhattisgarh is rich in minerals. It produces 20% of the country's total cement produce. It ranks first in the nation for coal production and second in reserves, third in iron ore production and first in tin production. (http://en.wikipedia.org/).

The soil samples were collected from sampling site - 1 and 2, located about 1.5 km from disposal sites of slag and fly ash, at different horizontal and depth by removing the top layer of about 30 cm. All the samples are labeled properly for the identification of sources in thick quality polythene bags and are immediately brought to laboratory for further analysis. The heavy metals can pollute the surface water sources due to leachate released from the dumps and may be transported to water bodies and soil due to the presence of moisture available in the atmosphere and rain water.

Figure 1: Location of study area

Digestion of soil: The samples were first air dried, then placed in electric oven at a temperature of 40 °C approximately for 30 minutes. They were then homogenized which was previously ground and sieved through IS sieves of stainless steel 2 mm mesh. A 0.1g sample is weighed out and transferred to reaction vessel. 2.0 ml of concentrated nitric acid and 5.0 ml of concentrated hydrochloric acid were then added to each vessel. Vessels then placed in the rotor and the rotor is microwave at the given instrument condition. At the end of the microwave program, the vessels were allowed to cool for a minimum of 25 minutes before removing them from the microwave system. The vessels were carefully uncapped and the digests were filtered through Whatman No. 41 filter paper (or equivalent) and the filtrate was collected in a 100-mL volumetric flask, the volume was adjusted to 100 ml with 0.5% HNO_3.

To know the level of concentration of selected elements in study area due to leachate on surface water quality, ten samples from different location around a major industrial region were collected in pre monsoon and post monsoon season. The samples were collected in sterilized polythene bottles and prior to the sampling, all the sampling containers were washed and rinsed with the available surface water. Sampling points were chosen to cover all different directions of dumping/disposal site after preliminary survey of area. The samples were collected and preserve with the help of 1 N HNO_3 and were sealed and brought to the laboratory to know the heavy metal concentration by AAS analysis.

Metal Analysis: The of selected trace metals in all soil and surface water samples i.e. Iron, Copper, Chromium, Lead, Copper and Manganese were analysed using Atomic Absorption Spectrophotometer (VARIAN GTA-120, AA240). Prior to analysis, the samples were diluted with 2% 1N nitric acid solution. Table 1 shows the operating conditions of AAS for selected elements.

Table 1: Operating conditions of AAS

Instrument Condition	Lead	Chromium	Iron	Manganese	Zinc	Copper
Lamp	Lead Hollow Cathode	Chromium Hollow Cathode	Iron Hollow Cathode	Manganese Hollow Cathode	Zinc Hollow Cathode	Copper Hollow Cathode
Slit	4	3	3	4	4	4
Wavelength	283.3 nm	358.3 nm	248.3 nm	279.8 nm	670.8 nm	324.7 nm
Fuel	Acetylene	Acetylene	Acetylene	Acetylene	Acetylene	Acetylene
Oxidant	Air	Air	Air	Air	Air	Air
Type of flame	Oxidizing	Reducing (slightly	Oxidizing	Oxidizing	Oxidizing	Oxidizing

		yellow)				

III. Results and Discussions

From the Atomic Absorption Spectrophotometer (AAS) selected heavy metal concentrations results of surface water samples shows that the total concentrations of the heavy metals vary seasonally in small variation with more variation of chromium (Cr). The concentration of heavy metals in Surface water near the disposal/dumping sites during pre-monsoon and post monsoon is presented in fig. 1and 2 respectively. Also it was observed that the concentration of Mn, Fe and Cr have the high concentration in pre monsoon surface water samples. In post monsoon analysis of surface water samples only the Cr has been found with high concentration. It is observed from above analysis that after monsoon seasons the heavy metals may be transported or diluted by rain water and thus concentration of metals is less.

Samples	Concentration (mg/l)					
	Cr	Cu	Fe	Pb	Mn	Zn
1	0.326	0.002	0.822	0.26	0	0.0533
2	0.642	0	1.368	0.22	2.557	0.0246
3	0.811	0.005	0.76	0.2	0.088	0.0377
4	0.498	0.003	0.366	0.17	0.057	0.0095
5	0.3	0.014	3.505	0.2	2.931	0.0891
6	1.832	0.012	2.192	0.15	0.233	0.3967
7	2.398	0.033	0.755	0.21	0.209	0.1112
8	3.298	0.005	1.541	0.2	0.155	0.1068
9	3.192	0.006	0.697	0.21	0.341	0.0631
10	1.879	BDL	0.697	0.26	0.343	0.062

Table 2: Pre Monsoon Surface Water Analysis

Sample	Concentration (mg/l)					
	Cr	Cu	Fe	Pb	Mn	Zn
1	1.45	0.007	BDL	0.08	0.088	0.161
2	1.648	0.007	0.199	0.12	1.272	0.1584
3	2.16	0.008	0.731	0.09	0.559	0.204
4	2.013	0.007	BDL	0.09	0.046	0.127
5	1.853	0.008	0.019	0.08	0.327	0.1532
6	2.085	0.008	0.408	0.08	0.066	0.204
7	1.929	0.008	0.263	0.07	0.087	0.1085
8	2.185	0.008	0.269	0.1	0.097	0.1782
9	2.316	0.009	0.353	0.07	0.166	0.3411
10	2.149	0.009	0.352	0.07	0.656	0.2191

Table 3: Post Monsoon Surface Water Analysis

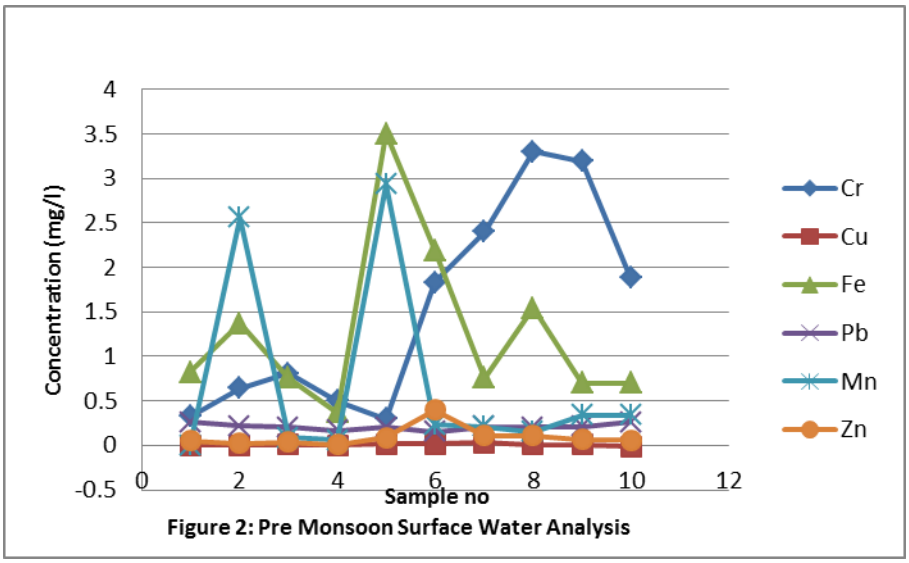

Figure 2: Pre Monsoon Surface Water Analysis

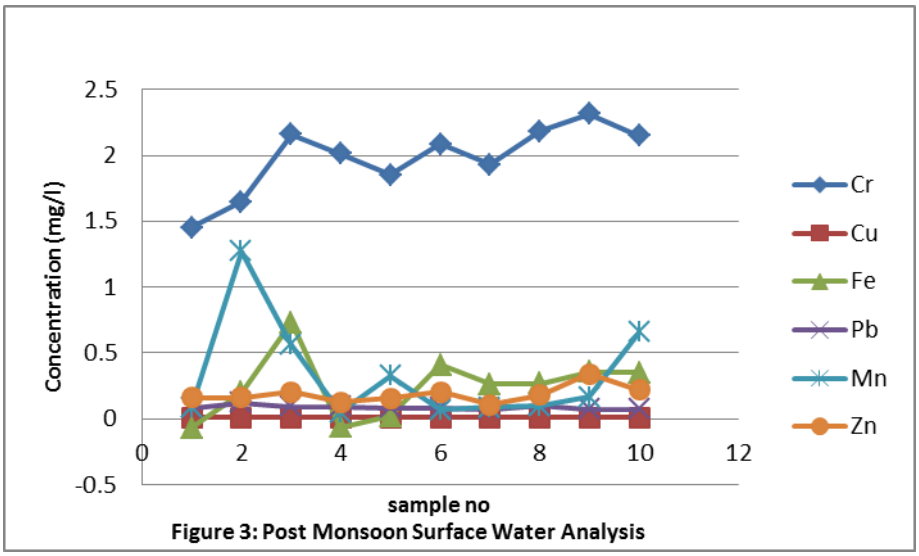

Figure 3: Post Monsoon Surface Water Analysis

The flame type Atomic Absorption Spectrophotometer (AAS) analysis was done for heavy metals concentration of soil samples which was collected for different distances and depths of ground from the surrounding of disposal/dumping sites of study area is presented in fig. 3. The concentration obtained (Zn > Pb > Fe > Cr > Mn) shows that heavy metals in the soil near the disposal/dumping sites is more and it is decreasing with respect to horizontal direction as well as with respect to depth also.

Distance (km)	Heavy matal concentration (mg/kg)				
	Fe	Pb	Mn	Zn	Cr
0.35	1.036	0.258	5..712	0.15	1.593
0.5	1.416	0.453	9.08	0.214	1.984
0.78	0.973	0.338	3.445	0.142	1.795
0.95	0.897	0.213	1.12	0.198	1.816
1.25	0.782	0.28	BDL	0.022	1.113
1.4	0.385	0.118	3.691	0.03	0.464
1.56	0.298	0.098	3.122	0.087	0.258
1.72	0.219	0.09	1.555	0.057	BDL
1.9	0.551	0.123	2.476	0.211	BDL
2.15	0.987	0.21	6.155	0.105	BDL

Table 3: Soil analysis for heavy metals (Distance wise sampling)

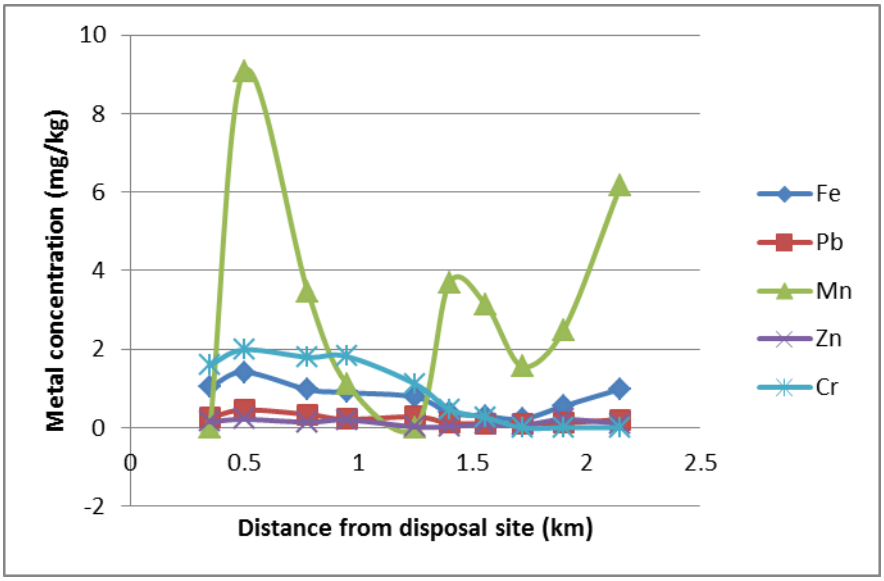

Figure 4: Heavy metal concentration in soil (Distance wise sampling)

Depth (m)	Heavy matal concentration (mg/kg)				
	Fe	Pb	Mn	Zn	Cr
0.25	0.9	0.256	3.85	0.163	0.948
0.5	0.769	0.231	4.29	0.083	0.839
0.75	0.767	0.196	3.47	0.08	0.739
1	0.687	0.188	2.039	0.158	0.698

Table 3: Soil analysis for heavy metals (Depth wise sampling)

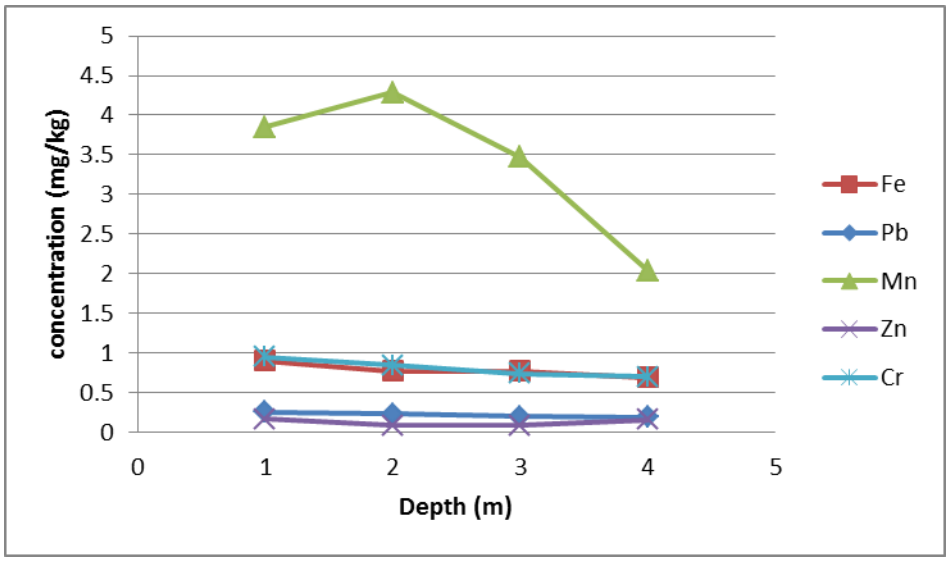

Figure 5: Heavy metal concentration in soil (Depth wise sampling)

IV. Conclusion and Recommendations

Soil and its biota are essential a component of the earth's living skin directly sustains life (Wilkinson et al., 2009). After the analysis of soil samples, a general conclusion that could be reached is that the concentrations of heavy metals in soil near to the dumping/disposal site is more and decreases as distance increases. Also in the depth wise analysis, it was observed that the in most of the soil samples, higher concentrations of selected heavy metals are observed near the surface of ground and magnesium which has highest concentration. The surface water analysis also indicated that the concentrations of Cr and Mn are higher before and after the monsoon. Leachate pollution can be reduced by using scientific designed dumping sites with liners and if possible the amount of industrial solid waste generation may be reduced with the help of process modification of particular products. Also the higher pH (alkaline) of the disposed industrial solid wastes may reduce the leachate generation, so suitable alternatives can be used for the same at the time of industrial solid waste disposal or dumping near populated vicinity.

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Yield of Maize-Soybean Intercrop and Soil Properties as Influenced by Fertilizer in the Southern Guinea Savanna Zone of Nigeria

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Abstract- Field experiments were conducted at the Teaching and Research Farm, University of Agriculture, Makurdi to determine the effect of fertilizer on soil properties and yield of maize-soybean intercrop. The experimental design consisted of two factors: cropping system at two levels (sole and intercrops) and fertilizer rates at three levels (0, 150 and 300 kg/ha of NPK 20:10:10). The treatments were laid out in a Randomized Complete Block Design (RCBD) in a split plot arrangement and replicated three times. The cropping systems were assigned to the main plots while the fertilizer rates were in the sub plots. A composite soil sample was obtained from a plough layer (0-15 cm) at the beginning and at the end of the experiment according to the treatments and analyzed for particle size distribution, pH, organic carbon, total nitrogen, available phosphorus and exchangeable cations [Mg^{2+}, Ca^{2+}, Na^{+} and K^{+}] as well as cation exchange capacity (CEC). Data collected for the yield parameters of maize and soybean for both cropping seasons were subjected to the Analysis of Variance (ANOVA) after which significant means were separated using Least Significant Difference (LSD) at $P<0.05$. Results showed that Intercropping reduced the yields of maize and soybean compared with their sole crops. Soybean yields were generally low due to the shading effect of the maize component. Application of fertilizer significantly ($P<0.05$) increased the yield of the component crops in both seasons. Intercropping resulted in yield advantage; the land equivalent ratio (LER) was (1.53) in 2013 and (1.35) in 2014 showing 35 % and 26 % land saved in 2013 and 2014 cropping seasons respectively. Based on yield and productivity advantage obtained from the intercropping, the effect of different rates of NPK fertilizer on the growth and yield of maize and soybean intercrop deserve further investigation using higher fertilizer rates. It is recommended that soybean should be integrated into the maize production system to enhance increased soil organic carbon content, N, CEC, Ca, Mg and P level.

Index Terms- Yield, Maize-Soybean Intercrop and Fertilizer Rates

I. INTRODUCTION

The growing of two or more crops simultaneously during the same season on the same piece of land is called intercropping. It is a common feature of production in the developing countries including Nigeria (Mbah *et al.*, 2007; Mehdi, 2013). The system serves as a viable strategy for higher total crop yield and insurance against crop failure, provides for efficient resource use, reduces cost of production and increases monetary returns to the farmers (Mbah *et al.*, 2003).

Maize is a major staple food of the people and a very important constituent of animal feed that had led to an increase in its utilization resulting in the huge demand to expand production through intercropping (Ayoola and Makinde, 2007; Awe and Abegunrin, 2009). Soybean on the other hand is among the major industrial and food crops grown in every continent. The crop can be successfully grown in many states of Nigeria using low agricultural input (Dugje *et al.*, 2009). Also, it has been found to be agronomically compatible with other common arable crops (Raji, 2007).

In the southern guinea savanna agro-ecology of Nigeria, the commonest crop mixtures practiced involve cassava, okra, sorghum, maize and yam as major food crops in all possible combinations, with each other, with little or no attention given to legumes in the combinations. Cereal-legume mixtures have been adjudged the most productive form of intercropping since the cereals may benefit from the nitrogen fixed in the root nodules of the legumes in the current year (Undie *et al*., 2012). Intercropping soybean with maize was found suitable under fertilizer combinations but data on the nutrient requirements in intercropping system is very scanty (Adeniyan and Ayoola, 2007).

Responses of soybean and maize to N and P have been documented in soybean growing areas of Nigeria but little has been done to establish the scale of macro (N, P and K) and micronutrient (Zn, Mo) deficiencies. Similarly, little effort has been made in research to establish the best nutrient management strategies in maize-soybean intercrop under variable soil conditions as a way of improving maize/soybean production and productivity (Mbah *et al.*, 2007). Though, a number of studies have been conducted on mono-cropped maize and soybean as affected by fertilizer rates, documented information on the optimum productivity of maize and soybean under intercropping systems in Makurdi is scanty, hence the need for this enquiry. The objective of the study is to determine the effect of fertilizer rates on soil chemical properties and yield of maize-soybean intercrop with a view to identify the appropriate fertilizer rate that will give optimal yield of maize-soybean intercrop in the study area.

Materials and Methods

The experiment was conducted during 2013 and 2014 cropping seasons at the Teaching and Research Farm of the

University of Agriculture, Makurdi-Nigeria. The study location falls within the Southern Guinea Savanna Zone of Nigeria with mean rainfall of 1, 250 mm per annum and temperature of 25-30 ^{0}C. The site had not been cultivated for about two years. It is located between latitude $7^0$40'N to $7^0$53'N and longitude $8^0$22'E to $8^0$35'E at an elevation of 97 m above mean sea level and with a slope of 4 %. The soil is classified as Typic Ustropepts (USDA) (Fagbemi and Akamigbo, 1986). TGX 1485 – 1D variety of soybeans was sourced from the International Institute for Tropical Agriculture (IITA) Ibadan, Nigeria. Also the maize variety used (TZESR – W) was sourced from the same institute. Both varieties are grown by farmers in the study area.

Experimental treatments and design

The trial consisted of two factors: cropping system at two levels (sole maize, soybean and intercropping) and fertilizer rates at three levels (0 kg/ha, 150 kg/ha and 300 kg/ha of NPK 20:10:10) and were laid out in a split plot in RCBD with cropping system occupying the main plots and fertilizer rates at sub plots and were replicated thrice. The experimental area was cleared manually using cutlass. Thereafter it was demarcated into experimental units. Each plot was measured 4 m x 4 m = 16 m^2. Planting was done on 15th July, 2013 and 17th July, 2014 respectively. Soybean and maize seeds were sown the same day after seed treatment with apron-plus. Two maize seeds were sown per hole at an inter and intra row spacing of 0.75 x 0.25 m which were later thinned to 1 plant per hole at 2 weeks after sowing to give a plant population of 53,333 plants ha^{-1}. Soybean seeds were drilled along ridges (and straight lines on flat) and were later thinned to have plants within 5 cm of each other with an inter row spacing of 0.75 m to achieve a population of 266,000 plants ha^{-1}.

Manual weeding was carried out at 3 and 8 weeks after planting (WAP). Fertilizer application was done at 3 WAP by band placement on sole crop soybean / sole crop maize and maize-soybean intercrop in alternate rows. Maize was harvested when the cobs were dry. Further sun-drying of the maize cobs was done before shelling. Soybean was harvested later, when the leaves had turned yellow and pods sufficiently dried.

Soil Data Collection and Analysis

A composite soil sample was obtained from a plough layer (0-15 cm) at the beginning and at the end of the experiment according to the treatments for routine analysis to see if there was a change in the soil properties after the experiment for both cropping seasons. The soil samples taken from each plot according to treatment and the composite were analyzed at NICANSOL Soil Testing Laboratory of the University of Agriculture, Makurdi, for particle size distribution, pH, Organic Carbon, Total Nitrogen, Available phosphorus and exchangeable cations [Mg^{2+}, Ca^{2+}, Na^+ and K^+] as well as Cation Exchange Capacity (CEC) using standard analytical procedures.

Maize/Soybean Data Collection and Analysis

Data were collected for the yield parameters of maize for both cropping seasons. These include cob length, cob diameter, weight of 100 seeds, number of cobs per plant and grain yield while that of soybean include number of pods per plant, number of seeds per pod, weight of 100 pods, weight of 100 seeds and grain yield.

Data for the yield parameters of both crops were subjected to the Analysis of Variance (ANOVA) and significant means were separated using Least Significant Difference (LSD) at 5 % level of probability. The productivity from the mean yield data of both sole and intercropping system were determined by the land equivalent ratio (LER), (Willey, 1985).

$$LER = \frac{\text{Intercrop yield of Crop A}}{\text{Sole Crop yield of Crop A}} + \frac{\text{Intercrop yeild of Crop B}}{\text{Sole crop yeild Crop B}} \quad \text{---------- (1)}$$

$$\text{Percentage Land Saved} = 100\text{-}1/LER \times 100 \quad \text{---------- (2)}$$

Where LER is equal to 1.0, it means that there is no advantage to intercropping over sole crop. LER above 1.0 shows an advantage to intercropping while number below 1.0 shows a disadvantage in intercropping.

Results and Discussion

Effect of Rainfall on Yield Components

Higher amount of rainfall was recorded in 2013 compared to 2014 (Table 1). The total amount of rainfall in 2013 and 2014 were 1287.8 and 1266.1 mm respectively. The low yield of both crops recorded in 2013 as compared to 2014 may be attributed to the high amount of rainfall in 2013 which most probably interfered with the fertilization and root development during flowering stage of the crops and consequently reducing yield.

Delouche (1980) and Adeniyan and Ayoola (2007) had suggested that frequent or prolonged rainfall during the post maturation and pre-harvest period results in alternate wetting and drying of the crop seeds and may lead to severe deterioration. This is an indication that the yield of both crops grown during the first cropping season will have been reduced compared to the one grown during the second cropping season. The frequent and or prolonged rainfall during the first season could prevent the ability of the plants to flower; however, this would encourage the vegetative growth to the disadvantage of seed production. Also heavy rainfall which leads to water logging and heavy soil affect germination and establishment of seedlings and hence reduces yield of the crops (Swindale, 1987). This probably could have been responsible for the low yield of both crops in 2013.

Pre-Planting Soil Analysis

The pre-planting soil analysis (Table 2) indicates a poor soil fertility status that requires fertilizer application to replenish nutrients taken out from the soil through crop harvest and to supplement nutrients to boost yields (Olatunji and Ayuba, 2012). The total N before planting in the two cropping seasons (0.06 and 0.08 %) falls below the optimum value of 0.150 % (Agboola, 1975). Similarly, the values of SOM (1.56 and 1.64 %) for the two cropping seasons were below the average range of 2.5- 2.6 % considered for good crop growth (Prasad and Singh, 2000) in the study area. The results of the pre-planting soil analysis thus indicated that soil amendment was required in line with earlier observation by Agboola (1975) who reported that farmers in

Africa requires adequate soil amendment for good crop production as a result of low inherent soil fertility.

Effect of Fertilizer Rates on Soil Chemical Properties

The pH of the soil after harvest in 2013 and 2014 (Tables 3 and 4) decreased in all the treatments but increased with the application of 300 kg/ha NPK fertilizer. The increase in soil pH can be adduced to addition of high inorganic fertilizer and also consistent with the findings of Chuwku *et al.,* (2012) who reported that application of 300 kg/ha of NPK fertilizer could lead to increase in soil pH in the south eastern Nigeria. The decrease in the pH of plots with low application of inorganic fertilizer could be attributed to complete decomposition of organic matter as a result of enhanced activities of micro organisms and low level of inorganic fertilizer application (Agbede, 2009). The use of inorganic fertilizer increased SOM (Table 3 and 4) in both seasons. The soil organic matter was consistently low in plots with zero application of fertilizer. This can be attributed to the absence of fertilizer which would have enhanced the decomposition of organic matter in the soil. According to Plaster (1992), organic matter content of the soil can be maintained through incorporation of crop residues, mulching, and addition of organic and inorganic fertilizers.

The total nitrogen status of the soil increased with increased application of NPK fertilizer. The increase in N content of the soil observed with addition of NPK fertilizer can be adduced to release applied of N which further enhanced microbial activities as a result of increased concentration of nutrients (Adeniyan and Ojeniyi, 2003). The depletion in total N observed in the control plots may be attributed to nutrient up take by component crops and absence of fertilizer application.

Similarly, the available P was depleted in the control plots which may be attributed to uptake of the nutrients by component crops and probably due to fixation of the element that usually occur at low soil pH (Brady and Weil, 2007). A higher build up of available P was observed with the application of 300 kg/ha NPK fertilizer. Similar trend was observed with the exchangeable bases. The release of nutrients to the soil by fertilizer application most probably explains the increase in Mg and K. The increases in Mg and K upon application of fertilizer have been reported by Adeniyan and Ojeniyi (2003). The ECEC of the soil was affected by addition of inorganic fertilizer (Tables 3 and 4). This is an indication that soils with high organic matter content will have high ECEC as reported by Plaster (1992) and Agbede (2009). This observation is consistent with Brady and Weil (2007) who reported that inorganic fertilizer application significantly ($p<0.05$) increased ECEC of soils.

Effect of Fertilizer Rates on the Yield Components of Maize

In 2013 and 2014, cob diameter, cob length and number of cobs per plant were not affected by intercropping while grain yield was significantly ($P<0.05$) affected by intercropping (Table 5). Maize yield components (100 seeds weight, grain yield and number of cobs per plant) increased with increased application of NPK fertilizer in both seasons. Higher yield components of maize were recorded under sole cropping compared to intercropping indicating that crops in sole plots suffered less from competition. The implication of this finding is that the nutrient requirements of soybean and maize in the intercropping system were higher than the nutrient need of the sole crops as Baker (1979) and Mbah *et al.,* (2007) reported that the nutrient demand of the component crops were always higher than for sole crops.

Effect of Fertilizer Rates on the Yield Components of Soybean

The soybean yield components increased with increase in NPK fertilizer application. Similar positive responses of soybean to NPK fertilizer application have been observed by some researchers (Osunde *et al.,* 2004; Mbah *et al.,* 2007). In addition, Kang (1975) reported a significant linear increase in yield of soybean to nitrogen (N) applied at 0, 30, 60 and 120 kg N/ha but noted that N at 30 kg/ha with inoculation gave higher yields. Okpara *et al.,* (2002) in their study with straight nitrogen within the range (0-100 kgN/ha) and potassium (0-80 kg K_2O/ha) fertilizers in the humid rainforest zone reported high response of soybean to fertilizer application and concluded that nitrogen alone was very effective in increasing soybean yield with application of up to 100 Kg N/ha.

Similar work by Chiezey (2001) in the guinea savanna showed increased soybean grain yield with increased nitrogen fertilizer application from 0 to 80 kgN/ha. The results of the present investigation showed that soybean benefited more from the highest fertilizer rate (300 kg/ha) in the two cropping seasons, hence corroborate these reports. The zero NPK treatment gave the least yield components assessed. Averaged over the two cropping seasons, the lowest numbers of pods per plant were obtained from intercropping at zero level of NPK fertilizer application while the highest values (56.00) were obtained under sole cropping at 300 kg/ha NPK fertilizer in 2013. A similar trend was obtained in 2014 cropping season.

Intercropping resulted in yield advantage; the total land equivalent ratio (LER) was (1.53) in 2013 and (1.35) in 2014 showing 35 % and 26 % land saved in 2013 and 2014 cropping seasons respectively (Table 7) due to intercropping compared to sole crop of both maize and soybean.

Conclusion and Recommendations

A field experiment was conducted during 2013 and 2014 cropping seasons at the Teaching and Research Farm of the University of Agriculture, Makurdi. Results showed that intercropping reduced the yields of maize and soybean compared with their sole crops. Soybean yields were generally low due to the shading effect of the maize component and excess water in 2013. Fertilizer significantly ($P<0.05$) increased the yield of the component crops in both seasons than when no fertilizer was applied. Increasing the quantity of NPK fertilizer resulted in significant increase in the yield components of maize and soybean crop in both years.

The productivity of maize-soybean mixture showed yield advantage of 1.53 at 35 % land saved (2013) and 1.35 at 26% land saved (2014). The highest crop yields were obtained at the highest fertilizer rate used in the study. The increases observed in the values of soil pH, organic matter, total nitrogen and exchangeable cations is an indication that soil fertility can be improved by application of NPK fertilizer for sustainable agricultural production. Based on yield and productivity advantage obtained from the intercropping, the effect of different

rates of NPK fertilizer on soil chemical properties and the growth and yield of maize-soybean intercrop deserve further investigation using higher NPK 20:10:10 fertilizer rates in the study area.

Table 1: Meteorological data for Makurdi (2013/2014)

Month	Rainfall (mm)		Min Temp (^{0}C)		Max. Temp (^{0}C)		RH (%)	
	2013	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**
January	00	4.0	17.9	18.3	35.3	35.5	48	55
February	00	4.0	20.9	21.2	36.7	37.0	57	51
March	44.2	33.7	23.3	24.2	37.7	33.7	66	69
April	122.9	56.4	21.5	23.1	34.4	35.2	75	72
May	183.4	160.5	20.4	22.3	32.2	33.1	81	78
June	141.8	165.0	20.5	21.6	31.0	31.6	82	81
July	243.6	129.3	22.6	21.5	30.0	30.6	85	83
August	131.0	274.6	22.7	21.8	29.5	29.4	85	86
September	285.3	306.9	22.4	22.0	30.3	30.2	84	86
October	125.5	100.6	23.0	22.8	31.9	31.5	85	81
November	00	26.4	23.0	21.3	34.3	33.3	75	77
December	10.1	4.7	19.5	17.9	34.6	33.7	58	56

Source: Tactical Air Command, NAF Base Makurdi.

Table 2: Soil physical and chemical properties of the experimental site before planting

Property	**2013**	**2014**
Chemical Property		
pH H_2O (1:1)	6.43	6.30
pH KCl (1:1)	5.70	5.50
Organic Carbon (%)	0.90	0.95
Organic Matter (%)	1.56	1.64
Total Nitrogen (%)	0.06	0.08
Available p (ppm)	3.00	3.80
Exchangeable Cation (Cmol Kg^{-1})		
Ca	3.28	3.06
Mg	1.40	1.37
K	0.26	0.25
Na	0.61	0.60
CEC	6.26	6.21
Base Saturation (%)	89.5	87.5
Particle size Distribution		
Sand (%)	78.4	76.0
Silt (%)	10.3	10.9
Clay (%)	11.3	13.1
Textural Class	Sandy loam	Sandy loam

Table 3: Physical and chemical properties of soil at harvest (2013)

	Particle Size Distribution				pH		Org	Org		Bray-1	Exch. Cations (Cmol/Kg)					Base
Treatments /Plot	Sand (%)	Silt (%)	Clay (%)	Textural Class	H_20 1:1	KCl 1:1	C (%)	M (%)	N (%)	P (ppm)	Ca	Mg	K	Na	CEC (Cmol/kg)	Saturation (%)
T_1	76.6	11.0	12.4	Sandy Loam	6.60	5.88	0.95	1.64	0.080	3.00	3.07	1.40	0.25	0.60	6.12	87.90
T_2	72.3	12.4	15.3	Sandy Loam	6.50	5.70	0.88	1.90	0.077	4.20	3.29	1.51	0.26	0.65	6.40	89.10
T_3	76.2	11.2	12.6	Sandy Loam	6.65	5.90	0.90	1.56	0.070	3.50	3.01	1.30	0.21	0.52	6.10	88.60
T_4	77.6	11.2	11.2	Sandy Loam	6.45	5.65	0.74	1.80	0.091	3.10	2.96	1.26	0.21	0.50	5.80	87.40
T_5	77.5	11.3	11.2	Sandy Loam	6.60	5.85	0.90	1.56	0.077	4.60	2.77	1.30	0.23	0.48	5.20	90.20
T_6	71.8	11.2	17.0	Sandy Loam	6.65	5.90	0.92	1.75	0.088	4.00	3.80	1.60	0.30	0.71	6.00	86.70
T_7	73.3	13.0	13.7	Sandy Loam	6.40	5.60	0.80	1.81	0.097	2.90	2.84	1.28	0.24	0.55	5.40	89.40
T_8	72.1	14.0	13.9	Sandy Loam	6.70	5.95	0.87	1.87	0.091	3.30	3.57	1.37	0.26	0.58	6.22	88.50
T_9	71.4	13.5	15.1	Sandy Loam	6.45	5.65	0.77	1.88	0.079	4.50	3.11	1.40	0.22	0.50	6.30	87.60

$T_1 = SMF_0$, $T_2 = SMF_1$, $T_3 = SMF_2$, $T_4 = SSF_0$, $T_5 = SSF_1$, $T_6 = SSF_2$,$T_7 = MSIF_0$,$T_8 = MSIF_1$,$T_9 = MSIF_2$, SM= Sole Maize, SS = Sole Soybean, MSI = Maize Soybean Intercrop, F_0 = 0kg/ha, F_1 = 150kg/ha and F_2 = 300kg/ha NPK 20:10:10

Table 4: Physical and chemical properties of soil at harvest (2014)

	Particle Size Distribution				pH		Org	Org		Bray-1	Exch. Cations (Cmol/Kg)					Base
Treatments /Plot	Sand (%)	Silt (%)	Clay (%)	Textural Class	H_20 1:1	KCl 1:1	C (%)	M (%)	N (%)	P (ppm)	Ca	Mg	K	Na	CEC (Cmol/g)	Saturation (%)
T_1	76.0	10.8	13.2	Sandy Loam	6.50	5.72	0.97	1.68	0.070	2.90	3.05	1.38	0.23	0.58	6.16	86.40
T_2	73.2	11.9	14.9	Sandy Loam	6.38	5.68	0.90	1.86	0.076	4.50	3.25	1.50	0.23	0.63	6.30	88.00
T_3	74.6	11.5	13.9	Sandy Loam	6.51	5.80	0.95	1.64	0.070	3.00	3.00	1.28	0.20	0.50	6.06	87.60
T_4	76.9	11.9	11.2	Sandy Loam	6.45	5.67	0.78	1.70	0.093	3.20	2.93	1.23	0.21	0.48	5.60	87.10
T_5	76.5	12.0	11.5	Sandy Loam	6.50	5.80	0.96	1.66	0.070	3.00	2.77	1.30	0.22	0.45	5.30	90.00
T_6	71.6	13.7	14.7	Sandy Loam	6.62	5.88	0.95	1.71	0.087	4.30	3.78	1.50	0.29	0.70	5.90	87.30
T_7	74.0	12.9	13.1	Sandy Loam	6.32	5.62	0.81	1.80	0.099	4.40	2.83	1.23	0.22	0.50	5.30	89.50
T_8	73.0	14.0	13.0	Sandy Loam	6.79	5.91	0.89	1.85	0.092	3.50	3.56	1.30	0.24	0.55	6.10	88.60
T_9	72.1	13.8	14.1	Sandy Loam	6.48	5.67	0.79	1.80	0.078	4.60	3.10	1.36	0.20	0.49	6.28	87.00

$T_1 = SMF_0$, $T_2 = SMF_1$,$T_3 = SMF_2$, $T_4 = SSF_0$, $T_5 = SSF_1$, $T_6 = SSF_2$,$T_7 = MSIF_0$,$T_8 = MSIF_1$,$T_9 = MSIF_2$, SM= Sole Maize, SS = Sole Soybean, MSI = Maize Soybean Intercrop, F_0 = 0kg/ha, F_1 = 150kg/ha and F_2 = 300kg/ha NPK 20:10:10

Table 5: Main effect of cropping systems and fertilizer rates on yield and yield parameters of maize

	COB DIA		COB LNT (cm)		COB/PLT		100 S WT(g)		Grain Yield (kg/ha)	
Cropping Systems	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**
Sole maize	11.98	12.10	11.50	12.20	1.06	1.47	19.40	22.80	1025.00	1275.00
Intercropped maize	8.97	11.20	11.00	12.00	0.73	1.41	17.40	21.30	775.00	575.00
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	231.0	682.5
Fertilizer Rates (Kg/ha)										
0	9.23	10.99	8.61	9.61	0.79	1.41	16.45	20.40	800.00	375.00
150	10.06	11.77	11.45	12.45	0.89	1.46	19.42	21.70	900.00	1125.00
300	12.14	12.27	13.36	14.36	1.01	1.49	19.45	24.12	975.00	1250.00
LSD (0.05)	1.07	NS	1.09	2.09	0.13	NS	1.23	1.29	NS	121.0

NS = Not Significant

Table 6: Main effect of cropping systems and fertilizer rates on yield and yield parameters of soybean

Cropping Systems	**100Pods WT(g)**		**100 Seeds WT(g)**		**No of Pods/PLT**		**No of Seeds/P**		**Grain Yield (kg/ha)**	
	2013	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**
Sole Soybean	31.85	36.50	11.01	14.02	45.87	50.70	2.15	2.18	1300.00	1300.00
Intercropped Soybean	31.75	36.40	10.98	13.50	45.01	49.80	2.13	2.14	1000.00	1175.00
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	281.80	NS
Fertilizer Rates (Kg/ha)										
0	31.46	34.70	10.79	13.16	32.03	35.00	2.13	2.14	800.00	500.00
150	31.87	36.50	10.87	13.80	42.05	59.60	2.15	2.16	1200.00	1250.00
300	32.04	38.30	11.32	14.50	56.00	66.20	2.15	2.16	1425.00	2000.00
LSD (0.05)	NS	1.51	NS	0.66	9.08	19.58	NS	NS	221.50	351.10

NS = Not Significant

Table 7: Productivity from mean yield data of sole and intercropping system

Cropping System	Maize 2013	Soybean 2013	Maize 2014	Soybean 2014
Sole crop yield (Kg)	1025.00	1300.00	1275.00	1300.00
Intercrop yield (Kg)	775.00	1000.00	575.00	1175.00
LER	1.53		1.35	
Land saved (%)	35		26	

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Condition Monitoring Of Cooling Tower Fan Gearboxes by Wear Debris and Vibration Analysis – A Case Study

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Abstract- In these days condition monitoring plays a main role in many of the industries. Lubricantsare essential and expensive components of machine systems needing sampling, analysis and monitoring. Monitoring can be either performance testing or oil condition monitoring or vibration analysis. Hear wear debris analysis and vibration analysis plays a curtail role in the maintenance of the cooling tower. Components of the gear box fail without proper maintenance. For the reduce of the heavy expenses analysis is done. Key component of the cooling tower fan is the gearbox. Maintenance of gearboxes is difficult and expensive, given the location and therefore condition monitoring techniques have been applied to detect common failure mechanisms. Future condition monitoring may be possible using low cost on-line techniques. With these oil analysis and vibration techniques, monitoring has been done and gear box failures has been detected.

Index Terms- *condition monitoring, failure mechanisms, gearbox, lubricant.*

I. INTRODUCTION

It has long been accepted that condition- based maintenance is the most effective and cost-efficient approach to maximizing the life of industrial machinery. Vibration and wear debris analyses are two key components of any successful condition-monitoring program and can be used as both predictive and proactive tools to identify active machine wear and diagnose faults occurring inside machinery. When these techniques are conducted independently, only a portion of machine faults are typically diagnosed. However, practical experience has shown that integrating these two techniques in a machine condition-monitoring program provides greater and more reliable information, bringing significant cost benefits to industry.

Vibration analysis in particular is becoming increasingly popular as a predictive maintenance procedure and as a support for machinery maintenance decisions. As a general rule, machines do not break down or fail without some form of warning, which is indicated by an increased vibration level. By measuring and analyzing the vibration of a machine, it is possible to determine both the nature and severity of the defect, and hence predict the machine's failure.

The overall vibration signal from a machine is contributed from many components and structures to which it may be coupled. However, mechanical defects produce characteristic vibrations at different frequencies, which can be related to specific machine fault conditions. By analyzing the time and frequency spectrums and using signal processing techniques, both the defect and natural frequencies of the various structural components can be identified.

Practitioners of oil analysis are familiar with the practice and advantages of oil wear debris analysis. Compared to vibration analysis, oil and particle analysis have certain advantages, as they can provide direct and early information on wear modes and the machine's condition. In fact, in many instances it has been proven to be a leading indicator of active machine wear, compared to vibration analysis. In addition, oil analysis has certain advantages in monitoring low-speed machinery (less than 5 rpm), where it is usually difficult to apply vibration analysis techniques. However, wear debris analysis cannot effectively uncover all manners of failure mechanisms on its own. For this reason, both oil analysis and vibration analysis are necessary and vital parts to an effective program.

Both wear debris analysis and vibration analysis are complicated in terms of their analysis requirements, and the demand of human expertise and experience. Experts in the two fields are often isolated from each other. Hence, effective integration of the two condition-monitoring techniques can be challenging in a working environment, especially for remote industries such as offshore drilling, mine sites and other isolated operations. In recent years, research toward this goal has been conducted, but with limited achievement. However, advances in technological innovation, including artificial intelligence and advanced computer analysis techniques, have created renewed optimism at the prospects of overcoming these obstacles to develop a new integrated approach to machine condition monitoring.

II. PROBLEM IDENTIFICATION

Access to continuous information allows you to detect problems before they lead to failure. Vibration alerts warn of pending problems, enabling further investigation to detect and diagnose the fault so maintenance can be scheduled.

Overall vibration with embedded temperature measurement will identify developing mechanical faults. The technology provides advanced diagnostics for early indication of bearing and gearbox faults. Vibration energy bands enhance trending and

alarming, making it easier to interpret the data. More detailed information can be accessed through high resolution spectra and waveform data.

Trend values can be compared against appropriate alert levels, informing you when the condition of the gearbox or motor is deteriorating — as well as providing the underlying cause of the problem. Vibration monitoring data is communicated over a self-organizing Smart Wireless network, removing the additional costs associated with running cables.

Some of the problem identifications are:

Bearing Defects:

Bearings often operate under heavy, variable load and extreme environmental conditions. Because of the force applied to bearings in a cooling tower, defects often progress quickly and lead to friction, bearing damage, and gearbox failure.

Shaft Misalignment:

Due to the length of the shaft in a cooling tower and the thermal changes that the shaft experiences, misalignment are a common issue. Stress inside the shaft can damage couplings, cause bearing fatigue, and even lead to shaft breakage.

Broken/Chipped/Worn Teeth:

Shaft misalignment causes increased load on the input gear, which causes bad meshing of the gears and generates debris. Damaged and misaligned gears can result in failure of the gearbox.

Coupling Issue:

Excessive shaft misalignment can damage the coupling, which can lead to shaft separation. Severe coupling damage can lead to gearbox failure, damaged shafts, and rotor cracks.

Insufficient Lubrication:

The extreme conditions of the cooling tower often lead to issues with lubrication. Bearing wear and gear teeth damage caused by insufficient lubrication contributes to premature equipment failure. However, the inaccessibility of a cooling tower makes it virtually impossible to perform accurate grease and oil analysis.

Steps Involved overcoming the Problem:

The two types of analysis to overcome the problem:

1. Oil Analysis.
2. Vibration Analysis.

III. EXPERIMENTAL PROCEDURE

OIL ANALYSIS

In order to reduce the failure and to reduce vibrations, an oil analysis is performed.

Tan Preparation:

Materials required for Tan preparation:

The materials required for Tan preparation are,Tan table chart, Reagent ‘C’ chemical for tan, 2ml sample oil, Reagent d (200ml distil water + 2gm KOH pallets).

Procedure:

Take 25ml cylinder + add 10ml of reagent c followed by 2ml of sample oil.Then titrate with reagent d up to the end point.Conclusion is that the solution should turn to pink in colour.

Preparation of Moisture:

The materials required for the preparation of moisture are, Reagent ‘A’ – 15 ml,5ML sample oil, Reagent B 15 drops, Hydro Gauge.

Procedure:

Take 15ml of reagent ‘A’ in cylinder tube.Add 5ml of sample oil pour the mixture into the hydro gauge.Take a cap and pore 15 drops of reagent ‘B’ in the cap and dip it into hydroguage close the cap.Shake for 2minutes so that the mixture can absorb.

Preparation of Viscosity:

Materials required for the preparation of viscosity are,KinematicViscoBatha, Capillary Tube, Stop Watch, Rubber Ball, Sample Oil, Syringe, Calculator, Capillary Tube Chart, Oil Grade Chart

Procedure:

First set the temp to 40deg C for lubrication oil (except engine oil).Select the tube as per oil grade given by the customer and we should find the range. After finding the range we can select the tube by capillary tube chart after that insert the tube to K.V bath then pour the oil 7ml in the tube and heat the sample for 15-20 min.It gets heated and with the help of rubber ball suck the sample oil from the capillary tube the capillary tube has 2marks namely upper mark and lower mark when the sample touches the upper

mark.Start stop watch and calculate how much time it takes for sample oil for travelling from upper path to lower path after that note the time in seconds multiply the time with capillary constant value no.

Slide preparation:

Materials required for slide preparation are ferrogram maker, glass slide, cleaner liquid, oil sample

Procedure:

First keep the slide on the ferrogram maker and add some oil sample to the tube installed in ferrogram maker now on the ferrogram maker so that the oil flows on the slide and the impurities in the oil attach to the slide.

VIBRATION ANALYSIS

It can forecast potential machinery problems and pinpoint their cause. Further the same provides periodic condition monitoring using instrumentation. A database is developed to record performance, establish machine histories, assist maintenance diagnostics and extend machinery reliability. Problems detected include imbalance, misalignment, motor and electrical defects, gear train defects, and bearing defects.

Generally, a set of instruments consisting of accelerometers, FFT analyser, recorder and set of cables are used to obtain spectral plots. If the hardware is interfaced with fault diagnostic system to the computerized maintenance management system, then suitable signals can provide information to the operator or maintenance staff.

The steps included in the Vibration Analysis are:

- Using FFT Analyser Collect the XYZ Axis Readings.

IV. RESULTS AND DISCUSSION

The experiment is done and the Oil Analysis and the Vibrational Analysis reports are as shown in the figure below.

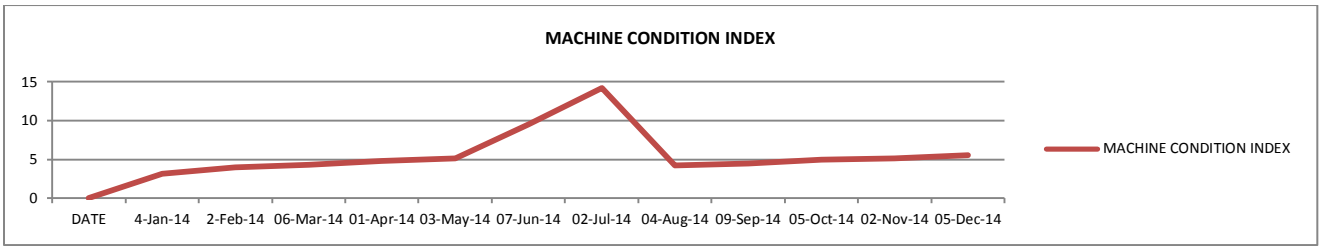
Oil Analysis Report For Cooling Tower 1A:

The Oil analysis report for the cooling tower 1A is as shown in the Table 1

PREVENTIVE MAINTENANCE (OIL ANALYSIS REPORT)		
DATE	**MACHINE CONDITION INDEX**	**Remarks / Actions**
4-Jan-14	3.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
2-Feb-14	4	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
06-Mar-14	4.3	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
01-Apr-14	4.8	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
03-May-14	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
07-Jun-14	9.5	Oil sample tested found warning . Vibration Limits are Also Raising trend. (Oil Report attached)
02-Jul-14	14.2	Oil inspected, found metal particals gear box dismentled and inspetcedpinoin damaged, new spare pinoinrepalced.
04-Aug-14	4.2	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
09-Sep-14	4.5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Oct-14	5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
02-Nov-14	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Dec-14	5.5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)

Table 1. MACHINE CONDITION INDEX ACCORDING TO ISO ISO 4406-1996

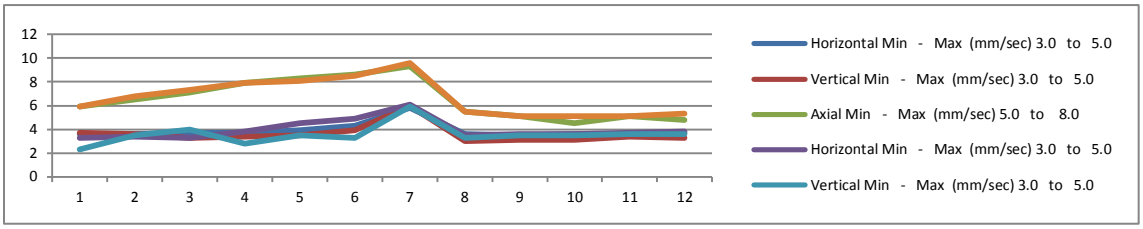
0 --NORMAL-- 5	6 --ABNORMAL-- 10	11--CRITICAL--15



Vibrational Analysis Report For Cooling Tower 1A:

The Vibrational analysis report for the cooling tower 1A is as shown in the figure.

PREVENTIVE MAINTENANCE (VIBRATION ANALYSIS REPORT)							
1A - COOLING TOWER FAN GEARBOX							
DATE	**Vibration (Velocity) mm/sec.**						**Remarks / Actions**
	DRIVE END			**NON DRIVE END**			
	Horizontal	**Vertical**	**Axial**	**Horizontal**	**Vertical**	**Axial**	
	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	
	3.0 to 5.0	3.0 to 5.0	5.0 to 8.0	3.0 to 5.0	3.0 to 5.0	5.0 to 8.0	
4-Jan-14	3.6	3.7	5.9	3.3	2.3	5.9	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
2-Feb-14	3.6	3.6	6.5	3.4	3.5	6.8	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
06-Mar-14	3.7	3.3	7.1	3.3	4.0	7.3	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
01-Apr-14	3.7	3.4	7.9	3.8	2.8	7.9	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
03-May-14	3.9	3.5	8.3	4.5	3.5	8.1	Oil sample tested found Alert. Vibration Limits are Also Raising trend. (Oil Report attached)
07-Jun-14	4.3	3.9	8.6	4.9	3.3	8.5	Oil sample tested found warning . Vibration Limits are Also Raising trend. (Oil Report attached)
02-Jul-14	5.8	6.0	9.3	6.1	5.9	9.6	Oil inspected, found metal particals gear box dismentled and inspetcedpinoin damaged, new spare pinoinrepalced.
04-Aug-14	3.6	3.0	5.5	3.5	3.3	5.5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
09-Sep-14	3.5	3.1	5.1	3.6	3.5	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Oct-14	3.6	3.1	4.5	3.6	3.5	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
02-Nov-14	3.6	3.4	5.1	3.7	3.6	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Dec-14	3.7	3.3	4.8	3.8	3.6	5.3	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)



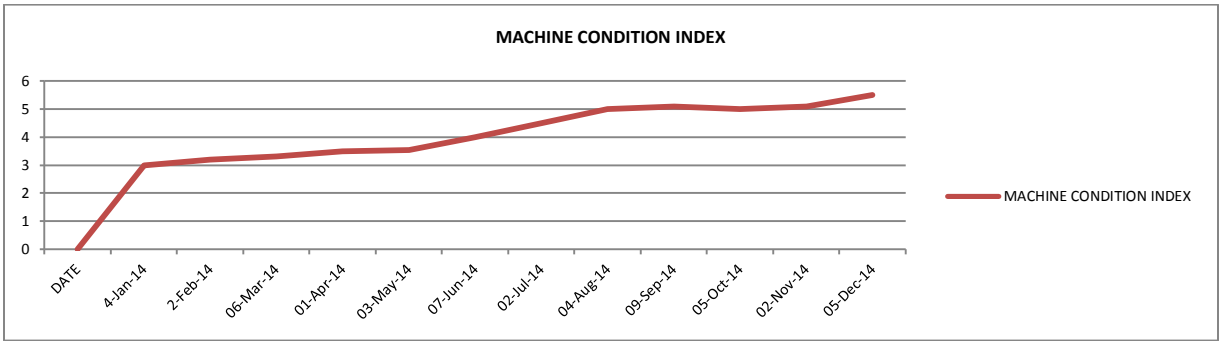
Oil Analysis Report For Cooling Tower 1B:

The Oil analysis report for the cooling tower 1B is as shown in the table 2.

PREVENTIVE MAINTENANCE (OIL ANALYSIS REPORT)		
DATE	**MACHINE CONDITION INDEX**	**Remarks / Actions**
4-Jan-14	3	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
2-Feb-14	3.2	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
06-Mar-14	3.3	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
01-Apr-14	3.5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
03-May-14	3.55	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
07-Jun-14	4	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
02-Jul-14	4.5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
04-Aug-14	5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
09-Sep-14	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Oct-14	5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
02-Nov-14	5.1	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Dec-14	5.5	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)

Table 2: MACHINE CONDITION INDEX ACCORDING TO ISO ISO 4406-1996

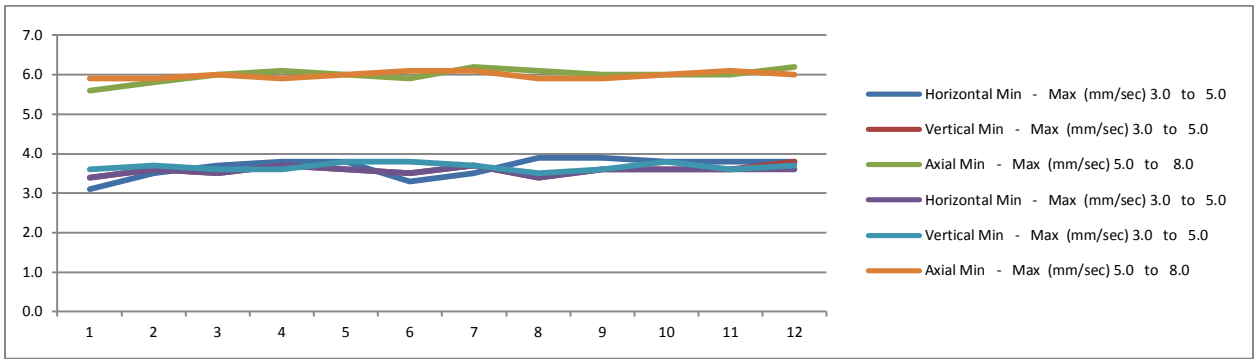
0 --NORMAL-- 5	6 --ABNORMAL-- 10	11 --CRITICAL-- 15



Vibrational Analysis Report For Cooling Tower 1B:

The Vibrational analysis report for the cooling tower 1B is as shown in the figure.

PREVENTIVE MAINTENANCE (VIBRATION ANALYSIS REPORT)							
1A - COOLING TOWER FAN GEARBOX							
DATE	Vibration (Velocity) mm/sec.						Remarks / Actions
	DRIVE END			NON DRIVE END			
	Horizontal	Vertical	Axial	Horizontal	Vertical	Axial	
	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	Min - Max (mm/sec)	
	3.0 to 5.0	3.0 to 5.0	5.0 to 8.0	3.0 to 5.0	3.0 to 5.0	5.0 to 8.0	
4-Jan-14	**3.1**	**3.4**	**5.6**	**3.4**	**3.6**	**5.9**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
2-Feb-14	**3.5**	**3.6**	**5.8**	**3.6**	**3.7**	**5.9**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
06-Mar-14	**3.7**	**3.5**	**6.0**	**3.5**	**3.6**	**6.0**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
01-Apr-14	**3.8**	**3.7**	**6.1**	**3.7**	**3.6**	**5.9**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
03-May-14	**3.8**	**3.6**	**6.0**	**3.6**	**3.8**	**6.0**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
07-Jun-14	**3.3**	**3.5**	**5.9**	**3.5**	**3.8**	**6.1**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
02-Jul-14	**3.5**	**3.7**	**6.2**	**3.7**	**3.7**	***6.1***	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
04-Aug-14	**3.9**	**3.4**	**6.1**	**3.4**	**3.5**	**5.9**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
09-Sep-14	**3.9**	**3.6**	**6.0**	**3.6**	**3.6**	**5.9**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Oct-14	**3.8**	**3.6**	**6.0**	**3.6**	**3.8**	**6.0**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
02-Nov-14	**3.8**	**3.6**	**6.0**	**3.6**	**3.6**	**6.1**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)
05-Dec-14	**3.8**	**3.8**	**6.2**	**3.6**	**3.7**	**6.0**	Oil sample tested found no abnormalities. Vibration Limits are with in range. (Oil Report attached)



V. CONCLUSION

Condition monitoring of the gear box fo the cooling tower through wear debris analysis and vibration analysis yielded the same results regarding the condition of both the gear boxes. Both the analysis reported abnormality in the 6th sample / visit and criticality in the 7th sample for the 1a cooling tower. Hear the equipment cost and time involved in the preparation of the reports is very much high

in case of wear debris analysis when compare to vibration analysis however wear debris analysis gives an idea of the defective components of the gear box whereas the vibration analysis followed in this case needs spectrum analysis to get an idea on the defective elements of gear boxes but equipment capable of giving overall vibration and the spectra gives much quicker and precise results even in the case of vibration hence vibration analysis can be prepared over wear debris analysis considering the time and cost

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Study on the Quality of Honey Collected from Three Floral Sources of Bangladesh

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Abstract- An investigation on quality parameters of honey collected from mustard, litchi and sundarban (multiflora) flora of Bangladesh was undertaken to compare with European Union (EU) quality standard viz., moisture content, electric conductivity, specific rotation, hydroxymethylfurfural (HMF) content, invertase content, antibiotic content and sulfonamides content. Sundarban honey (multifloral) (17.7g/100g) and mustard honey (19.5g/100g) were found in standard moisture condition and the litchi honey was found above the limit of EU standard (20g/100g). All the honey samples were found in the EU standard limit in terms of electrical conductivity and specific rotation. The HMF content was found higher (200.5mg/kg) in sundarban sample and no HMF was observed in the litchi honey. Highest invertase activity (99 IU/kg) was found in the litchi honey where as mustard and sundarban honey showed very low invertase activity with 2.0 IU/kg and 0.0 IU/kg respectively which was far below than EU standard (50 IU/kg). All the samples had shown negative reaction with tetrasensor and sulfasensor. So, it may be concluded that the honey from sundarban was highly overheated. On the other hand, the mustard and litchi honey were overheated and not heated respectively. Sundarban and mustard honey had failed to reach the quality standard to the EU. But litchi honey was found to met the all the EU quality requirements except the moisture content.

Index Terms- Hydroxymethylfurfural, Litchi honey, Mustard honey and Sundarban honey

I. INTRODUCTION

Honey has been called the "original medicine" and has been revered cross-culturally as a gift from the gods. It is a popular sweetener throughout the world. As the only available natural sweetener honey was an important food for *Homo sapiens* from his very beginnings. Indeed, the relation between bees and man started as early as Stone Age. The first written reference to honey, a Sumerian tablet writing, dating back to 2100-2000 BC, mentioned honey's use as a drug and an ointment (Crane, 1975). In the long human tradition honey has been used not only as a nutrient but also as a medicine. An alternative medicine branch, called apitherapy, has developed in recent years, offering treatments based on honey and the other bee products against many diseases (Molan, 2001). From ancient times, honey was not only used as a natural sweetener but also as a healing agent. Many health-promoting and curative properties attributed to it are the basis for some traditional folk medicine treatments throughout the world today. Of the consumers who use honey, 93 percent consider honey a healthful product, recognizing it as a pure, natural product. Seven percent think of it as a good home remedy (Krishna, 2005). At present, the annual world honey production is about 1.2 million tons, which is less than 1% of the total sugar production. The major honey exporting countries China and Argentina have small annual consumption rates of 0.1 to 0.2 kg per capita. Honey consumption is higher in developed countries, where the home production does not always cover the market demand. In the European Union, which is both a major honey importer and producer, the annual consumption per capita varies from medium (0.3-0.4 kg) in Italy, France, Great Britain, Denmark and Portugal to high (1-1.8 kg) in Germany, Austria, Switzerland, Portugal, Hungary and Greece, while in countries such as USA, Canada and Australia the average per capita consumption is 0.6 to 0.8 kg/year (Molan, 2001). However, in recent years, governments of many countries have increased control over food production, processing, and distribution to protect consumers against the biological, chemical, and environmental contamination of food. There have been a number of cases where contaminated honey has been found on sale, including India and China. Such cases have demonstrated that systems were inadequate to prevent contamination and led to demands for more stringent systems to prevent contamination in honey. Honey can be contaminated from the environment and from beekeeping practices. Environmental contaminants can reach the raw materials of bee products (nectar, honeydew, pollen, plant exudates) through the air, water, plants, and the soil. These contaminants include insecticides, herbicides, bactericides, fungicides, heavy metals and radio active substances. The main contaminants of honey from beekeeping practices are substances used to control the bee pest *Varroa* and the disease foulbrood. Varroacides, antibiotics, residues of para-dichlorobenzene (PDCB) and other more toxic substances, such as naphthalene, which is used by beekeepers to control wax moths and storage vessels, are the main contaminants of from beekeeping practices. Honey can be contaminated with heavy metals from inappropriate storage containers as inorganic or organic components can diffuse from the inner surface of paraffinated, corrosive and painted vessels into honey. Increased iron concentration caused by storing honey in metal containers is a common problem. These chemicals are not only hazardous for health but also make a barrier for honey trade both national and international market. Bangladesh is exporting a little quantity of honey in the Middle East especially in Saudi Arabia and in the

United Arab Emirates. Beside these, due to low price in the domestic market beekeepers are trying to export their honey in the developed country mainly in the European countries. To get permission to export in the EU countries Bangladesh honey needs to qualify some parameters to meet the EU standard. Hence, the present study was undertaken to compare some important parameters of Bangladesh honey to meet the EU standard.

II. Materials and Methods

Honey Sample:

Two samples were collected from migratory beekeepers who migrate their hives to mustard and litchi flora during its flowering season and were designated as mustard honey and litchi honey. Another honey sample was collected from Mowali who gathered honey from Sudarban (multifloral source) located in Khulna district of Bangladesh. This honey was named as Sundarban honey. Mustard and litchi honey were known to be processed honey and the processing method was also known. Mustard honey was processed through steaming and the litchi honey was processed through filtering. But processing method of the Sundarban honey samples was not known.

All the samples were tested in the laboratory of Instituut voor Landbouw- en Visserijonderzoek (ILVO), ministry of Agriculture, Belgium in June to August 2010 and 2011.

The parameters of honey quality were 1. Moisture content 2. Electric conductivity 3. Specific rotation 4. Hydroxymethylfurfural (HMF) content 5. Invertase content 6. Antibiotic content and 7. Sulfonamides content. All the quality parameters were tested as described by Reybroeck *et al.* 2007 and explained under the following subheadings:

Sample preparation for determining moisture content:

Honey samples were homogenized for 3 minutes. As the mustard honey sample is in solid form, a part of the honey was liquefied by heating in a water bath at 50^0C ($\pm 2^0$C) for 20 minutes in a closed glass flask. The flask was in airtight condition. Honey sample were mixed firmly with a dry and clean glass rod. Honey samples were than passed through a 0.5 mm sieve to remove non soluble particles (bee particles, wax, egg), and any coarse material. Honey samples were kept for cooling at room temperature (25ºC) and were stirred again and again.

Measurement of water:

Water has a refractive index of 1.3330 at 20^0C (range 1.3327 – 1.3333). When the temperatures were above 20^0C, a constant number of 0.00008 was added for each ^{0}C increased and when the temperatures decreased below 20^0C, 0.00008 was subtracted for each ^{0}C.

Measurement of honey refractive index:

The refractive index was corrected for the temperature. It was done by adding 0.00023 per ^{0}C temperatures increase above 20^0C and subtracting 0.00023 per ^{0}C the temperatures decrease below 20^0C.

Calculation of the refractive index at 20^0C

Measurements were repeated three times and mean measurements were taken. The difference among the measurements (corrected to 20.0 °C) were found between the range of 0.0004.

Calculation and expression of results

The mean refractive index (at 20°C) was converted to moisture content [in % (g/100 g)]: Moisture Content = [$-\log_{10}$ (Corrected Refractive Index - 1) -0.2681] / 0.002243.

The result was expressed as moisture content in % (g/100 g) with a 1 digit after the comma.

Norm

Council Directive 2001/110/EC of 20 December 2001 relating to honey:

In general : Not more than 20.0%

Heather (*Calluna*) an baker's honey in general: Not more than 23.0%

Baker's honey from heather (*Calluna*): Not more than 25.0%

Determination of electrical conductivity:

The electrical conductivity of honey is defined as that of a 20% weight in volume solution in water at 20^0C, where the 20% refers to honey dry matter. Result is expressed in milliSiemens per centimeter ($mS.cm^{-1}$).

Reagents required for the determination of electrical conductivity were freshly prepared distilled water, potassium chloride solution, 0.1M. Potassium chloride (KCl) weighing7.4557 g was dissolved, dried at 130^0C, in freshly distilled water in a 1000 ml flask and filled to volume with distilled water.

Equipment requirements were conductivity meter and cell. Model of conductivity cell was Consort SK10T, BB8. Water bath required at a temperature of 20ºC ± 0.5ºC. Volumetric flasks of 100 ml and 1000 ml and Beakers, tall form were also required.

Sample preparation procedure for electric conductivity determination

A part of honey was dissolved, equivalent to 20.0 g anhydrous honey, in distilled water. The solutions were transferred quantitatively to a 100 ml volumetric flask and made up to volume with distilled water.

The beakers were placed with the sample solutions in the thermo stated water bath at 20ºC ± 0.5ºC. The conductivity cell was dried with absorbing paper. The conductivity cell was immersed in the sample solutions. The conductances were read in mS after temperature equilibrium (20ºC) has been reached. The conductance (G) and the temperature were read and noted.

As the determination was carried out at a different temperature, due to lack of thermostated cell, a correction factor were used for calculation of the value at 20ºC:

For temperatures above 20ºC: 3.2% value was subtracted for each ºC increase and for temperature decrease below 20ºC: 3.2% value was added for each ºC decrease. The electrode was rinsed with distilled water.

Calculation and expression of results

The electrical conductivity of the honey solution was calculated, by using the following formula:

$S_H = K.G$

Where: S_H = electrical conductivity of the honey solution in $mS.cm^{-1}$, K = cell constant in cm^{-1}, G = conductance in mS. The results were expressed to the nearest 0.01 $mS.cm^{-1}$.

Determination of the cell constant

As the cell constant of the conductivity cell was not known, it was determined by transferring 40 ml of the 0.1M potassium chloride solution to a beaker. Then, the conductivity cell was connected to the conductivity meter. After that, the cell was rinsed thoroughly with the potassium chloride solution and immersed the cell in the solution, together with a thermometer. The electrical conductance of those solutions was read in mS after the temperature was equilibrated to exactly 20ºC.

Calculation of the cell constant K by using the following formula: K= 11.691 X 1/G. Where: K = the cell constant in cm^{-1}, G= the electrical conductance in mS, measured with the conductivity cell and 11.691= the sum of the mean value of the electrical conductivity of freshly distilled water in $mS.cm^{-1}$ and the electrical conductivity of 0.1M potassium chloride solution, at 20ºC.

Norm

Council Directive 2001/110/EC of 20 December 2001 relating to honey.

- Honey not listed below, and blends of these honeys : ≤ 0.80 mS/cm
- Honeydew and chestnut honey and blends of these except with those listed below : > 0.80 mS/cm
- Exceptions: strawberry tree (*Arbutus unedo*), bell heather (*Erica*), eucalyptus, lime (*Tilia* spp), Ling heather (*Calluna vulgaris*), manuka or jelly bush (*Leptospermum*), tea tree (*Melaleuca* spp.).

Determination of specific rotation:

The method can be applied to all honey samples. In particular, most of the honeydew samples have positive values of specific rotation whereas nectar honeys have negative values.

The specific rotation $[\alpha]^{20}_D$ is the angle of rotation of polarized light at the wavelength of the sodium D line at 20°C of an aqueous solution of 1 dm depth and containing 1g/ml of the substance.

Reagents required were distilled water, Carrez I solution (10.6 g potassium hexacyanoferrate(II), ($K_4Fe(CN)_6.3H_2O$) was dissolved in distilled water and diluted to 100 ml, Carrez II solution (24 g zinc acetate ($Zn(CH_3COO)_2.2H_2O$) was dissolved in distilled water, 3g (= 2.86 ml) of glacial acetic acid was added and diluted to 100 ml with distilled water.

Equipment required were Polarimeter+sodium lamp+2-dm polarimeter tube, volumetric flasks (100 ml), filtration funnels and filtration papers.

Sample preparation procedure

Twelve g honey samples were weighed (corresponding to about 10 g dry substance) and then the honey were dissolved in distilled water, 10 ml of Carrez I solution was added in each sample and mixed thoroughly for 30 seconds. Ten ml of Carrez II solution was added in each sample and mixed again for 30 seconds and was made up to volume in a 100 ml volumetric flask with distilled water. The samples were allowed to stand overnight at room temperature. The next day, the solutions were filtered.

Test procedure

Zero was set with distilled water. A clean 2-dm polarimeter tube was rinsed and filled with the filtered honey solution. The tube was placed in the polarimeter and the angular rotation (α) was read. The measurements were taken at the temperature of 20°C.

Calculation and expression of results

Specific angular rotation $[\alpha]^{20}_D = \alpha \times 100 / l \times p$ (When using 10 g of honey (dry matter) and a 2 dm polarimeter tube $[\alpha]^{20}_D = \alpha \times 5$).

Where, α = angular rotation found, l = length in decimeters of the polarimeter tube and p= grams of dry matter taken.

(If the wavelength of the light used is 589 nanometer (the sodium D line), the symbol 'D' is used. The sign of the rotation (+ or -) is always given. The formal unit for specific rotation is deg cm^2 g^{-1} but scientific literature uses just degrees). Results were at one decimal place. Most of the honeydew samples have positive values of specific rotation whereas nectar honeys have negative values.

Determination of Hydroxymethylfurfural (HMF) (as described by White, 1979):

The method determines the concentration of 5-(hydroxymethyl-) furan-2-carbaldehyde. The result is usually expressed in milligrams per kilogram. The HMF content was used as a heat-treatment indicator. The determination of the hydroxymethylfurfural (HMF) content was based on the determination of UV absorbance of HMF at 284 nm (White, 1979). In order to avoid the interference of other components at this wavelength the difference between the absorbances of a clear aqueous honey solution and the same solution after addition of bisulphate was determined. The HMF content is calculated after subtraction of the background absorbance at 336 nm. This method is based on the original work of White.

Reagents required were Carrez solution I: [15 g of potassium hexacyanoferrate (II), $K_4Fe(CN)_6.3H_2O$ was dissolved in water and was made up to 100 ml], Carrez solution II: [30 g zinc acetate, $Zn(CH_3.C00)_2.2H_2O$ was diluted and made up to 100 ml], sodium bisulphate solution 0.20 g/100g [0.20 g of solid sodium hydrogen sulphite $NaHSO_3$, (sodium metabisulphite, $Na_2S_2O_5$) was dissolved in water and diluted to 100 ml. Freshly prepared 5-Hydroxymethyl-2-furaldehyde, Sigma H40807.

Equipment required, UV-Visible Spectrometer operating in a wavelength range including 284 and 336 nm. 1 cm quartz cells or disposable UV-cuvettes (Brand 7591 50 or equivalent), vortex mixer, filter paper.

Preparation of sample and reference solutions

Five g of honey was accurately weighed into a 50 ml beaker (filtration tube). The samples were dissolved in approximately 25

ml of water and transferred quantitatively into a 50 ml volumetric flask. Now 0.5 ml of Carrez solution I was added and mixed. Then 0.5 ml of Carrez solution II was added and mixed and made up to the mark with water (a drop of ethanol was added to suppress foam). Filtration was done through paper; the first 10 ml of the filtrate was rejected. Five ml in each of two 2 test tubes (18 x 150 mm) were pipetted.

Dilution of sample and reference solutions were carried out as follows:

Additions to test-tube	Sample Solution	Reference solution
Initial honey solution	5.0 ml	5.0 ml
Water	5.0 ml	-
0.2 % sodium bisulphate solution	-	5.0 ml

Test procedure

The absorbance of the sample solutions were determined against the reference solution at 284 and 336 nm in 10 mm quartz cells within one hour.

(If the absorbance at 284 nm exceeds a value of about 0.6, the sample solution was diluted with water and the reference solution with sodium bisulphate solution to the same extent in order to obtain a sample absorbance low enough for accuracy)

If dilution was necessary,

The Dilution factor 'D', where $D = \frac{\text{Final volume of sample solution}}{10}$

If no dilution was necessary, the dilution factor = 1.

Calculation and expression of results

HMF in mg/kg = (A284 – A336) X 149.7 X 5 X D/W

Where:

A284 = absorbance at 284 nm, A336 = absorbance at 336 nm, $149.7 = \frac{126x1000x1000}{16830x10x5}$ = Constant, 126 = molecular weight of HMF, 16830= molar absorptivity of HMF at λ= 284 nm, 1000= conversion g into mg, 10= conversion 5 into 50 ml, 1000= conversion g of honey into kg, 5= theoretical nominal sample weight, D= dilution factor, in case dilution is necessary, W= Weight in g of the honey sample. The results were expressed in mg/kg to 1 decimal place.

Note

Some honeys, such as lime, may show strong absorbance at 284nm due to interfering substances. If these have an absorbance at 336 nm different to that at 284 nm, the result will be in error. This difficulty is normally overcome by using a double-beam spectrophotometer. In the absence of such instrument, sample dilution may be tried. In this case the dilution factor must be taken into account when calculating the result. If dilution is too great to give adequate accuracy, an alternative method should be used.

Council Directive 2001/110/EC of 20 December 2001 relating to honey.

Hydroxymethylfurfural content (HMF) determined after processing and blending

In general, except baker's honey: Not more than 40 mg/kg

Honeys of declared origin from regions with tropical climate and blends of these honeys: not more than 80 mg/kg

Determination of invertase as described by White (1994)

The invertase activity, a freshness parameter is expressed in units, where one unit is defined as the number of micromoles of substrate destroyed per minute and expressed per kilogram of honey. p-Nitrophenyl-α-D-glucopyranoside (pNPG) is used as a substrate for the determination of the sucrase number in honey. p-Nitrophenyl-α-D-glucopyranoside (pNPG) is split into glucose and p-nitrophenol by α-glucosidase (invertase, sucrase). By adjusting the pH to 9.5 the reaction was stopped and at the same time nitrophenol was transformed into the nitrophenolate anion, which corresponds to the amount of converted substrate and is determined photometrically at 400 nm.

Reagents required for the determination of invertase

Buffer solution (0.1 M, pH=6.0) [11.66 g of potassium hydrogen phosphate KH_2PO_4. $2H_2O$ was dissolved in water and diluted to 1L], Substrate p-nitrophenyl-α-D-glucopyranoside (pNPG)solution, 0.02M [6.0252g pf pNPG was dissolved in buffer solution and made up to 1L (dissolved by heating (never above 60°C)]. Up to 1 month it was stored in a dark bottle in the refrigerator. STOP solution (3M, pH = 9.5) [363.42g of tris-(hydroxymethyl) aminomethane was dissolved in water and diluted to 1L. pH was adjusted to 9.5 with 3M hydrochloric acid. Equipment required: Photometer at 400 nm, 1 cm disposable UV-cuvettes (Brand 7591 50 or equivalent), Thermostated water bath (40 ± 0.5 °C) and vortex mixer.

Preparation of sample: Honey solution: 5g of honey + buffer solution in 25 ml flask and made up to the mark with buffer solution (was kept in the refrigerator for 1 day).

Procedure

Five ml of substrate solution was placed in test tube at 40°C. 0.50 ml of honey solution was added (starting time). The samples were then mixed and incubated at 40°C. After exactly 20 minutes 0.50 ml of STOP solution was added and mixed (sample solution).

For the blank, 5.0 ml of substrate solution was incubate at 40°C at the same time. 0.50 ml of STOP solution was added and mixed and 0.50 ml of honey solution was added. The solutions were cooled to room temperature and within one hour the absorbances were measured for the samples and the blank solutions in 1 cm cells at 400 nm.

Calculation and expression of results:

The amount of p-nitrophenol (µM) produced corresponds to the amount of substrate (µM) utilised.

Invertase (1 U/kg) = 1 µmol pNPG / minutes x kg honey

Invertase in U/kg = 6 x 0.05 x 0.05298 x 104 x ΔA400 = 158.94 x ΔA400

Where, U = 1 international unit with a defined utiklisation of 1 µM per minute, 6 = factor for the ml of sample solution used (total volume), 0.05 = converts reaction time from 20 minutes to 1 minute, 104 = converts the amount of honey taken (0.1 g in 0.5 ml) to 1 kg, 0.05298 = 7.37 / 139.11; conversion factor for µg into µM per ml, where 7.37 = factor for p-nitrophenol from the corresponding graph, 139.11 = molecular weight of p-nitrophenol. Reported to one decimal place.

Invertase number (IN) = 21.64 x ΔA400 where 21.64 = slope of linear regression of IN (y-axis) on ΔA400 (x-axis).

Norm

No norm in Council Directive 2001/110/EC of 20 December 2001 relating to honey.

International Honey Commission proposal:

In general, except baker's honey: ≥ 50 (IU)

Honey with a low natural enzyme content: ≥ 20 (IU)

Arbutus, *Robinia*, *Erica* : ≥ 10 (IU)

IU: Siegenthaler units

Determination of tetracyclines in honey (as described by Reybroeck, 2007):

This method describes a procedure to determine residues of tetracyclines in honey by means of TetraSensor Honey (Unisensor s.a., Wandre, BE). The method can be applied to all types of honey.

Principle of the Tetrasensor Honey

The Tetrasensor Honey is a receptor assay for the fast screening of residues of tetracyclines in honey. During this first incubation period tetracyclines possibly present in the honey bind with the specific receptor. During the second incubation the sample is migrating over an immunochromatographic dipstick with two capture lines. The first line (TEST) captures the remaining active receptor and the second line (CTRL) serves as a control line. The colour intensity at both capture lines is interpreted visually.

Reagents required

Tetrasensor Honey testkit (the kit was stored in a refrigerator (2–8 °C) until the expiration date stated on the kit label), vials with lyofilised receptor and the immunochromato-graphic dipsticks (kept 1 day at room temperature), the testkit TH00616 was for 25 assays, testkit TH00624 was for 100 assays, chlortetracycline hydrochloride (Sigma C4881 , stored at -18°C), distilled water.

Standards

Blank honey (free from tetracyclines) and Honey with 10 µg/kg (ppb) chlortetracycline.

Equipment required: Small spatula or glass rod and waterbath at 37±2 °C.

Sample preparation

For liquid and semisolid honey sample preparation was not required. Solid honey was liquified by heating in a glass test tube in a water bath at 37±2 °C.

Test procedure

The lid of the honey dilution tube was filled with honey. Then, the samples were vigorously mixed to dissolve all honey. 200 µl of the dilution was added to the lyophilised receptor into the reagent vial. The sample was mixed by swirling the vial. After that, the samples were incubated at room temperature (20 ± 5°C) for 15 minutes. A dipstick (with the arrows downwards) was dipped into the vial. The dipstick was making contact with the liquid. The incubation was continued for 15 minutes. The coloured lines were interpreted as shown in the figure.

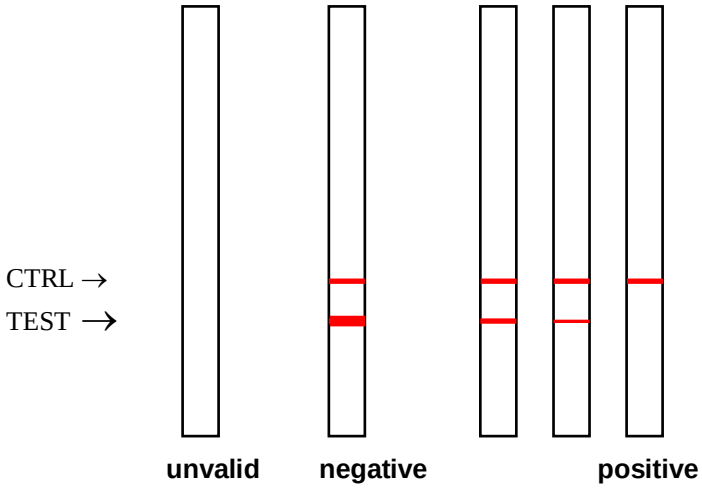

Figure 1. Tetrasensor strip reaction

The visual interpretations were as follows: when the colour of the test line is more intensive than the colour of the control line, the honey sample is negative ('vis neg'). In all other cases the honey is contaminated with tetracyclines ('vis pos') (Figure 1).

Quality control and control criteria

Besides the samples to be tested, always include a blank control honey and a honey doped with 10 µg/kg chlortetracycline the same day. The blank honey must give a negative result. The honey doped with 10 µg/kg chlortetracycline must give a positive result. The second capture line on the dipstick serves as a control line and always has to become visible; otherwise the test is invalid. This is shown in the figure 1.

Expression of results: A positive result was expressed as 'Result: +, tetracyclines present); a negative result was expressed as 'Result: -, tetracyclines not detectable'.

Norm

Regarding the European legislation (EEC Regulation 2377/90 and modifications) the use of antibiotics is not allowed in apiculture: no MRLs are fixed for tetracyclines in honey (zero tolerance).

Determination of sulfonamides in honey (as described by Reybroeck, 2007):

This method describes a procedure to determine residues of sulfonamides in honey by means of SulfaSensor Honey (Unisensor s.a., Wandre, BE). The method can be applied to all types of honey.

Principle of the SulfaSensor Honey

The SulfaSensor Honey is a receptor assay for the fast screening of residues of sulfonamides in honey. Sample pretreatment = hydrolysis to release the sulfa's possibly bound on the sugars. During the first incubation step of the assay, sulfonamides possibly present in the honey bind with the specific receptor. During the second incubation the sample is migrating over an immunochromatographic dipstick with two capture lines. The first line (TEST) captures the remaining active receptor and the second line (CTRL) serves as a control line. The colour intensity at both capture lines was interpreted visually.

Reagents required

SulfaSensor Honey testkit (the kit was stored in a refrigerator (2–8°C) until the expiration date stated on the kit label), vials with lyofilised receptor and the immunochromatographic dipsticks (kept 1 day at room temperature), Sulfamethazine (Sigma S6256, stored between 2-6°C) and distilled water.

Standards

Blank honey (free from sulfonamides) and honey with 20 µg/kg (ppb) sulfamethazine.

Equipment required: Small spatula or glass rod, gas burner, beaker or pot in heat-resistant glass or in metal and dry-block Heatsensor incubator at 40°C (Waterbath at 37±2 °C).

Sample preparation

Solid honey was liquified by heating in a glass test tube in a water bath at 37±2 °C. The neutralizing buffer was completely dissolved before use. Boiling water was prepared. The cap of the tube was filled with honey (650 mg). 600 µl (3 micropipettes) of acid buffer was added to the tube and vigorously mixed to dissolve all honey. When water was boiling the water was removed from the fire and directly incubated the honey tube sample for 5 minutes using the floating tube support. The tube from the warm water was removed and was open carefully. 600 µl (3 micropipettes) of neutralizing buffer was added, the cap was closed and vortex was done. 1800 µl (9 micropipettes) of honey buffer (total volume = 3.5 ml) was added, the cap was closed and vortex was done.

Test procedure

The corresponding number of freeze-dried reagent microwells was opened and placed them in the Heatsensor at 40°C. Directly 200 µl of the honey sample tube solution was added to the lyophilised receptor, the samples were mixed 5-10 times by pushing up and down the plunger of the micropipette. Incubation was done for 5 minutes at 40°C. A dipstick (with the arrows downwards) was dipped into the vial. The dipstick was making contact with the liquid. The incubation was continued for 15 minutes at 40°C. The dipstick and the filter were removed directly. The samples were interpret within 10 minutes and the coloured lines as shown in the figure or perform an instrumental reading.

The visual interpretations were as follows: when the colour of the test line is more intensive than the colour of the control line, the honey sample is negative ('vis neg'). In all other cases the honey is contaminated with sulfonamides ('vis pos') (Figure 2).

Quality control and control criteria

Besides the tested samples, a blank control honey and a honey doped with 20 µg/kg sulfamethazine was included on the same day. The blank honey gave a negative result. The honey doped with 20 µg/kg sulfamethazine gave a positive result. The second capture line on the dipstick served as a control line and always became visible.

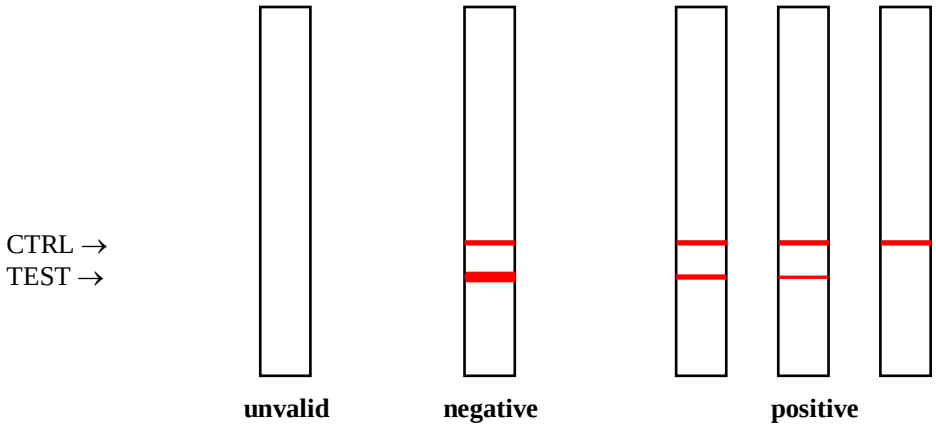

Figure 2. Sulfasensor strip reaction

Expression of results

A positive result is expressed as 'Result: +, sulfonamides present); a negative result is expressed as 'Result: -, sulfonamides not detectable'.

Norm

Regarding the European legislation (EEC Regulation 2377/90 and modifications) the use of antibiotics is not allowed in apiculture: no MRLs are fixed for sulfonamides in honey (zero tolerance). In some countries an action limit is applied (e.g.in Belgium, set at 20 µg per kg).

III. Results and Discussion

Moisture content

Highest moisture content (21.0g/100gm) was obtained in litchi honey which is followed by mustard (19.5g/100gm) and sudarban honey (17.7g/100gm) respectively (Table 1). Among the three honey samples sundarban honey and mustard honey met the EU standard (20g/100gm) but moisture content in litchi honey was higher and failed to reach export quality.

Table 1. Comparative moisture content of Bangladesh honey to EU standard

Type of honey	Mean moisture content (g/100 g)	EU standard* (g/100 g)
Mustard honey	19.5	not more than 20
Litchi Honey	21.0	not more than 20
Sundarban honey	17.7	not more than 20

* Council Directive 2001/110/EC of 20 December 2001 relating to honey

In general, high moisture content occurred if honey is harvested in unripe condition and in that case moisture content is crossed over EU limit (20g/100gm). To maintain the acceptable limit honey is processed either in processing plant or manually through steaming method. As the mustard honey samples were steamed its' moisture content was found low. Sundarban honey generally marketed after processing manually or through processing plant and its moisture content remained below 20%. The litchi honey was collected as fresh condition and no processing was done (only filtered), and therefore, its moisture content was high. This finding is supported by the work of Reybroeck *et al.* (2007).

Electrical conductivity

Highest electrical conductivity (0.213 mS/cm) was recorded in sundarban honey (Table 2). The lowest electrical conductivity (0.158 mS/cm) was found in litchi honey. All the honey samples were in the acceptable limit of EU standard (≤ 0.80 mS/cm). So, each type of honey has the quality to enter in the EU market in terms of electrical conductivity.

Table 2. Comparison of electrical conductivity of Bangladesh honey to EU standard

Type of honey	Average electrical conductivity (mS/cm)	EU standard* (mS/cm)
Mustard honey	0.175	≤ 0.80
Litchi Honey	0.158	≤ 0.80
Sundarban honey	0.213	≤ 0.80

* Council Directive 2001/110/EC of 20 December 2001 relating to honey

The results indicated that the honey samples were form the floral source only. If honey is mixed with sugar syrup its electrical conductivity crossed EU standard (0.80 mS/cm).

Specific rotation

The highest specific rotation (-11,0 deg cm^2 g^{-1}) was recorded in mustard honey and the lowest specific rotation (-13.0 deg cm^2 g^{-1}) was in Sudarban honey (Table 3). All the honey samples showed negative specific rotation. So, all the honey samples were obtained from floral origin (nectar honey) and all the samples were in the acceptance status of EU standard.

Table 3. Comparison of specific rotation of Bangladesh honey to EU standard.

Type of honey	Average specific rotation (deg cm^2 g^{-1})	EU standard* (deg cm^2 g^{-1})
Mustard honey	-11.0	(+) indicate extra floral honey (-) indicate nectar honey
Litchi Honey	-12.0	(+) indicate extra floral honey (-) indicate nectar honey
Sundarban honey	-13.0	(+) indicate extra floral honey (-) indicate nectar honey

* Council Directive 2001/110/EC of 20 December 2001 relating to honey

It is known that mustard nectar and litchi nectar found its flower which is a good natural source for foraging by bees. As sundarban honey was obtained from different floral source of sundarban (multifloral source), it also showed negative specific rotation. The results also suggested that sundarban honey was also from the nectar of flowers not from the extra floral nectar.

Hydroxymethylfurfural (HMF) content

The highest HMF was obtained from the sudarban honey (200.5 mg/kg) and the lowest HMF (0.0 mg/kg) was obtained from litchi honey which was 8.2 mg/kg in mustard honey (Table 4). From the tested sample litchi honey and the mustard honey

showed the acceptable limit of EU standard (80.0 mg/kg). On the other hand, sundarban honey showed more HMF content in comparison to mustard and litchi honey and was not in the acceptable limit of EU standard (80.0 mg/kg).

Table 4. Comparison of Hydroxymethylfurfural (HMF) content of Bangladesh honey to EU standard.

Type of honey	Average hydroxymethylfurfural (HMF) (mg/kg)	EU standard* (mg/kg)
Mustard honey	8.2	not more than 80.0
Litchi Honey	0.0	not more than 80.0
Sundarban honey	200.5	not more than 80.0

* Council Directive 2001/110/EC of 20 December 2001 relating to honey

Hydroxymethylfurfural content increases with the increase of temperature when the honey is processed. Fructose of honey is damaged when honey is heated. As the litchi honey samples were freshly harvested, HMF was not found. Mustard honey was processed through steaming, and therefore the mustard samples showed slightly higher HMF. In case of Sundarban honey, the honey samples were not processed in the processing plant and the honey might be overheated. The results are also supported by the work of Reybroeck *et al.* (2007).

Invertase activity

Invertase activity was the highest in number (99.0 IU/kg) in the litchi sample and lowest (0.0 IU/kg) in the sundarban honey (Table 5). Mustard honey showed higher number (2.0) of invertase activity in comparison to sundarban honey but lower than the samples of litchi honey. Both the mustard and sundarban honey had lower invertase than the acceptable limit of EU standard (≥ 50 IU/kg).

Table 5. Comparison of invertase activity of Bangladesh honey to EU standard.

Type of honey	Average invertase activity (IU/kg)	EU standard* (IU/kg)
Mustard honey	2.0	≥ 50
Litchi Honey	99.0	≥ 50
Sundarban honey	0.0	≥ 50

* Council Directive 2001/110/EC of 20 December 2001 relating to honey

Enzyme is denatured in high temperature. If the honey is processed in overheated condition invertase activity will be dropped to lower level. As the litchi honey was in fresh condition i.e. not processed its invertase activity was found in higher. The mustard honey was processed through steaming and it might be overheated and hence resulted lower invertase activity. In case of sundarban honey, the enzyme was damaged fully and it was might be through overheating, and therefore no enzyme activity was found in this sample.

Tetrasensor reaction

All the samples were found having no antibiotics (tetracycline) (Table 6). So, all the honey samples were in the acceptable limit of EU standard.

Table 6. Comparison of tetrasensor reaction of Bangladesh honey to EU standard.

Type of honey	Reaction to tetrasensor	EU standard*
Mustard honey	(-) negative	(-) not detected/ zero tolerance
Litchi Honey	(-) negative	(-) not detected/ zero tolerance
Sundarban honey	(-) negative	(-) not detected/ zero tolerance

*Council Directive 2001/110/EC of 20 December 2001 relating to honey

In Bangladesh, most of the beekeepers do not use antibiotics to control foulbrood or nosema disease. Even the mustard and litchi sample were collected from the hive where use of antibiotics was not observed. Marketed Sundarban honey was also may be from the beekeepers/ mowalis who did not apply any antibiotics in the hives. In addition there was no record of foulbrood and or nosema disease in the hives.

Sulfasensor reaction

All the samples were found having no sulfur containing compound or sulfonamide drugs (Table 7). So, all the honey samples were found in the acceptable limit of EU standard in respect of sulfasensor reaction.

Table 7. Comparison of sulfasensor reaction of Bangladesh honey to EU standard.

Type of honey	Reaction to sulfasensor	EU standard*
Mustard honey	(-) negative	(-) not detected
Litchi Honey	(-) negative	(-) not detected
Sundarban honey	(-) negative	(-) not detected

*Council Directive 2001/110/EC of 20 December 2001 relating to honey

Most of the beekeepers of Bangladesh do not use sulfonamide drugs to control parasitic mite. Even the mustard and litchi sample were collected from the hive where the use of sulfur containing chemical or drugs was not observed. Marketed Sundarban honey was also may be from the beekeepers who did not apply sulfonamide drugs in the hives because of the absence of parasitic mites in the hives.

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Effect of Different Chemicals on Drone Fertility of Honeybee (*Apis mellifera* L.)

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Abstract- Investigated the effect of two different soft chemicals viz., formic acid and oxalic acid+ sugar syrup, and one synthetic miticide (Bayvarol) on drone fertility of *Apis mellifera* L. Drones of untreated control were found in highly fertile condition where the highest sperm production (1.63µl) was recorded. The highest living sperm cell (94.58%) was also observed in the untreated control drones. The lowest sperm production (0.46 µl) and the lowest living sperm cell (84.38%) were observed in the Bayvarol treated drones. The highest mortality of drone (56.36%) was also recorded in the Bayvarol treated drones. The lowest ejaculation (17.27%) and the highest nosema infected drones (30.9%) were also observed in the Bayvarol treated drones. Formic acid and Oxalic acid+ sugar syrup had shown little effect on drone fertility. It is concluded that the Bayvarol affects the sperm production, sperm viability and interfere the immune system of bees due to high number of nosema infection.

Index Terms- Drone fertility, Formic acid, Oxalic acid and Synthetic miticide.

I. Introduction

Humans and honey bees interactions are date back at least 9000 years and are found in prehistoric cave paintings depicting people on ladders with baskets collecting honey from nests on a rock cliff (Caron 1999). To obtain more hive products and human interests on honey bee led to the development of man-made hives and beekeeping practices for the efficient management of honey bee colonies. The development of modern hives also led to an increased interest in the study of honey bees as a biological organism. Over the years researchers have increased the understanding of the biology and behavior of the honey bees, from how bees navigate, to the inner workings of their complex social behavior. Research has also led to improvements in management practices. However, problems continue to plague the beekeeping industry, particularly those associated with colony health. Researchers and beekeepers, for example, have failed to find methods for the safe control of parasitic mites viz., *Acarapis woodi*, *Varroa destructor* and *Tropilaelaps clarae* affecting honey bees worldwide. Tracheal mites, *Acarapis woodi* and the varroa mite, *Varroa destructor* affect populations of both feral and managed honey bee colonies (Sammataro *et al.*, 2000). *Varroa destructor* is a serious parasitic mite of honeybees worldwide. In general, the control of this mite is obtained by the use of several acaricides. The most common and popular methods for parasitic mite control in the beekeeping industry have been the use of synthetic chemical acaricides placed directly in honey bee colonies (Gregorc *et al.*, 2007). More natural products, such as organic acids (soft chemicals such as oxalic acid, formic acid etc.) and plant-derived oils (such as thymol, menthol etc.), have also made their way into the world market. Little has been reported on the side effects of these chemical treatments on honeybees (Gregorc *et al.*, 2007) and there has been no research on the biochemical effects on the host after exposure to acaracides. In addition, other problems have emerged from the use of acaricides in colonies, including the accumulation of chemical residues in beeswax, as well as mite resistance to the chemicals. Concomitant with this miticide use, beekeepers have faced increased problems with maintaining productive queens in their hives. Problems such as queen failure, heightened queen supersedure rates, and the inability of hives to re-queen themselves have been reported (Sanford, 2001). Likewise, more studies on these acaricides are needed to evaluate their possible negative impacts on the honeybee populations especially on drone honey bees.

Drone bees play important role in the hive to get huge number of workers and queen production for the next generation. Research on drone fertility is very limited in the world. As the beekeeping industry in Bangladesh is emerging and parasitic mites are threats to Bangladesh beekeeping industry, there is an urgent need to develop a bee breeding centre to get very good quality mated queen, and therefore, research on drone bees is necessary. Thus, the current study on the effects of soft chemicals and synthetic miticides on drone fertility was conducted to investigate the effect of soft chemicals and synthetic miticides on the reproductive physiology of drones with regard to sperm production and viability and to know the effect of these chemicals on drone bees.

II. Materials and Methods

The experiment was conducted in the Centre for Integrative Bee Research (CIBER) of the University of Western Australia, Australia during January to April 2012. The materials required and the methodology of the application of treatments and determining various parameters are described under the following sub-headings:

Drone collection:

One healthy colony of honey bee was selected in the Apiary of the University of Western Australia which was located at Schenton Park, Perth. The queen of healthy colony was used to

get drone eggs in the pre-built drone comb. The drone rearing hive was transferred to the bee yard of the school of animal biology of the University of Western Austraila after 24 days of egg laying. On day 25 the drone frame was taken out from the hive and was kept in a one framed drone box in the incubator for drone emergence. On day 26 most of the drones were emerged from the drone pupal cell.

Design and layout of the Experiment:

The experiment was set up in a Randomized Complete Block Design (RCBD). Oxalic acid+ Sugar syrup, commercial miticide Bayvarol (flumethrin) strip, formic acid and untreated control treatments were applied on 2 days old drone. Therefore, four treatments were: Oxalic acid+ Sugar syrup, Bayvarol (Flumethrin), Formic acid and untreated control (without miticide)

Preparation of treatments

Oxalic acid+ sugar syrup treatment: 4.5 ml 100% oxalic acid was mixed with 94.5 ml distilled water to get 4.5% oxalic acid. After that 300gm of sugar were dissolved in 1 liter of water to get 30% sugar syrup. Ten ml of oxalic acid was mixed with half part 10ml 30% sugar syrup. Bayvarol: 1 commercial Bayvarol strip was cut to make 4 pieces of strip. Formic acid: 2ml of 5% formic acid was soaked in cotton puff.

Application of treatment

For Oxalic acid+ sugar syrup treatment, 100 drone bees were kept in 4 plastic boxes (20cmX10cmX5cm) for each treatment. The lids of the boxes were punctured to make proper ventilation. Two water soaked small towel were kept in each plastic box for the maintenance of proper moisture inside the plastic box. A chocolate sized sugar candy was placed inside the plastic box for proper food supplement. After that each boxes of bees were sprayed with oxalic acid + sugar syrup by using syringe. Lid of each box was placed on the plastic box. Four treated plastic boxes were then kept in a large plastic box (50cmX25cmX20cm). For Bayvarol treatment 2 pieces of prepared Bayvarol strip were kept in a big plastic box which was of similar size as used for oxalic acid+ sugar syrup treatment. Then 4 small plastic boxes with bees were kept in the large box as described for the earlier treatment. For formic acid 1 piece of 2 ml formic acid soaked cotton puff was placed in a large plastic box which was similar to those used for oxalic acid+ sugar syrup and Bayvarol treatments. Then 4 small plastic boxes with bees were kept in the big box and a control treatment was also been done. All the boxes having bees inside were kept in the incubator maintained at 33ºC and 70% R.H which was left for 1 day to get the treatment effect.

Drone preparation for the laboratory test

After the day of treatment application 25 bees were kept in small wooden boxes. Sixteen (4x4) small wooden boxes keeping one side open with a piece of queen excluder were set in two frames with rubber band. Then the drones were backed to their original hive to get workers' nursing.

After 12 days the data on the Sperm production (µl) of drone, Sperm viability, Drone mortality, Ejaculation success of drone, and other vulnerability was recorded.

Drones were collected in a container. A piece of paper towel was placed at the bottom of the container to keep the container clean. Two cotton balls soaked in sugar syrup were kept in the container as food supplement for the drones. Artificial insemination (AI) microscope was prepared. Artificial insemination syringe was filled with semen diluents. Sperm viability fluorescent dyes were prepared and the dyes were defrosted at dark. Twelve to sixteen days old sexually matured drones were collected. Drones were prepared for sperm collection by stimulating them through partial eversion of the penis. Under a microscope, ejaculation was stimulated by pressing on the thorax. Using an AI syringe approximately 1.0 to 2.0 µl of semen was collected from the drone. Two hundred to 250 µl of semen diluents was used depending on the sperm concentration. Sperms were mixed with semen diluents very gently and mixed very slowly.

Fluorescent Staining: A microscope slide was placed in the developing container (incubation). The slide was kept in the dark condition. Five µl of SYBR-14 (clear solution) was placed onto the slide. Five µl of the semen sample was added in a circular motion to ensure that all sperm were equally distributed over the droplet. The slide was then kept for incubation for 10 minutes in the dark and at room temperature. Two µl of propidium iodide (red solution) was added to each droplet, again in a circular motion. The droplet was gently covered with a 12 mm square cover slip. Then the prepared slide sample was kept 7-10 minutes in the dark and at room temperature for incubation.

Counting sperm viability: the fluorescent microscope was turned on and the main light was turned off. The slide was gently placed under the objective and was focused using the edge of cover slip. The first 500 perm cells were counted along the centre of the cover slip. Dead cells were in red color and the live cells were in green color.

Sperm viability was expressed in percentage by using the following formula:

$$\text{Percentage (\%) sperm viability of drone} = \frac{\text{Live sperm in the prepared sample}}{\text{Total number of counted sperm}} \times 100$$

Drone mortality percentage was calculated by following formula:

$$\text{Drone mortality (\%)} = \frac{\text{Dead drone in the treatment}}{\text{Total number of drone in the treatment}} \times 100$$

Ejaculation success percentage was calculated by the following formula:

$$\text{Ejaculation success (\%)} = \frac{\text{Drone ejaculated normally}}{\text{Total number of drone used in ejaculation}} \times 100$$

Other vulnerability: During the experimental period it was found that drones were susceptible to nosema disease hence, nosema infected drone (%) was also calculated and the following formula was used:

$$\text{Nosema infected drone (\%)} = \frac{\text{Nosema infected bees}}{\text{Total number of live bees}} \times 100$$

Nosema Identification: Nosema disease was diagnosed through the squeezing of drones. The excreta of drones were come out in liquid form after squeezing. The excreta were in yellow in color and in liquid form.

III. Statistical analysis

The data for each parameter was analyzed statistically to find out the variation among the treatments. The percent data were transformed by square root transformation. The analysis of variance for different parameters was done using MSTAT-C software. The mean were separated by Least Significance Difference (lsd) Test.

IV. Results and Discussion

Sperm production:

The highest (1.63µl) sperm per drone was provided by the control drones which was follwed by the drones treated with oxalic acid +sugar syrup and found significant difference with other treatments (Table I). Formic acid treated drone showed the third highest number of sperm (0.96 µl) and the lowest (0.46 µl) was observed in the Bayvarol treated drone. All the treatment showed better performance in comparison to the drone treated with Bayvarol. According the scale highly fertile drone (scale 4) was observed in the control drones and poorly fertile drone was observed in the Bayvarol treated drones.

Table I. Average sperm production and scaling of sperm production as affected by different treatments.

Treatment	Average sperm production (µl)/drone	Scale
Oxalic acid+ Sugar syrup	1.38b	3
Bayvarol (Flumethrin)	0.46d	1
Formic acid	0.96c	2
Control (without miticide)	1.63a	4

In a column means having similar letter(s) are statistically identicital and those having dissimilar letter(s) differ significantly as per 5% level of lsd.

It was evident that synthetic miticide, Bayvarol had negative effect on the sperm production and resulted poorly fertile drone.

Sperm viability:

The highest live sperm cell (94.58%) was observed in the untreated control drones. The lowest live sperm cell (84.36%) was obtained in the Bayvarol treated drones (Figure 1). Formic acid treated drones (88.68%) and oxalic acid+ sugar syrup treated drones (89.07%) had higher live sperm cells compare to that of Bayvarol treated drones. But the treated drones showed lower number of live sperm cell as compared to that of untreated control drones.

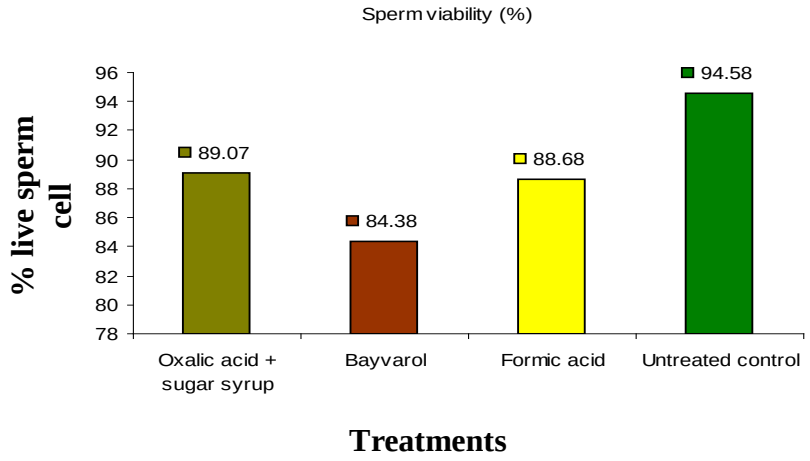

Figure 1. Live sperm cells (%) as influenced by different miticidal treatments.

From the results it is evident that Bayvarol, Formic acid and Oxalic acid+ sugar syrup had negative impact on sperm cells viability of drone bees.

Drone mortality

The highest drone mortality (56.36%) was observed in the Bayvarol treated drones (Figure 2). The lowest percent drone mortality (11.01%) was observed in the Formic acid treated drones which was almost similar with that of untreated control drones (18.09%). Oxalic acid+ sugar syrup treated drones showed the second highest (42.25%) drone mortality which differed numerically with the other treatments.

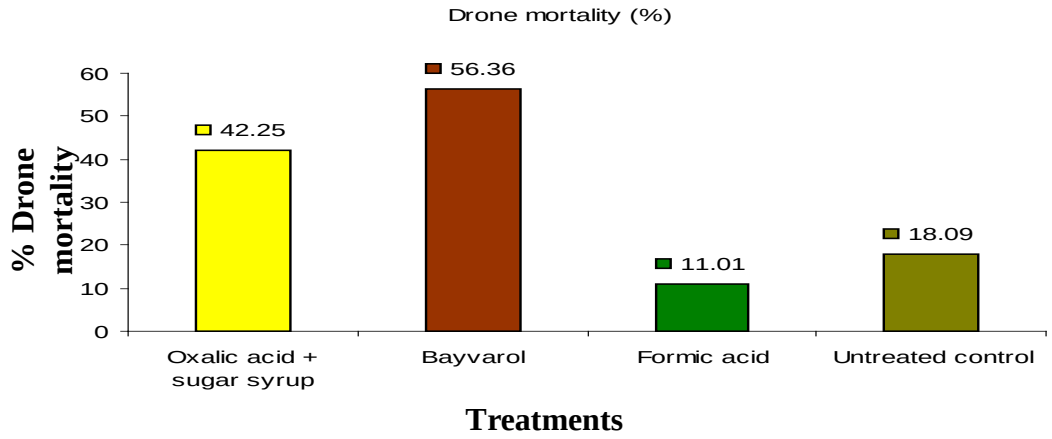

Figure 2. Drone mortality (%) observed in different miticidal treatments.

From the results it is evident that Bayvarol and Oxalic acid+ sugar syrup might had negative effect on drone mortality in terms of direct exposure.

Ejaculation of drone

The highest ejaculation of drone (74.28%) was observed in the untreated control drones (Figure 3). The lowest percent drone ejaculation (17.27%) was observed in the Bayvarol treated ones which was lower than that of the other treated drones. Formic acid treated drones showed the second highest (66.97%) ejaculation of drone percentage which was almost similar to that of untreated control treated drones (74.28%).

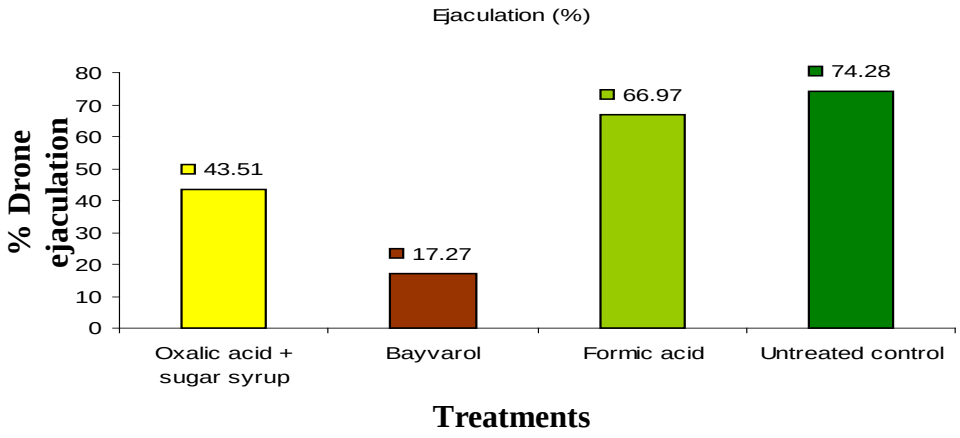

Figure 3. Ejaculation of drone found after different miticidal treatments.

From the results it is evident that Bayvarol had negative impact on ejaculation of drone.

Nosema infection

The highest rate of drone was infected by nosema disease (30.9%) and it was observed in the Bayvarol treated drones. The lowest percent nosema infected drone (12.38%) was observed in the untreated control drones which was lower than any of the treated drones. Formic acid treated drones showed the second highest (26.61%) nosema infection which was almost similar to that of Bayvarol treated (30.90%)) and oxalic acid+ surgar syrup treated drones (21.72%) (Figure 4).

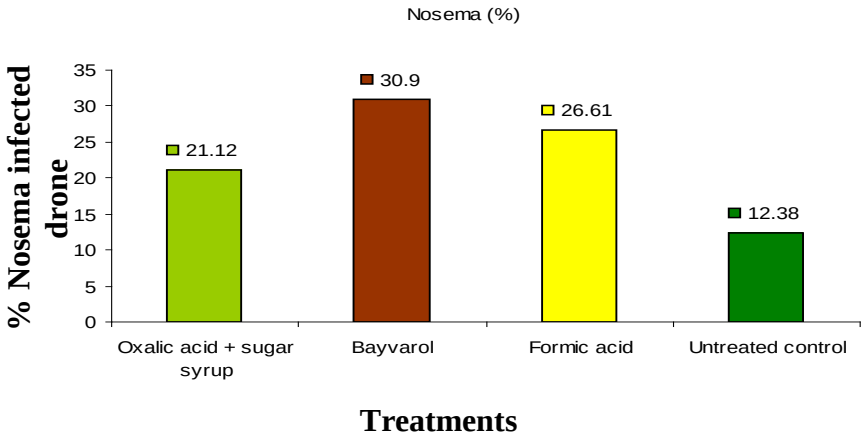

Figure 4. Nosema infection (%) found after different miticidal treatments.

From this result it is evident that Bayvarol might have negative effect on the bee immunity, and therefore, more bees were infected by nosema in the Bayvarol treated drones compared to other treated drones.

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Geophysical and Geotechnical Investigations of a proposed Site for Afijio Local Government Stadium Ilora, Southwestern Nigeria.

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Abstract- Stadium disasters due to inappropriate multiple engineering/geological errors have been part of history of the world necessitating pre construction site investigation using geotechnical and geophysical evaluation of a proposed Site for Afijio Local Government Stadium Ilora, Southwestern Nigeria. gGeotechnical aspect of this research involved, diging of three trial pits and seven samples were taken per pit at interval of 0.5m. The samples were taken to the laboratory for grain size analysis and consistency limits determination following the standards specified by ASTM D6913-04. Furthermore, five points on the proposed site were occupied employing Schlumberger electrode array, with a maximum current electrode spacing (AB/2) of 100m. The data obtained were interpreted using partial curve matching technique and RESIST software. Results of the geotechnical investigation revealed that the soil samples from the proposed site have plastic limit that ranged from 50 – 95 (av. 69), liquid limit from 5 – 25 (av. 15.43) while the plasticity index ranged between 30 and 70 (av.53.57). The soil samples from the proposed site are in the intermediate to high plasticity class, poorly graded and with high percentage finer passing 0.075 mm (av. 96.12%).. Electrical resistivity survey of the study area revealed three geoelectric curves (H, QH and Q) indicative of the preponderance of the combined weathered and fractured layer (unconfined) aquifers system. Five different subsurface lithologic sequences namely; lateritic topsoil, sandy clay, weathered basement, fractured basement and fresh basement were delineated with overburden thickness ranging from 1 to 60m. Geo-electric layers of the VES stations revealed generally, partially weathered/fractured subsurface
Geotechnical assessment revealed that, the average percentage of the finer exceeded 35% approved maximum standard for a foundation material and also the site being underlain by poorly graded soil that did not meet engineering specification for foundation render the site unsuitable such massive structure while the electrical resistivity survey revealed partially weathered/fractured terrain which further confirmed its unsuitability. Except, there is constrain of space, if this site must be used, further investigation must be done using other geotechnical approaches to better understand engineering strength characteristics of the underlying soil for well engineered foundation design to ensuring safety of the proposed structure.

Index Terms- Trial pits, Schlumberger arrays, plasticity index, poorly graded, geoelectric curves.

I. INTRODUCTION

The main purpose of a stadium is to provide entertainment to humans apart from Socio-economic incentive as it provides jobs for its construction and operation. Stadium disasters have been part of history of the world. In 1902, Ibro Stadium in Glasgow constructed using wooden frame terrace collapsed during a Scotland versus England international leading to the death of 26 people. The incident led to the prohibition of wooden scaffold type terraces in favor of solid earth banking (www.stadiumguide.com/timelines/stadium-disasters**).** Burden Park in Bolton collapsed in 1946 due to overloading resulting from high population with estimated crowd of 85,000 people. Thirty five (35) Fans were reported dead while about 400 people were injured. The top of a temporary stand of Stade Furiani in Bastia collapsed in 1992 before the start of a Coupe de France semi-final between SC Bastia and Olympique de Marseille. Eighteen (18) people died and hundreds more were injured [1]. The causes of the collapsed stadia include amongst others; multiple engineering/geological errors, safety breaches, poor planning and poor safety management.

Safety of life and property is paramount in stadium location and construction. The need for pre-foundation studies has therefore become necessary so as to prevent loss of valuable lives and properties that always accompany stadium collapse due to structural failure. Geophysical and Geotechnical investigations have acquired substantial importance in preventing human and material damage due to foundation cracks and other geo-hazard features from deficient geologic structures. The scope of this research encompasses determination of the geotechnical suitability and land stability in the context of the proposed Stadium. The principal objectives of the investigation are to develop an appropriate geotechnical model of the site so that recommendations with regard to land stability and geotechnical constraints to the proposed development are identified. Vertical electrical sounding technique was employed to determine the depth to bedrock, structural mapping and evaluation of subsoil engineering characteristics to assess its competence.

II. LOCATION AND GEOLOGY

The study area is located at the outskirt of Ilora, along Agricultural Settlement in Afijio Local government area, Oyo State. The study area is just by the side of the road (Fig.1).

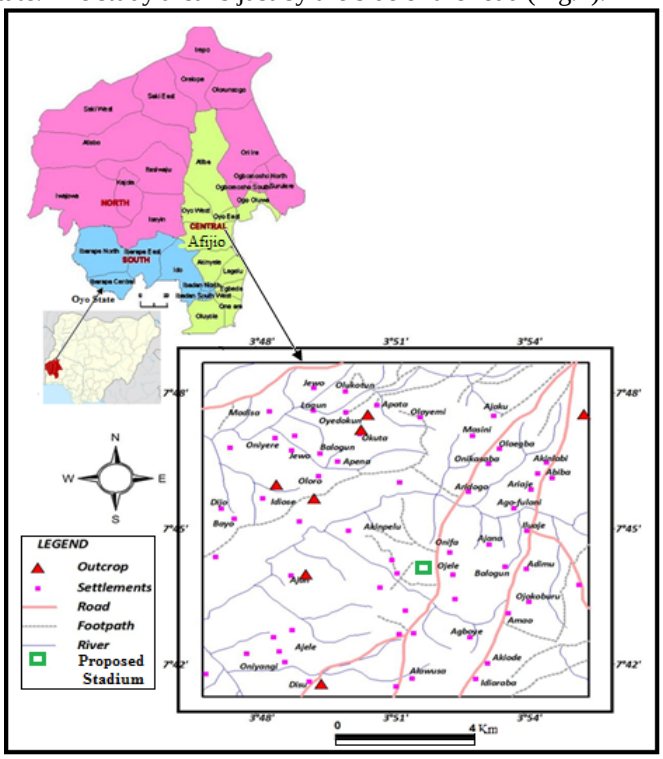


Figure1: Location of Study

The study area has a tropical derived savannah climate with average temperature of 26^{0}C and up to 29^{0}C during the peak of the dry season. Lower night-morning temperature of 12-18^{o}C is possible during the brief cold period in the harmattan season. The climate is characterized by dry and wet seasons with the dry season covering mid-October to March while the rainy season is from March to mid October. The area has an average annual precipitation of about 1500mm. The local physiography of the proposed stadium site revealed flat relief or topography generally characteristic of derived savannah. The site is a farm land which has suffered a lot of human activities mainly farming and overgrazing by animal. The notable plants in the area include the cassava plantation, cashew and mango trees.

Geologically, the area falls within the Basement Complex of southwestern Nigeria. The evolution of the Basement complex of Nigeria is associated with the general evolution of the African continent. The oldest rocks is the migmatites gneiss with supralcrustal relics which have yielded Archean (c. 2700Ma), and Proterozoic (c.2000Ma) ages [3]. The Principal rock units in Afijio local government include Migmatite gneiss, Banded gneiss and quartzites belonging to the Migmatite gneiss complex. Other minor rocks are the intrusion of quartz pegmatite, and dolerites. There is no outcrop within the vicinity of the proposed stadium site. However, the degree of weathering of the soil as well as any structural deficiency will be determined employing electrical resistivity survey and other necessary geotechnical index properties.

III. METHODOLOGY

The geotechnical aspect of this study entailed digging of 3 trial pits, each of 3.5m deep. Figure 2 represents sample trial pit in this research. At each pit, disturbed samples were collected at interval of 0.5m. A total of seven samples were collected per pit and taken to the laboratory for further geotechnical tests (grain size analysis and consistency limits) following the standards specified by [2].

Figure 2: Sample Trial Pit dugged during Sampling Operations

Vertical Electrical Sounding (VES) was employed to probe the subsurface of the study area. The extent of pore spaces, joints or fractures as well as the nature of the associated fluid/liquid are said to have significant control on the resistivity of rock/subsurface medium [4]. Five points on the proposed site (one at the centre and one at each angle of the rectangular site) were occupied for fair coverage using Ohmega Ω Resistivity Meter. Schlumberger arrays were employed with the electrodes expanded from a minimum current electrode spacing (AB/2) of 1.0 m to a maximum of 100m. Thus with maximum current electrode separation (AB) of about 200m and potential electrode separation (MN) of 1-10m with geometric relationship between the potential electrodes and current electrodes maintained at MN ≤ 1/5AB, sufficient subsurface current penetration was guaranteed. The focus of such VES operation is primarily on the evaluation of the vertical variation within the subsurface in the selected locations. Subsequent to field survey measurements and data collection, data from VES measurements were subjected to data processing and evaluation as the basis for interpretation of the results of the field measurements. The VES field data were plotted on bilogarithmic paper and processed using the usual manual curve matching technique. This entails the use of a two-layer model master curve alongside with auxiliary curves. For the above-mentioned curve matching techniques, the principle of conversion of geo-resistivity field data to layer or stratified subsurface was upheld in the course of interpretation of the

processed data. For quantitative interpretation, the result of the manual curve matching interpretation was used as in-put model for computer-assisted RESIST software version 1.0. [5].

IV. RESULTS AND DISCUSSION

4.1. Geotechnical Result

The results of the geotechnical properties of soil samples from the study area are presented in Table 1. The results revealed that the plastic limit ranged from 50 – 95 (av. 69), liquid limit from 5 – 25 (av. 15.43) while the plasticity index ranged between 30 and 70 (av.53.57). In accordance with the plasticity classification of [6], the soil samples are in the intermediate to high plasticity class. Samples D and E were in the intermediate plasticity class, while the remaining samples fell into high plasticity class. Plasticity index is used to know the workability of soil, the lower the plasticity index of a soil the better it is for construction purpose. Plasticity of fines affects engineering properties such as compressibility and shear strength and with the high plasticity of soil samples as indicated in Table 1, the proposed site is considered unsuitable for the location of a stadium. Moreover, the representative particle size distribution curves (Fig.3) of soil samples in this research indicate that the soil is poorly graded. Particle-size distribution curve shows not only the range of particle sizes present in a soil but also the type of distribution of various size particles which affect the engineering properties of soil. Poorly graded soils, with their lack of one or more sizes, leave more or greater voids and therefore a less-dense mass. The soil samples under consideration are fine-grained, clayey with high plasticity index and will require considerable treatment if the stadium is to be sited at this location. The tested soils have percentage finer (percentage passing 0.075 mm) ranging from 94.60 – 97.50% (av. 96.12%). Generally, the tested soil samples have percentage passing 0.075 mm of more than 35% recommended by [7] for a foundation material. The soils can be generally rated as poor sub-grade foundation material. The soils that are largely made up of fine particle are likely to impacting the building with differential settlement as the clay changes volume especially during the change in weather from wet to dry season or vice vasa. Such soil is therefore termed to having poor geotechnical properties as foundation materials than soils that are largely made up of coarse particle.

Table 1: Results of geotechnical properties of soil samples from the study area

Sample	% Passing sieve no 200 (0.075mm)	W_p	W_L	Plasticity Index (PI)	D_{10}	D_{30}	D_{60}	C_U	C_C	PC	AC	RS
A	96.30	60.00	5.00	55.00	0.25	0.68	2.20	8.80	0.840	HP	A_7	Poor
B	96.20	60.00	8.00	52.00	0.20	0.60	2.40	12.00	0.750	HP	A_{7-6}	Poor to fair
C	96.20	70.00	10.0	60.00	0.19	0.50	1.80	9.47	0.731	HP	A_{7-6}	Poor to fair
D	96.8	50.00	20.0	30.00	0.23	0.42	0.82	3.57	0.935	IP	A_{7-6}	Fair
E	97.50	68.00	22.00	46.00	0.18	0.35	1.60	8.89	0.425	IP	A_{7-6}	Poor to fair
F	95.25	80.00	18.00	62.00	0.20	0.40	0.80	4.00	1.000	HP	A_{7-6}	Poor to fair
G	94.60	95.00	25.00	70.00	0.05	0.15	0.40	8.00	1.125	HP	A_7	Poor
Min	94.60	50.00	5.00	30.00	0.05	0.15	0.40	3.57	0.43			
Max	97.50	95.00	25.00	70.00	0.25	0.68	2.40	12.00	1.13			
Mean	96.12	69.00	15.43	53.57	0.19	0.44	1.43	7.82	0.83			
Stdev	0.96	14.84	7.70	12.91	0.06	0.17	0.77	3.03	0.23			

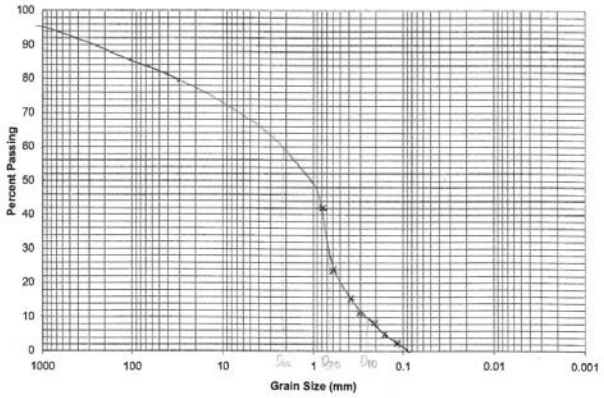
HP = High plasticity, IP = Intermediate Plasticity, Wp = Plastic limit, WL = Liquid limit, D_{10} = % Finer is 10%, D_{30} = % Finer is 30%, D_{60} = % Finer is 60%, C_u = Uniformity Coefficient, C_C = Coefficient of Curvature, PC = Plasticity Class, AC = AASHTO Class, RS = Rating as subgrade material.

Table 1 revealed that the tested soil samples are of high consistency limits indicating high percentage of clay content in the soil. Generally, soils having high values of liquid and plastic limits are considered poor as foundation materials and as such the location proposed for the siting of the stadium is not likely to be suitable and would otherwise warrants significant modification to upgrade its engineering strength characteristics. The plastic index of all the soil samples are higher than 20% maximum recommended by Federal Ministry of Works and Housing [7], hence it shows a poor engineering property since the higher the plastic index of a soil, the less the competency of the soil as a foundation material. Furthermore, the plasticity chart (Fig. 4) revealed that the soil samples are inorganic clay (lean clay) as PI > 7 and plots above "A" line.

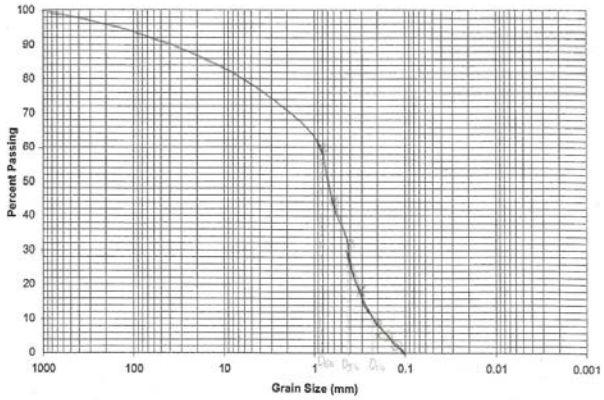
4.2. Geophysical Result

Vertical Electrical Sounding (VES) method was adopted to determine vertical variation in geo-resistivity parameter in order to gain insight into the variations in litho-units with depth. Five (5) vertical electrical soundings were carried out to determine the variation of electrical properties of the subsurface with depth. The summary of the interpreted results of the vertical electrical soundings (VES) are presented in Table 1 while the geoelectric curves are presented in Fig. 5. In addition, the geoelectric

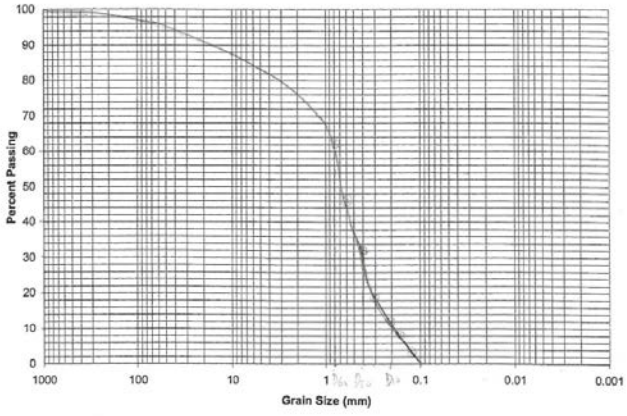
sections are as shown in Fig 6. The qualitative analysis of the VES interpretation shows that three main curves (H, QH and Q) (Fig.5) predominate the study area. The geo-electric curves are generally indicative of the preponderance of the combined



Sample A



Sample D



Sample G

Figure 3: Representative particle size distribution curves of soil samples from the study area

V. CONCLUSION

weathered and fractured layer (unconfined) aquifers system in the study area [8]. Furthermore, the geoelectric sections (Fig. 6) that show the variations of resistivity and thickness values of layers within the depth penetrated in the study area at the indicated VES stations, revealed five different subsurface lithologic sequences namely; lateritic topsoil, sandy clay, weathered basement, fractured basement and fresh basement. The topsoil thickness is relatively thin with average resistivity and thickness values of 1201Ω-m and 1m respectively. Sandy-clay was encountered in two locations with resistivity ranging between 76 and 124Ω-m and thickness values from 15 – 60m.

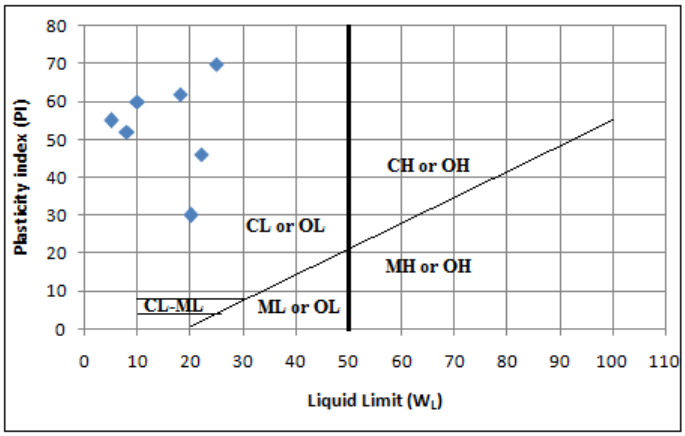


Figure 4: Plasticity Chart indicating the soil type of the study area.

Variation in the estimated overburden thickness ranged from 1 to 60m. This is a clear indication of varied thickness of the weathered regolith across the study area, with bedrock topography reflecting varied degree of weathering of the basement rock units. Weathered Basement was encountered in all the five VES locations and the resistivity and thickness values for the Weathered Basement ranged from 395 - 968Ω-m and 3 - 7m respectively. The Fractured Basement encountered in 3 locations (VES 2, 3 and 5) was characterized with low resistivity (av. 111 Ω-m) and average thickness value of 25m while the Basement which was encountered in only two locations (Fig. 6) has average resistivity and depth of 9820 Ω-m and 31m respectively. Geo-electric layers of the VES stations revealed generally, partially weathered/fractured subsurface units. The thickness of the saturated layer is highest around VES 1 and 4. VES 3 is partially weathered and highly fractured. Though, in term of groundwater potential, virtually, all the VES locations can be drilled for water development but VES 1, 2, and 3 are more promising in the proposed stadium. However, based on the results of geophysical survey under consideration this site is not suitable for stadium location as the area is highly fractured and weathered.

This research was conducted to establish the suitability of a site at Ilora in Afijio local government, Oyo state Nigeria for stadium location. The soil samples from the proposed stadium location are in the intermediate to high plasticity class. The soil is poorly graded with high percentage finer passing 0.075 mm (av. 96.12%).

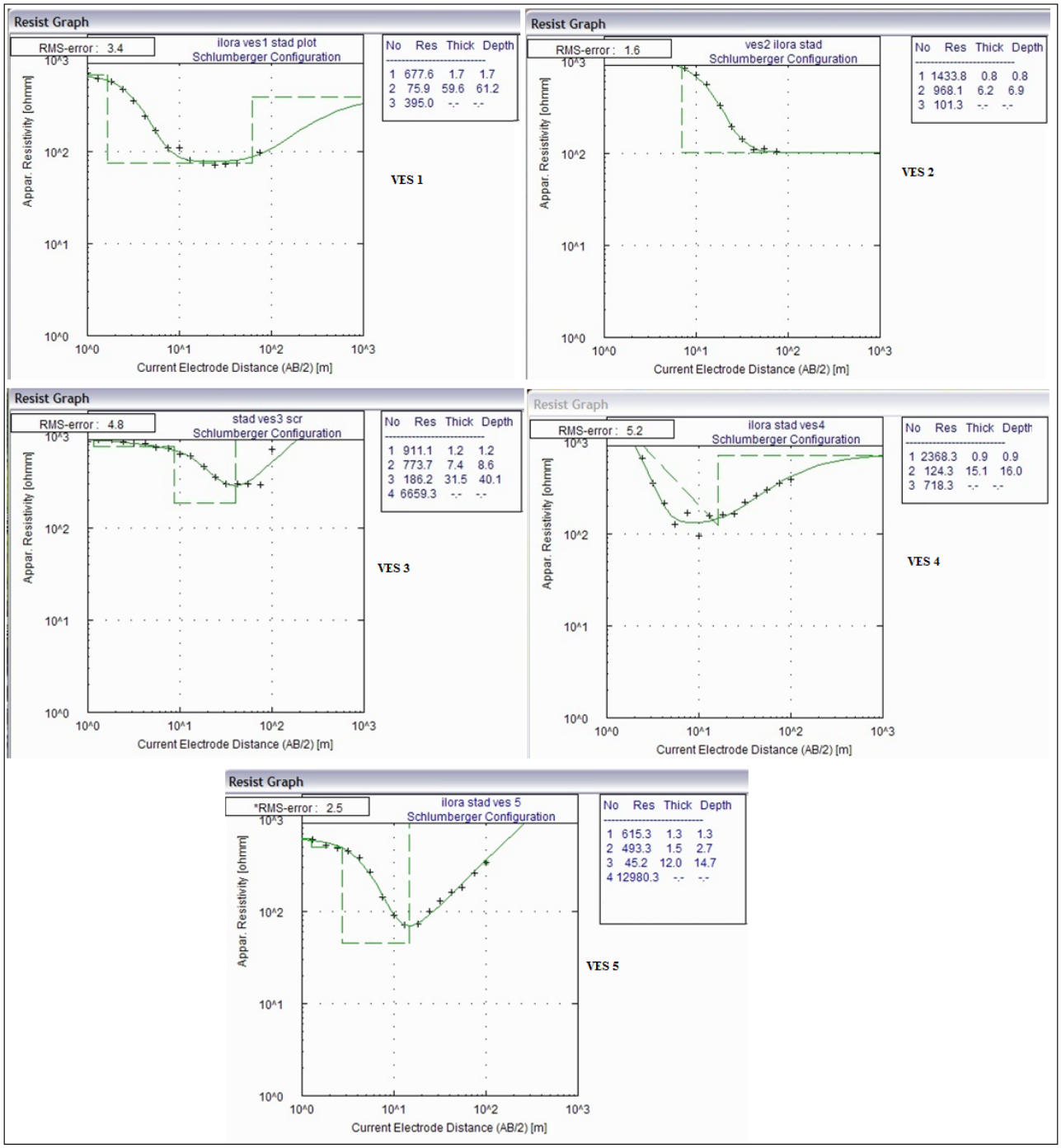


Fig. 5. Geo-electric curves of VES in the study area.

Geophysical survey of the study area revealed three geoelectric curves (H, QH and Q) indicative of the preponderance of the combined weathered and fractured layer (unconfined) aquifers system. Five different subsurface lithologic sequences namely; lateritic topsoil, sandy clay, weathered basement, fractured basement and fresh basement were delineated in the area with overburden thickness ranging from 1 to 60m.. Geo-electric layers of the VES stations revealed generally, partially weathered/fractured subsurface units while the geotechnical evaluation indicated poorly graded soil with high percentage finer. Based on the poor engineering properties of the soil as well as unfavorable result of resistivity survey, the site is not suitable for the stadium location. However, if this location must be used as already proposed, further Geotechnical test such as CPT,

Compressive Strength and XRF and Geophysics approach such as ERT and GPR must be carried out to better understand engineering characteristics such as bearing capacity, compressibility in the presence of water, clay minerals and fracture and Joint spacing / orientation for a well engineered foundation design that will ensure safety and stability of the proposed structure.

VES point		1	2	3	4	5
Curve Type Lithology		H	Q	QH	H	QH
Lateritic top soil	Top	0	0	0	0	0
	Base	2	1	1	1	1
	Thickness	2	1	1	1	1
	Ωm	677.6	1434	911	2368	615
Sandy Clay	Top	2	-	-	1	-
	Base	62	-	-	16	-
	Thickness	60	-	-	15	-
	Ωm	76	-	-	124	-
Weathered Basement	Top	62	1	1	16	1
	Base	-	7	8	-	4
	Thickness	-	6	7	-	3
	Ωm	395	968	772	718	493
Fractured Basement	Top	-	7	8	-	4
	Base	-	-	42	-	19
	Thickness	-	-	34	-	15
	Ωm	-	101	186	-	45
Fresh Basement	Top	-	-	42	-	19
	Base	-	-	-	-	-
	Thickness	-	-	-	-	-
	Ωm	-	-	6659	-	12980

Table 2: Summary of the VES Interpreted Results

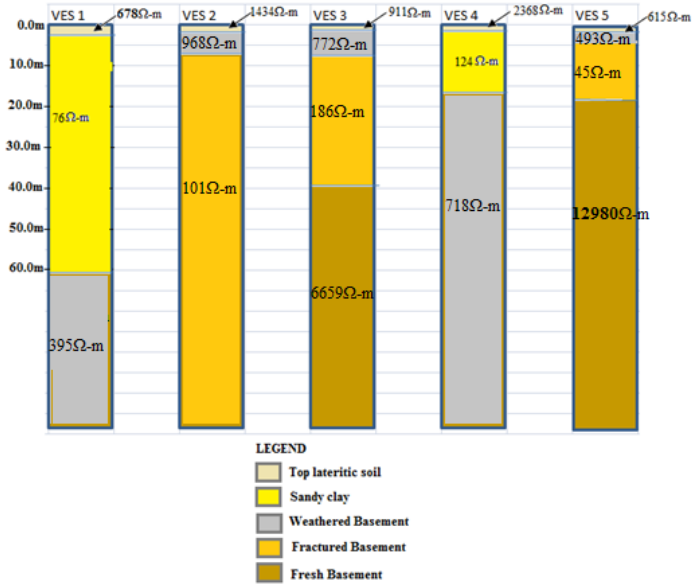


Figure 6: Geo-electric Sections across the VES in the study area.

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Malaria and Pre-Eclampsia among Pregnant Women Attending Ante-Natal Clinic in Okigwe Local Government Area.

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Abstract- A total of 1200 pregnant women attending antenatal clinic in Hospitals in Okigwe Local Government Area, were screened for the presence of malaria infection and factors for pre-clampsia (proteinuria and high blood pressure) using Giemsa stain, dipsticks (Albustix) and sphygmomanometer. The prevalence of malaria infection, proteinuria and high blood pressure among pregnant women attending antenatal clinic in Okigwe Local Government Area (L.G.A) in relation to age group, malaria was highest among 17-21 years (26.1%), followed by the age group of 37-41 (20.6%) and least age group was >42 years (2.7%). The result also showed that the prevalence of malaria was highest at Divine Hospital (17.2%), followed by General Hospital Okigwe (13.9%), and the least was observed at Eve hospital (6.9%), was considered statistically significant. While proteinuria among the pregnant women revealed that the age group of 22-26 years had the highest prevalence rate of 7.5%, followed by 17-21 years (5.5%) and the least was >42 (1.3%). Proteinuria was more prevalent among pregnant women attending Okigwe General Hospital (5.7%), while the least was found at Divine maternity (3.0%). The prevalence of high blood pressure among pregnant women in relation to age group showed that, the age group of 37-41 years had the prevalence rate of 42.8%, followed by 22-26 years (13.9%) and the least prevalent was >42 years (1.3%). General Hospital Okigwe recorded the prevalence rate of 10.4%, and the least was Eve Hospital (5.1%), ($p < 0.05$), age differed significantly in the study population. It is imperative to improve the quality of services in antenatal clinics so as to detect women who are at risk to malaria and complications such as pre-eclampsia.

Index Terms- Malaria, Proteinuria, High blood pressure, Preeclampsia & Pregnancy.

I. INTRODUCTION

Plasmodium falciparum, the causative agent of the deadliest form of Malaria (Ekeleme *et al*., 2014). In tropical countries, malaria and pre-eclampsia are common diseases of pregnancy. They have physiopathologic similarities such as placenta ischemia, and endothelial dysfunction.

When a pregnant woman is affected with malaria parasite, the unborn child is also vulnerable to the disease. Thus, malaria parasite infection in pregnancy is a major cause of low birth weight, abortion, intrauterine growth retardation, still birth and prenatal mortality.

It has also been reported that a physiologically abnormal state of pregnancy otherwise termed the pre-eclempsia pregnancy, have adverse effects in both function, as well as levels of blood fractions (knopp *et al*., 2003).

Pre-eclempsia in pregnancy are disorders occurring spontaneously in human females and only during pregnancy Pre-eclampsia is defined as pregnancy – induced hypertension associated with proteinuria. Pregnancy induced hypertension is defined as hypertension with blood pressure of 140 mmHg systolic or diastolic blood pressure of 90 mmHg diastolic or greater, arising after 20 weeks of gestation in a woman who was normotensive before 20 weeks gestation (Ndao *et al*., 2009). However, this work is aimed at studying the prevalence of malaria and preeclampsia among pregnant women attending antenatal clinic in Okigwe Local Government Area.

II. MATERIALS AND METHOD

Study Area

This study was carried out at the antenatal clinic in Okigwe Local Government Area, Imo State. The antenatal clinic consist of the following, Divine maternity, Eve maternity and General Hospital Okigwe.

Ethical Clearance

Prior to the commencement of the study, ethical clearance was sought by writing to the Chief medical Director (CMD) of Hospitals in Okigwe Local Government Area explaining the purpose of the study and seek for permission to use the health facility as well as the co-operation of their staff. On receiving approval, officers in charge of the Laboratory section were also consulted having received approval from the CMD.

Distribution of malaria among the pregnant women using CareStart malaria HRP2 and Giemsa Stain.

Whole blood was used for the diagnosis of malaria using parallel Malaria *Plasmodium falciparum* Rapid Test Device (manufactured by GLOBAL DEVICE, USA and INDR Diagnostica, USA). The malaria P.f. Rapid Test Device (Whole Blood) is a qualitative, membrane based immunoassay for the detection of P.f antigen in whole blood.

The method described by Etusim *et al*. (2013) was used for the Giemsa Staining of thick blood film. A thick blood film was made on a grease free slide. Giemsa stain was poured on the film and allowed to stay for 30minutes on the staining rack; the stain was then washed with running water. Finally, a drop of oil immersion was dropped on the stain and viewed through the objective lens (x100).

The distribution of proteinuria (albumin) and high blood pressure among the pregnant women using dipsticks (Albustix)

Proteinuria (albumin) was detected in a fresh urine sample before active labor by semiquantitative dipsticks (Albustix; Bayer Corporation, Elkhart, Indiana).

According to routine practices in maternity ward, measures of blood pressure were done using a sphygmomanometer. Blood pressure measures were taken at the time of admission after a 10-minute rest and the value was recorded. Cases were classified into 3 groups according to National High Blood Pressure Education Program guidelines: first, gestational hypertension (systolic blood pressure of 140 mm Hg or diastolic blood pressure of 90 mm Hg and albumin dosage of 2); second, preeclampsia (systolic blood pressure of 140 mm Hg or diastolic blood pressure of 90 mm Hg and albumin dosage of >2, without seizures); and third, eclampsia (when seizures or coma was associated with high systolic blood pressure of over 140 mm Hg or diastolic blood pressure of over 90 mm Hg with proteinuria).

III. RESULTS

A total of one thousand two hundred (1200) pregnant women attending antenatal clinic in Hospitals Okigwe Local Government were screened for the prevalence of malaria, and factors for pre-eclampsia (Proteinuria & high blood pressure).The result revealed that the prevalence of malaria infection among pregnant women attending antenatal clinic in Okigwe Local Government Area (L.G.A). In relation to age group, malaria was highest among 17-21 years (26.1%), followed by the age group of 37-41 (20.6%) and least age group was >42 years (2.7%). The result also showed that the prevalence of malaria was highest in Divine Hospital (17.2%), followed by General Hospital Okigwe (13.9%), and the least was observed at Eve hospital (6.9%) (Table 1).

Table 2 shows the prevalence of proteinuria among pregnant women attending antenatal clinic in Okigwe L.G.A., the result revealed that the age group of 22-26 years had the highest prevalence rate of 7.5%, followed by 17-21 years (5.5%) and the least was >42 (1.3%). Proteinuria was more prevalent among pregnant women attending Okigwe General Hospital (5.7%), while the least was found at Divine maternity (3.0%).

Table 3 shows the prevalence of high blood pressure among pregnant women attending antenatal clinic in Okigwe L.G.A. in relation to age group, 37-41 years had the prevalence rate of 42.8%, followed by 22-26 years (13.9%) and the least prevalent was >42 years (1.3%). General Hospital Okigwe recorded the prevalence rate of 10.4%, and the least was Eve Hospital (5.1%),

Fig. 1, .2, 3 shows the distribution of Malaria, Proteinuria, and High Blood Pressure (HBP) among pregnant women attending antenatal clinic in Hospitals in Okigwe L.G.A. The results showed that the age group of 22-26 years had the highest prevalence rate to HBP (High Blood Pressure) and proteinuria, while the age group of 17-21 years was more prevalent to malaria.

IV. DISCUSSIONS AND CONCLUSION

Malaria and pre-eclampsia occur frequently in women in tropics and are leading causes of maternal and perinatal morbidities, mortality and fetal growth restriction (Adam *et al*., 2011). Few data exist concerning the interaction between malaria and pre-eclampsia in Nigeria. However, this research work was done to study the prevalence of malaria and pre-eclampsia among pregnant women attending antenatal clinic in Okigwe Local Government Area, Imo State, Nigeria. In this study, a total of 1200 patients were examined for malaria; proteinuria and high blood pressure which are factors of pre-eclampsia. The result revealed that 457(38.1) were positive to malaria, 154(12.8) were positive proteinuria and 265(22.1) were positive to high blood pressure. This study is consistent with the work of Adam *et al.* (2011) who studied malaria and pre-eclampsia in an area with unstable malaria transmission in Central Sudan and found out that twenty-eight (19.6%) vs. 16 (11.2%); P = 0.04 of the cases vs. controls, had placental malaria infections. Five (2%), 1 (2%) and 22 (28.0%) vs. 1, 2 and 13 of the placentae showed acute, chronic and past infection on histopathology examination in the two groups respectively, while 115 (80.4%) vs.127 (88.8%) of them showed no infection, P = 0.04. In multivariate analysis, while there were no associations between age, parity, educational level, lack of antenatal care, blood groups and body mass index and pre-eclampsia; family history of hypertension and placental malaria (OR = 2.3, 95% CI = 1.0-5.2; P = 0.04) were significantly associated with pre-eclampsia. Adam *et al.* (2011) concluded that Placental malaria was associated with pre-eclampsia. Wong and Cox (2014) in study of proteomics analysis of preeclampsia, a systematic review of maternal and fetal compartments showed that 12 studies comparing samples from preeclamptic and normotensive pregnancies using mass spectrometry based techniques were selected and 401 proteins with significantly altered expression in preeclampsia were observed across all studies. Inter-study comparison identified 52 proteins as significant in two or more studies. These 52 proteins were enriched for 22 pathways, including several previously implicated in preeclampsia such as hemostasis, immune response, and lipid metabolism which is a focus of this analysis. Significantly, the proteins complement component 4 and apolipoprotein E were observed with aberrant expression at week 12 before the clinical diagnosis of preeclampsia indicating promising roles as clinical biomarkers. Wong and Cox (2014) now concluded that Preeclampsia is a relatively common hypertensive disorder of pregnancy that remains a high cause of maternal and fetal death due to the lack of early detection and treatment options.

Malaria during pregnancy poses a substantial risk to the mother, her fetus and the neonate. Although pre-eclampsia and maternal malaria would be expected frequently to occur concurrently in malarious areas, their interaction on the health of the mother and her baby has been studied as stated by Adam *et al*. (2011). In sub-Saharan Africa, the rates of both preeclampsia and malaria increase during the cooler rainy season (Bergstrom

et al., 1992); however, in non-malarious areas, preeclampsia may also increase during colder months (Magnu and Eskild, 2001). Preeclampsia increased the odds of malaria in Senegal (Sartelet *et al.*, 1996); however, it was not associated with peripheral parasitemia as stated by Dorman *et al.* (2002) or with placental infection by histology in Kenya (Ndao *et al*., 2009). A strong association was found between active malarial infection (identified by peripheral parasitemia) and bilateral notching of the uterine artery Doppler waveforms in late pregnancy (32–35 weeks' gestation) as observed in women with preeclampsia (Shulman *et al*., 2001; Ndao *et al*., 2009). In The Gambia, a 5.4-fold increase in maternal deaths due to eclampsia during the malarial season was observed.

The prevalence of malaria infection among pregnant women attending antenatal clinic, in Okigwe Local Government Area in relation to age group revealed that the age group of 17-21 years had the highest prevalence rate of 26.1%, followed by the age group of 37-41 years which was 20.6% and the least was the age group of >42 years which recorded 2.7%, P <0.05, was considered statistically significant. The malaria infection among the pregnant women was more prevalent within the active child-bearing age. This study is consistent with the work of Adam *et al.* (2011) who studied malaria and pre-eclampsia in an area with unstable malaria transmission in Central Sudan and found out that twenty-eight (19.6%) vs. 16 (11.2%); P = 0.04 of the cases vs. controls, had placental malaria infections. Malaria during pregnancy is a major health problem in Sudan, where pregnant Sudanese women are more susceptible to malaria, and it is associated with maternal anaemia and poor maternal and perinatal outcomes as stated by Adam *et al.* (2011)

The prevalence of proteinuria among pregnant women attending antenatal clinic in Okigwe L.G.A. revealed that the age group of 22-26 years had the highest prevalence rate of 7.5%, and the least was the age group of >42 (1.3%). The study is in line with Amin *et al.* (2014) who evaluated the efficacy of spot dipstick analysis and urinary protein-creatinine ratio (UPCR) in hypertensive disease of pregnancy for predicting 24-hour proteinuria. The results showed that seventy-eight patients (76.5%) had significant proteinuria of more than 300 mg/24 h. During pregnancy, the presence of proteinuria along with hypertension (the preeclampsia syndrome) increases the risk of numerous complications in the affected women, the most common being *HELLP* syndrome and eclampsia. The adverse outcomes associated are premature birth, low birth weight baby, intrauterine growth restriction, stillbirth and death of the newborn. The significance of proteinuria (i.e. proteinuria without hypertension or any other abnormality) is not known with certainty, but it is expected to be associated with increased risk of adverse outcomes. Women with isolated proteinuria may develop hypertension later and progress to preeclampsia or eclampsia (Hollegaard *et al*., 2013).

The prevalence of high blood pressure among the pregnant women increased significantly within the age group of 22-26 years and 37-41 years had decreased significantly with the age group of >42 years. Ndao *et al.* (2009) conducted a case-control study to explore the relation between malaria and hypertension at Guediawaye, a hypoendemic malarial setting in Senegal. Cases were pregnant women admitted to the delivery unit for hypertension. Controls were pregnant women admitted for normal delivery, without any history of hypertension or proteinuria during the present pregnancy. Malarial infection was determined by placental tissue examination. From January to December 2002, 77 cases of gestational hypertension, 113 cases of preeclampsia, 59 cases of eclampsia, and 241 controls were enrolled. Placental malarial infection (PMI) was present in 14 cases (6.3%) and in 15 controls (6.2%). The prevalence of PMI was 4.6% for eclampsia, 4.0% for preeclampsia, and 11.6% for gestational hypertension. In multivariate analysis, PMI appeared to be an independent risk factor for gestational hypertension (adjusted odds ratio ¼ 2.7, 95% confidence interval: 1.0, 7.6). Ndao *et al.* (2009) found an association between PMI and nonproteinuric hypertension in women living in a malaria-hypoendemic area. However, Muehlenbachs *et al*. (2006) in a study titled hypertension and maternal–fetal conflict during placental malaria concluded that hypertension occurs in young first-time mothers with chronic malaria, and their elevated soluble vascular endothelial growth factor receptor 1 (sVEGFR1) levels suggest they are suffering from preeclampsia.

V. Conclusion

Conclusively, it was noted from the research work that malaria infection was high among the pregnant women attending ante-natal clinic in Okigwe L.G.A and this suggest that malaria during pregnancy may be an independent factor for pre-eclampsia. Proteinuria and high blood pressure are the major cause of pre-eclampsia. It is imperative to improve the quality of services in antenatal clinic so as to detect pregnant women who are at risk to malaria and complications such as pre-eclampsia.

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TABLE 1: THE PREVALENCE OF MALARIA INFECTION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN OKIGWE L.G.A

AGE GROUP (YEARS)	NO OF PATIENTS EXAMINED	NO OF PATIENTS INFECTED WITH MALARIA AT DIVINE MATERNITY	NO OF PATIENT INFECTED WITH MALARIA AT EVE HOSPITAL	NO OF PATIENTS INFECTED WITH MALARIA AT GENERAL HOSPITAL OKIGWE	TOTAL
17 – 21	268	70 (7.0%)	22 (8.2%)	38 (14.1%)	48.5
22 – 26	345	55 (6.3%)	29 (8.4%)	58 (16.8%)	41.1
27 – 31	209	29 (6.6%)	13 (6.2%)	25 (11.9%)	32.0
32 – 36	185	21 (6.4%)	10 (5.4%)	21 (11.3%)	28.1
37 – 41	121	25 (33.3%)	7 (5.7%)	16 (13.2%)	33.7
42 >	72	7 (5.5%)	2 (2.7%)	9 (12.5%)	25.0
TOTAL	**1200**	**207 (17.2%)**	**83 (6.9%)**	**167(13.9%)**	**457 (38.0)**

P <0.05, WAS CONSIDERED STATISTICALLY SIGNIFICANT.

TABLE 2: THE PREVALENCE OF PROTEINURIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN OKIGWE L.G.A

AGE GROUP (YEARS)	NO OF PATIENTS EXAMINED	NO OF PATIENTS INFECTED WITH PROTEINURIA AT DIVINE MATERNITY	NO OF PATIENT INFECTED WITH PROTEINURIA AT EVE HOSPITAL	NO OF PATIENT INFECTED WITH PROTEINURIA GENERAL HOSPITAL OKIGWE	TOTAL
17- 21	268	11 (4.1%)	12 (4.4%)	15 (5.5%)	14.1
22 – 26	354	9 (2.6%)	15 (4.3%)	26 (7.5%)	14.4
27 – 31	209	7 (3.3%)	9 (4.3%)	11 (5.2%)	12.9
32 – 36	185	5 (2.7%)	7 (3.7%)	9 (4.8%)	11.3
37 – 41	121	3 (2.4%)	4 (3.3%)	6 (4.9%)	10.7
42 >	72	2 (2.7%)	1 (1.3 %)	2 (2.7%)	6.9
TOTAL	**1200**	**37 (3.0%)**	**48 (4.0%)**	**69 (5.75)**	**154 (12.8)**

P <0.05, WAS CONSIDERED STATISTICALLY SIGNIFICANT.

TABLE 3: THE PREVALENCE OF HIGH BLOOD PRESSURE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN OKIGWE L.G.A

AGE GROUP (YEARS)	NO OF PATIENTS EXAMINED	NO OF PATIENTS WITH HIGH BLOOD PRESSURE AT DIVINE	NO OF PATIENT WITH HIGH BLOOD PRESSURE AT EVE	NO OF PATIENT WITH HIGH BLOOD PRESSURE AT GENERAL HOSPITAL OKIGWE	TOTAL
17 – 21	268	19 (7.0%)	15 (5.5%)	30 (11.1%)	64 (23.9)
22 – 26	345	22 (6.3%)	21 (6.0%)	48 (13.9%)	26.4
27 – 31	209	14 (6.6%)	11 (5.2%)	21 (10.0%)	22.0
32 – 36	185	12 6.4%)	9 (4.8%)	15 (8.1%)	19.4
37 – 41	121	7 (33.3%)	5 (23.85)	9 (42.8%)	17.4
>42	72	4 (5.5%)	1 (1.3%)	2 (2.7%)	9.7
TOTAL	**1200**	**78 (6.5%)**	**62 (5.1%)**	**125 (10.4%)**	**265 (22.1)**

P <0.05, WAS CONSIDERED STATISTICALLY SIGNIFICANT. **BP ≥140/90MMHG** WAS CONSIDERED HIGH BLOOD PRESSURE

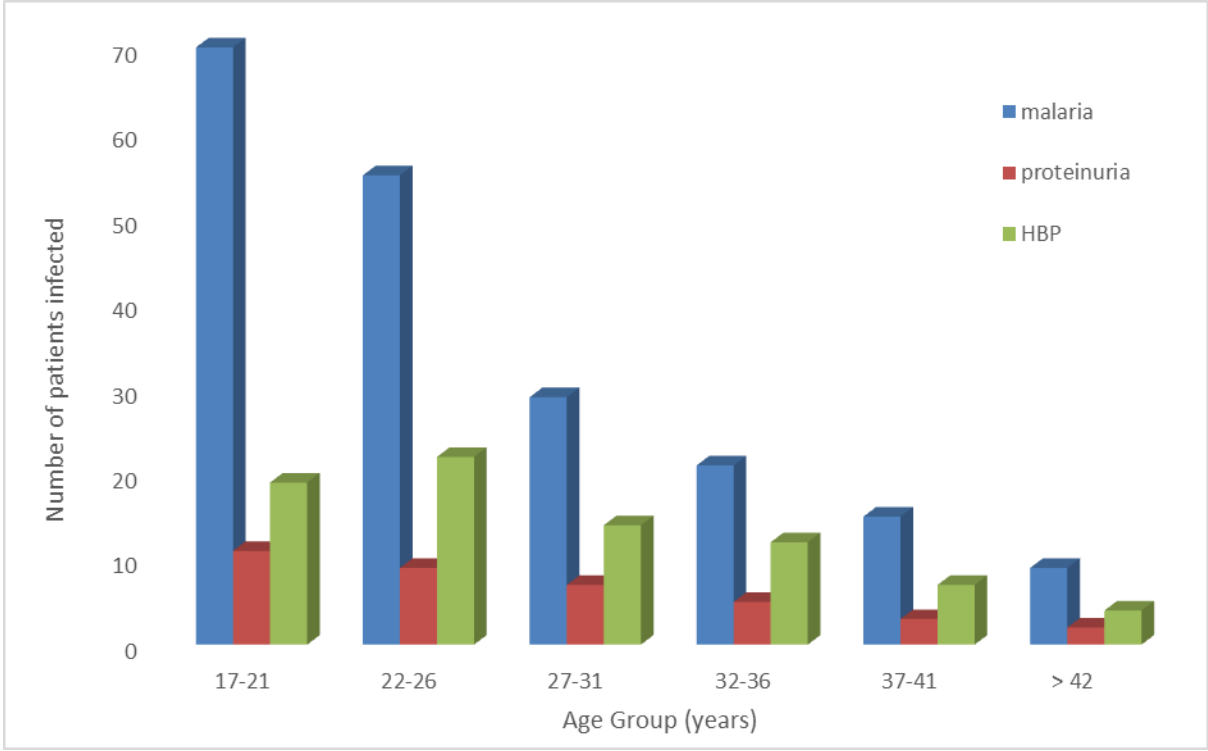

FIG. 1: DISTRIBUTION OF MALARIA, PROTEINURIA, AND HIGH BLOOD PRESSURE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT DIVINE HOSPITAL IN OKIGWE L.G.A.

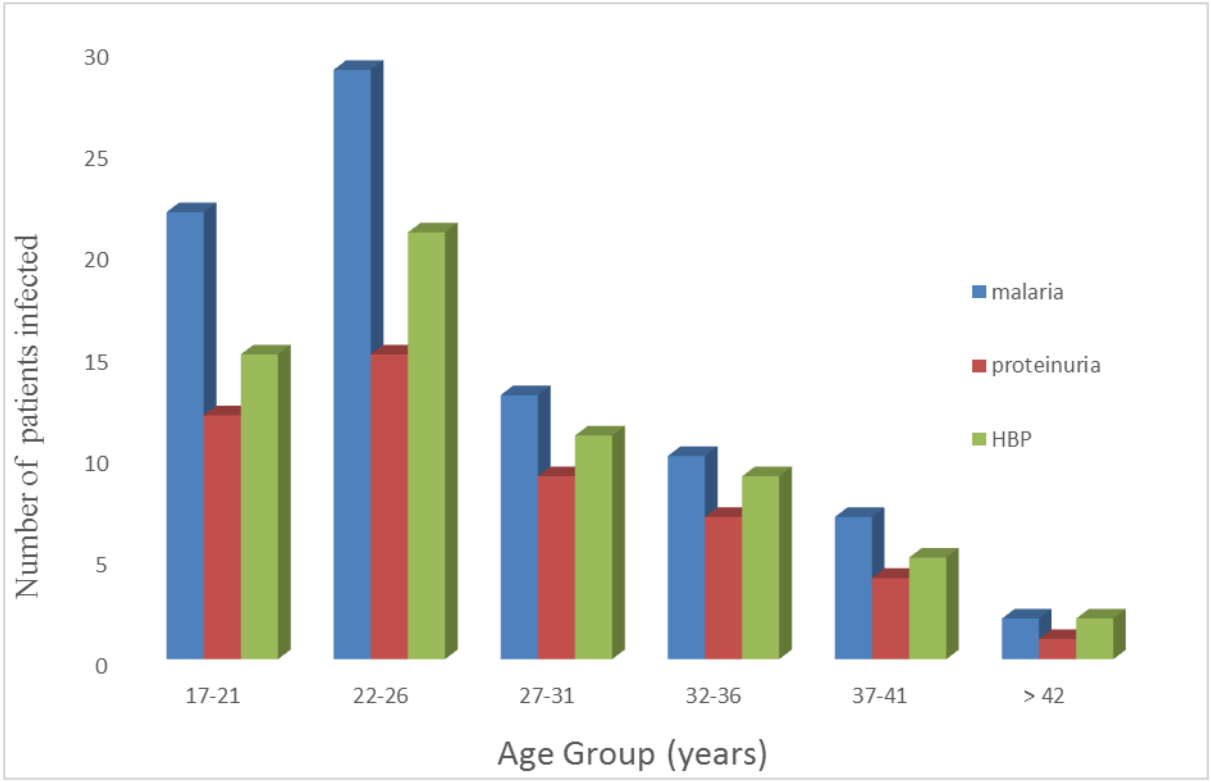

FIG. 2: DISTRIBUTION OF MALARIA, PROTEINURIA, AND HIGH BLOOD PRESSURE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT EVE HOSPITAL IN OKIGWE L.G.A.

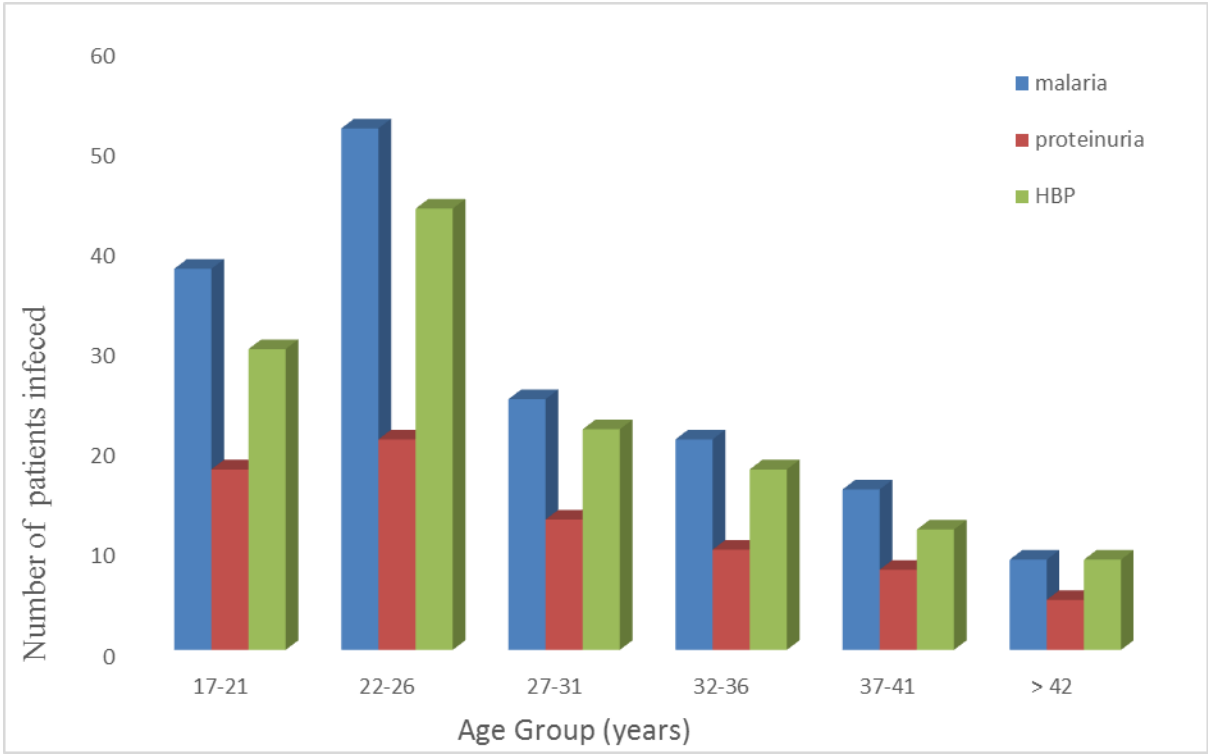

FIG.3: DISTRIBUTION OF MALARIA, PROTEINURIA AND HIGH BLOOD PRESSURE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT OKIGWE GENERAL HOSPITAL IN OKIGWE L.G.A.

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Precautions in Planning and Construction for Trouble Free Maintenance

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Abstract- In modern day times, construction of Multistory Buildings has become a necessity due to scarcity of land and increase in population of towns and cities. Any city we travel , though we find a number of Multistory Buildings but at the same time it is found that they are facing numerous maintenance problems from civil engineering point of view and these maintenance problems occur due to not paying enough attention to serviceability and maintainability during planning and construction stage. The problems, author has written down in this research paper are very small and trivial common sense issues, but at the same time these are neglected by site engineers and their supervisors with the result, the occupants who have put their life time savings in purchase of such exorbitantly costly apartments, sometimes feel cheated and frustrated due to frequent occurrence of maintenance problems.

Thus in this research paper, the author has tried to pinpoint the fine detailing precautions to be kept in mind not only while planning and execution of Multistory apartments but also during maintenance post occupation of the apartments where most of the time a manager cum supervisor who has little knowledge of civil engineering is in-charge of stage the Maintenance Team.

Index Terms- Maintenance of Buildings, Precautions in Planning of Buildings, Problems in Multistory Buildings, Solution to Maintenance problems, Tips for Trouble-free Maintenance.

I. INTRODUCTION

An house is the dream of every human being and due to increasing cost of land in cities and towns, multistory Apartment is the ready- made answer to housing problems for emerging middle class people who have the capacity to pay either in installments or in lump sum but don't have time to construct their own house. Mostly the builders spent good amount of money to ensure a good elevation of Multistory (MS) apartments but they are very careless and negligent about detailing issues which affect the occupants or the buyers of apartments .In order to avoid maintenance problems after taking possession of apartment, the site engineer and the supervisor of builder has to provide good attention towards the preventive as well as corrective maintenance issues of the buildings effectively and qualitatively. The traditional concept is that we start the process of maintenance, only when user starts to use it but the process of maintenance should start right from conceptual stage and should be continued up to construction stage. Most of the maintenance problems are inherent in nature and may be due to defective planning, co-ordination and execution. Subsequent dismantling in building, due to lack of co-ordination and planning, not only weakness the structure but also creates complex maintenance problems.

1.1 Suggestions for Trouble-Free Maintenance

We can ensure trouble free maintenance with minimum cost, if we keep in our mind the following key issues:

i) A building should be well conceived by an Architect keeping in view the maintenance and serviceability aspect.
ii) A structure should be well designed based on sound engineering principles and practices.
iii) Structure should be well constructed using quality material and workmanship.

II. PRECAUTIONS IN PLANNING STAGE

Architects, Civil Engineers, Electrical Engineers and user as well should be involved in the planning process. The main points in planning from maintenance point of view are following:

2.1 PLANNING POINTS RELATED TO ARCHITECT

i) Terraces should be accessible

ii) Rain water pipes should be spaced around the building uniformly and not concentrated around the shaft.

iii) RCC Landings of staircase at terrace level should be raised sufficiently above the roof slab to accommodate the thickness of terracing and to prevent rainwater coming inside the staircase from terrace.

iv) Sufficient space should be provided for pipe shaft to accommodate all the pipes and provide sufficient space for workmen.

v) Shaft should be accessible at every floor and should have adequate light and ventilation.

vi) Proper drainage of the shaft floor should be ensured.

vii) Pipe shaft should be covered at the top by transparent sheets at sufficient height to check the entry of rainwater in the shaft and to provide ventilation to shaft too.

viii) External walls should be protected by projection of at least 60cm at roof level. For high rise buildings, slab projection at intermediate level should also be provided to break the flow of water and for maintenance convenience.

ix) Chajjas with upward fascia should be avoided which will obstruct the free flow of water.

x) Closed boxes in the elevation should be avoided. These boxes accumulate the dampness and transfer it to the buildings.

xi)External walls should not be exposed concrete or sand stone tile veneering.

xii)Concealed rainwater and sanitary pipes should be strictly avoided.

xiii)Water bodies like, toilets, kitchen, water coolers etc. should be nearer to the shaft to minimize the distance of horizontal water disposal pipes.

xiv) A space for desert coolers and window A.C. should be clearly earmarked so that provision for water supply and disposal of water may be planned.

2.2 In Staff Quarters following measures must be provided

a) We are not providing any separate stores in the staff quarters. Having transferable liability, lot of extra things are accumulated with the employees depending upon the climatic conditions and other local conditions and packing material etc. Therefore, sufficient space at 7 feet above the floor level must be planned for storage purpose.

b) Sufficient number of shelves or cupboards in the kitchen must be provided because requirement in today's context is much more as compared to past. Suitable arrangement sunken in walls, for keeping broom, utensil/washing aids etc. must be planned.

c) More electrical points must be provided in kitchen because nowadays more electro -mechanical appliances are used.

d) A space for washing machines along with electrical point, W/S & disposal arrangement must be planned.

e) Provision for keeping various types of soaps, detergents and other things must be planed may be sunken in walls.

f) In the same way, in W.C. also sunken space for cleaning aids must be planed.

g) Space Headway and width of landings & staircase flight must be designed keeping in view of shifting of house hold goods during transfer.

h) Provision for drying of clothes and in sufficient number must be kept in mind while planning the balcony. Solar movement from North to South Equinox must be also kept in mind while planning the orientation of balconies and kitchen.

i) Main door of quarters should preferably be of single leaf for safety point of view.

j)Traditionally locally available material and construction practices should be adopted.

2.3 PLANNING POINTS RELATED TO CIVIL ENGINEERS

i. i)R.C.C. O/H tank on terrace should be provided sufficiently above the terrace level to attend the possible leakage from the bottom of tank & to attend the problems of water proofing treatment of terrace below the tank.

ii. ii)Selection of correct type of water proofing treatment should be done very carefully keeping in view the climatic condition and temperature variation.

iii. iii)New materials like P.V.C. based felt for water proofing and treatment with broken ceramic pieces may be introduced. P.V.C. pipes (U.V. Resistant) in sanitary installation should be used.

iv. iv)Traditional cast iron grating at mouth of rain water pipe have hardly 40% net open area. This should be modified with mild steel grating having large opening area.

v. v)The over flow pipe from overhead storage tank should be taken directly to the rain water pipes. If two or more tanks are there, they should be interconnected at top.

vi. vi)A working platform of steel structure should be provided 0.90 to 1.2m below the floor level in each shaft along with the provisions of foot rest.

vii. vii) In heavy rainfall areas and in the areas where good quality of bricks are not available, it is desirable to plaster walls with 1:3 cement: sand plaster.

viii. viii)Detailed plan of internal plumbing system of toilet or kitchen including floor slopes and detailing of depression or raised portion (difference of levels) etc. should be prepared in advance.

ix. ix)There should be some standard color coding system for identifying the plumbing and drainage piping system.

x. x) For balcony and staircase, floor landings should be depressed 15mm & sufficient slope should also to be provided towards spout or pipe. Therefore, it is desirable to depress the structural slabs itself 30mm or more.

xi. xi)Minimum depression in toilet with floor squatting pattern W.C.(Indian Style) should be 600mm and in bathrooms & kitchens general depression should be 250 mm so as to fix the traps in floor.

xii. xii)Crossing of sanitary/drainage pipes through R.C.C. Beams should be avoided, by lowering the beams. If unavoidable, suitable opening should be provided in the beams by inserting across PVC pipe piece and beams should be designed accordingly.

xiii. xiii) Minimum M 25 grade concrete should be used for sunken slabs with suitable water proofing compound.

xiv. xiv)Integral cement based water proofing treatment must be provided over the sunken slab and along the walls keeping a slope of 1:80 towards outer wall. A , 32 mm galvanized iron pipe piece working as a spout should be provided through the walls to drain out water in case of any eventuality and at the mouth of the spout, some loose aggregate must be filled.

xv. We should start the use of Flushing values instead of flushing cisterns in W.C. & urinals since it will control the wastage of water and frequent maintenance of cisterns is a problem.

xvi. We should provide bottle traps or any other type of traps in Wash Basins, Sinks & urinals after detailed and proper planning from long term maintenance point of view. Preferably Khurra & floor trap should be provided below the wash basins & sinks and waste pipe should be directly fixed with waste coupling & disposed directly to floor trap. In series of urinals, we should provide ceramic half round channels with sufficient slope and waste pipe disposal should be direct in these channels. Alternatively, PVC pipes with sufficient slope should be provided below the urinals.

xvii. Expansion joints should be avoided as far as possible in toilets portion to avoid leakage.

xviii. For covering the expansion joints, traditional asbestos cement sheet covering does not work. Instead aluminum moulded sheet covering etc. should be used.

xix. Shelves in kitchen, bathrooms & cupboards of bed room etc. should be of Kota, Kadappa or similar types of hard stones instead of traditional wooden or R.C.C. shelves. Otherwise complete box of shelves made up of block board should be provided.

xx. Flush door shutters and MDF shutters are not suitable for external doors, sanitary shaft, toilets, bathrooms & kitchen etc. Paneled shutters should be preferred. In toilets, shutters of moulded P.V.C. are also useful.

xxi. Aluminum sliding door bolts are not safe on entry doors for safety point of view. Coated Mild Steel sliding door bolts or branded latch arrangement is safer on entrance or exit doors.

xxii. Window sills should be provided of Kota, Kadappa or similar type hard stone keeping the slope outwards for effective rain water discharge.

xxiii. In heavy rainfall areas & coastal regions, powder coated Aluminum window should be provided.

xxiv. There should be no compromise in deciding the plinth level of Buildings. Future raising of roads should always be kept in mind. Invert level of municipal sewer should also be checked before deciding plinth level.

xxv. Complete drainage plan should be prepared in advance.

III. PLANNING POINTS RELATED TO ELECTRICAL ENGINEERS

i) Cooling Towers, make up water tanks & condenser units should be avoided at terrace. If not possible, details of these structure may be given in advance so that supporting structure may be provided at terrace without disturbing the water proofing treatment and structural slab.

ii) Details of all the cutouts in slab & walls, power and data cable ,exhaust fan opening etc. should be given in advance to civil Engineers to avoid any subsequent dismantling.

iii) Cutouts in terrace slab should be avoided.

iv) In machine rooms of lifts, details of cutouts for rope & wheel, design of hook etc should be planned in advance to avoid any subsequent cutting in slab.

v) Electrical components i.e. switches, panels, boards etc should be planned away from water bodies.

vi) RCC platform along with diesel generator and transformer etc should be planned in advance so that structural arrangements can be made accordingly.

vii) Details of RCC Hume pipes, to be provide below the road considering future requirement also, should be planned and given in advance to avoid any subsequent road cuttings.

IV. PLANNING POINTS RELATED TO USER

i. Details of all the cutouts, cable entry, fire hydrants, fire risers and smoke detectors, earthing etc. should be planned in advance before release of working drawings.

ii. Details of roof antennae, mast or any other feature to be mounted at terrace, should be planned and space marked before construction.

iii. Structural additions, alterations & deletions should be avoided as far as possible.

iv. Provision of vertical extension should be avoided. At least R.C.C. Structure of complete building along with external wall & finishing should be done in one stroke only.

v. Terraces, Stair case & pipe shafts etc. should not be used as dumping ground of old furniture &wooden packing cases etc.

vi. A list of 'Dos' & 'DONTs' should be prepared and wide publicity of the same should be given among users.

V. PRECAUTIONS IN CONSTRUCTION STAGE

Following precautions should be taken in construction stage:

i. Pipe connections to service tanks should be built into tanks at the time of concreting.

ii. Rain water pipes and spouts should cover the full thickness of the wall. If necessary, extra length of pipe should be provided. Its inlet level should be just below the finished level of Khurra.

iii. Pipes should not be laid just over the terrace but suitably fixed over masonry/concrete blocks.

iv. Sufficient care must be taken for treatment of Expansion joints and cutouts in terrace slab in case of future vertical expansion.

v. Sufficient care must be taken for the constructing & treatment of dummy column at terrace. Because they become a very big source of leakage.

vi. Concrete for Khurras to be laid before construction of Parapet and integral water proofing treatment.

vii. Tiles on terrace , if provided ,to over lap the concrete of Khurra by not less than 7.5 cm.

viii. PVC sheet under Khurra should not be less than 400 micron.

ix. Chase for C.C. Gola should not be less than 75mm wide & 75mm deep. C.C. Gola should be completed before plaster of Parapet.

x. Mumty door should open outside.

xi. Mumty should be well protected from rains by providing chajja & side walls. The sill level and lintel level of the mumty door should be suitably increased depending upon the thickness of water proofing treatment

xii. The holes in the walls around the sanitary and drainage pipes should filled with the concrete to check leakage.

xiii. All the pipes, fittings and fixtures and their joints must be tested under the specified pressure before covering.

xiv. Drainage pipes, from bath toilet and kitchen etc. should not be less than 100 mm dia.

xv. Special care must be taken for the quality of G.I. fittings like elbow, tee, unions etc.

xvi. Enough valves should be provided in water supply system to regulate the supply in case of break down.

xvii. Enough G.I.(galvanized iron) unions should be provided in pipes to have more flexibility in maintenance operations.

xviii. Top of floor trap and finished floor should be connected with PVC pipe, not by C.C. blocks.

xix. Sufficient care must be taken for making joints of W.C. pan, trap and soil pipes. After jointing and testing, a polymer coating should be provided on the joint for a length of 150 mm on both sides of joint. This will provide a flexible polymer sleeve to give additional protection. Alternatively joint may be covered with 1: 2: 4 concrete.

xx. Discharging of one floor trap into another should be avoided.

xxi. Pipe from floor trap to the stack should have a slope not less than 1 in 50.

xxii. Collar joints should be avoided in the horizontal pipe from floor trap to stack.

xxiii. Pipe socket in case of European WC should project over the floor.

xxiv. Use of Rigid PVC pipe is recommended in toilets, kitchen & bathrooms.

xxv. Provide the paint on all pipes as per planned colour code.

xxvi. G.I. waste pipes from wash basin, sink and urinals should be firmly fixed in the walls and not be left hanging.

xxvii. Traditional holder bat clamps to hold the PVC or cast iron pipes are not satisfactory. Holding arrangement with angels & long bolds are very useful. Pipe should be projected 50 to 60mm away from the wall of the shaft to avoid any dampness in the wall in case of leakage.

xxviii. We should not forget to provide required slope in the channel of manhole

xxix. All the drawings and details of water supply and sanitary installations must be prepared after construction is over and should be available with the user for reference at the time of maintenance.

xxx. All special care must be taken in the joinery work of wood. Glue should be applied liberally and bamboo pins should not be very near to the edges.

xxxi. Wooden cleats spoils the veneering of flush door shutter. Instead of cleats, floor door stoppers should be used.

xxxii. Wooden window grills should be so designed that window fittings may be operated easily

xxxiii. Size of steel windows should be 20mm less than the size of brick work opening.

xxxiv. Special attention should be given for steel windows. After plastering, traditional hinges create the problem. Box type hinges are much better instead of traditional hinges as specified in specifications.

xxxv. To prevent leakage from bathroom or kitchen from upper floors which is generally due to seepage from fitments, bathtubs, shower trays, buried pipes or drains or due to improper construction of joints, or improper use of sealants – a proper workmanship and strict supervision during construction work is required in such vulnerable areas of water seepage.

xxxvi. Waterproof cement should be laid below floor tiles in bathrooms and kitchen and joints of tiles are to sealed properly with sealant compounds to prevent any seepage.

xxxvii. The exit to emergency staircase should be outside the building and not on ground floor.

xxxviii. On external walls where rains hit directly, walls should be plastered in rich cement sand mortar in 1 : 3 ratio.

xxxix. Any holes, cracks, joints, or spalling of concrete etc on external face of the building should be sealed with water proof sealant compound to prevent seepage of water at a later date

VI. CONCLUSION

A sweet home is a dream for most of the people and with land prices ever increasing and family size becoming smaller and smaller, more and more people are turning towards purchasing Apartments into a multistory building. But Apartments owners face the problems of Maintenance over a period of time and a small carelessness or poor planning during construction leads to many complex problems of maintenance for the residents. Therefore, in this article, the author has tried to list out the major problem areas and their solution in a very simple manner. Most of the solutions are time tested during the long service period of the author. Thus the designer and executing authority must keep the idea of maintainability in their mind for minimal maintenance. This will not only reduce the expenditure on maintenance but will also provide the consumer satisfaction. Precautionary measures during planning and construction stage cost for little but due to negligence on these aspects, maintenance cost increases manifold. For a durable, serviceable and healthy built environment maintenance issues have to be tackled in the first stage only. Computerized Maintenance Management Systems are being followed in modern built environment although problem areas and solutions as mentioned in this research paper are always to be kept in mind for trouble free minimal maintenance.

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Examination of Lactic Acid Bacteria's Ability from Fish Intestinal Tract in Deconjugation Bile Salt

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Abstract- The study was carried out to determine the ability of lactic acid bacteria (LAB) isolated from fish intestine to do deconjugation of bile salt. Bile salt deconjugation was shown by the production of cholic acid. This experiment was consisted of six treatments with five replicates.

The treatments in thus experiment were addition of medium with bile salt equal to 0, 1.0, 0.2, 0.3, 0.4, and 0.5%. Lactic acid bacteria was grown in medium at 39^{o}C for 20 h. Variables observed were density per h., pH, and cholic acid produced in the end of fermentation process. The data obtained were analyzed using variance analysis with one way of Completely Randomized Design (CRD), differences between mean values of each variable were tested by Duncan's Multiple Range Test (DMRT). The changes of density show that LAB was able to grow in medium that added bile salt until level of 0.5%. Nevertheless, the addition bile salt in the medium decreased the growth rate of LAB during exponential phase. The production of cholic acid were 0.005, 0.087, 0.175, 0.211, 0.202, 0.150 μmol/ml, while the pH values were 4.6, 4.7, 4.92, 5.00, 5.05 and 5.15 respectively for the addition of 0, 0.1, until 0.2% in added 0.5% the production cholic acid decrease significantly.

It could be concluded that LAB isolated from fish intestine was able to do deconjugation of the bile salt until level 0.4%.

Index Terms- Lactic Acid Bacteria, Bile Salt, Deconjugation, Cholic Acid

I. INTRODUCTION

Background of Study

The increase of public awareness in the health importance nowadays causes people to be more careful in selecting food that they consume. Dairy products especially meat belong to the kinds of nutritious and delicious food. Thus, many people like to consume them. It is proved by the increasing of meat consumption year after year in line with the increase of people's degree in their life.

Cholesterol, on the one side, is needed by our body. Cholesterol is an important component for the body mostly for composing membranes, bile acid, and hormones. On the other hand, excessive amount of cholesterol in the body may cause several health issues. A high level of cholesterol in human food can raise the level of cholesterol in the blood serum which can increase the risk of arteriosclerosis and coroner heart disease (Lubbadeh et.al., 1999). The absorption of cholesterol depends upon the availability of bile acid from the liver, esterase cholesterol enzyme from the pancreas, and also based on the amount of consumed cholesterol (Ensminger et.al., 1993)

There are a lot of works done by scientists to overcome the problem. In the dairy field, it is attempted to provide low cholesterol dairy products. One of the ways to reduce the cholesterol level is done by the use of probiotic. Widodo (2003) explained that one of the familial groups used as probiotic was lactate acid bacteria (LAB).

There are a lot of advantageous LAB roles in the sector of health and nutrition. LAB can increase the digestibility of food nutrients, control the intestinal infections, increase the lactose digestion, control cancers blood cholesterol level (Gilliland, 1990).

In the last few years, it has been advanced the use of lactate acid bacteria to influence the cholesterol level in the human and cattle (Tanaka et al., 1999). The reduction of cholesterol by LAB is assumed to be able to work directly by using cholesterol assimilation and indirectly by using the mechanism of bile salt deconjugation.

The mechanism of bile salt de-conjugation is happened indirectly during the entero-hepatic cycle or fat absorption cycle from the intestine (Drassar and Barrow, 1995). Without the process of deconjugation, bile salt will be absorbed back into the small intestine.

LAB isolate from the Tawes fish intestines *(Puntius javanicus)* had been acquired in the previous research. That LAB is hoped to have a role as prebiotic which is able to lessen the cholesterol level which in this case will be seen from its ability to do the bile salt deconjugation.

Research Objective

The examination of LAB abilities from the Tawes fish alimentary tract *(Puntius javanicus)* to grow and do the bile salt deconjugation had been done in this research.

Research Significance

The results of this research are expected to be able to be used as information sources for dairy industries in utilizing LAB as probiotics.

Hypothesis

The lactate acid bacteria resulted from the isolation of fish alimentary tract can grow in the medium contained bile acid and do the bile salt deconjugation.

II. MATERIALS AND METHOD

This research was done in May – November 2005 in the Biochemical Nutrition Laboratory, the Department of Livestock Food and Nutrition, the Faculty of Farms, Gadjah Mada University, Yogyakarta.

Materials

Microbe sources

LAB isolate originated from the Tawes fish intestines; it was taken from the Biochemical Nutrition Laboratory, the Department of Livestock Food and Nutrition, the Faculty of Farms, Gadjah Mada University, Yogyakarta.

Chemical substances

The chemical substances used in this research were MRS (Man Ragosa Sharpe), sodium thioglycollate, bile salt (Oxoyd brand), NaOH 0,01N, NaOH 1N, HCl 10 N, ethyl acetate 99,5%, NaOH, H_2SO_4 16 N, furfuraldehide 1%, glacial acetate acids, alcohol 70%, gas CO_2,

Tools

The tools used in this research were glasses instruments, *hungate* tube (fermenter), pH meter (Hanna brand), spectrophotometer (Spectronic 21 brand), gas CO_2, *water bath* (Memmert brand), acid cupboard, *centrifuge*, *freezer*, micro pipets, analytic measures, *stirer*, vortex, electrical stove, laminar, sprites lamp, autoclave.

Methods

Microbes Activation

LAB isolate from stock culture was planted into the MRS broth (Oxoid) medium in the hungate tube (the chemical compositions and the way to make MRS medium are presented in the Appendix 1). The medium volume is 4 ml. The added LAB isolate was 10% from the total medium volume. Gas CO2 was given into the tube to make anaerobe condition. Then 12 hours incubation was done in the temperature of 39^o C. The fermentation result was a sub-culture which was replanted once more in the same way as before. The fermentation result was used as an activated-culture source.

Fermentation

Active LAB isolate were inoculated 1% into the MRS-thio medium (MRS broth with 0.2% *Sodium thioglycholat* in the *hungate tube*). The medium volume was 12 ml. the bile salt concentration in the medium was controlled from 0%, 0.1%, 0.2%, 0.3%, 0.4%, and 0.5%. Each treatment was done in 5 repetitions. The degree of acidity in the early fermentation was set at pH 6.5. Then the incubation was conducted in the temperature of 39^o C.

Observed Variables

pH value Measurement. The measurement of pH value was done at the end of fermentation in the 20th hour using pH meter (Walker and Gilliland, 1993).

Microbe growth. The observation was done to the density change which was measured using spectrophotometer with the wavelength of 620 nm (Walker and Gilliland, 1993). The observation was done each hour until it got a near-constant density taken from different observations.

Cholic acid level. The examination was done by doing analyses on the cholic acid which had been freed in each culture with method modified by Walker and Gilliland (1993).

Data Analysis

The data taken were analyzed with variance analyses using unidirectional pattern complete random framework continued with the test of Duncan's New Multiple Range Test (DMRT) (Steel and Torrie, 1993).

III. FINDINGS AND DISCUSSION

The Growth of Lactate Acid Bacteria in the Medium of Bile Salt

The pattern of LAB in the medium contained bile salt was measured by observing the drastic change in the medium each hour. The growth of microbes in the liquid medium was shown by the increase of density and the presence of sediment in the bottom of the tube (Gupte, 1990). The average density of LAB growth medium in various concentrations of bile salt is presented on the Table 1.

Table 1. The average density of LAB growth medium in various concentrations of bile salt

Hour of	0	0.1	0.2	0.3	0.4	0.5
0	0.13 ^{a}	0.14 ^{a}	0.14 ^{a}	0.14 ^{a}	0.13 ^{a}	0.14 ^{a}
0.5	0.16 ^{a}	0.14 ^{a}	0.16 ^{ab}	0.16 ^{ab}	0.13 ^{a}	0.14 ^{a}
1	0.22 ^{b}	0.16 ^{b}	0.19 ^{b}	0.20 ^{b}	0.15 ^{a}	0.14 ^{b}
2	0.44 ^{c}	0.25 ^{c}	0.33 ^{c}	0.35 ^{c}	0.20 ^{b}	0.17 ^{c}
3	0.82 ^{d}	0.51 ^{d}	0.61 ^{d}	0.69 ^{d}	0.36 ^{c}	0.25 ^{d}
4	1.04 ^{e}	0.79 ^{e}	0.81 ^{e}	0.89 ^{e}	0.56 ^{d}	0.62 ^{e}
5	1.22 ^{f}	1.05 ^{f}	0.99 ^{f}	1.05 ^{f}	0.78 ^{e}	0.84 ^{f}

6	1.23 ^{f}	1.12 ^{g}	1.05 ^{g}	1.08 ^{fg}	0.88 ^{f}	0.92 ^{g}
7	1.26 ^{fgh}	1.19 ^{h}	1.08 ^{gh}	1.10 ^{fg}	0.92 ^{g}	0.94 ^{h}
8	1.26 ^{fgh}	1.20 ^{gh}	1.09 ^{gh}	1.12 ^{g}	0.94 ^{gh}	0.97 ^{i}
9	1.26 ^{fgh}	1.21 ^{ij}	1.11 ^{hi}	1.19 ^{h}	0.97 ^{h}	1.04 ^{j}
10	1.26 ^{fgh}	1.23 ^{jk}	1.13 ^{ijk}	1.21 ^{h}	1.03 i	1.09 ^{k}
11	1.27 ^{ghi}	1.23 ^{jk}	1.20 ^{l}	1.32 ^{i}	1.08 ^{j}	1.16 ^{l}
12	1.25 ^{fgh}	1.24 ^{kl}	1.25 ^{m}	1.35 ^{ij}	1.13 ^{k}	1.23 ^{m}
13	1.32 ^{ij}	1.26 ^{lm}	1.34 ^{m}	1.40 ^{j}	1.17 ^{l}	1.30 ^{n}
14	1.30 ^{hij}	1.28 ^{mn}	1.39 ^{m}	1.47 ^{mn}	1.23 ^{m}	1.42 ^{q}
15	1.32 ^{ij}	1.30 ^{no}	1.40 ^{m}	1.53 ^{o}	1.28 ^{n}	1.54 ^{s}
16	1.33 ^{j}	1.31 ^{op}	1.42 ^{m}	1.52 ^{no}	1.40 ^{o}	1.63 ^{k}
17	1.34 ^{j}	1.31 ^{op}	1.40 ^{m}	1.49 ^{no}	1.49 ^{pq}	1.58 ^{p}
18	1.35 ^{j}	1.33 ^{p}	1.40 ^{m}	1.47 ^{lmn}	1.51 ^{q}	1.50 ^{o}
19	1.35 ^{j}	1.33 ^{p}	1.41 ^{m}	1.42 ^{klm}	1.46 ^{p}	1.46 ^{n}
20	1.35 ^{j}	1.30 ^{p}	1.39 ^{m}	1.41 ^{kl}	1.38 ^{o}	1.44 ^{d}

$^{a, b, c, d, e, and f}$ Different superscript in the same column are real different ($p<0,05$)

On the Table 1, it shows that there are increases in the density during the fermentation at all treatments. It showed that LAB could grow in the medium contained bile salt. The growth was marked by the increase of density for all treatments. LAB still could grow in the medium which had 0.5 % bile salt level. Data on the Table 1 shows that there was LAB growth in the medium contained bile salt. It is shown by the increase of density in the same way with the increase of incubation time. The density increases insignificantly until the 2nd hour, then grows increasing significantly ($P<0.05$) until the 20th hour. It shows that there was LAB growth phases, according to Hardjo *et.al*. (1989) that the pattern of microbes' growth consists of 3 phases; they are lag phase which is often called as adaptation phase because the microbes adapt with their environment, in this case is the medium in which the lactate acid bacteria grow. The second phase is exponential phase which is marked by the fast growth of cells and fermentation products. The third phase is the stationer phase which is marked by the static cell growth or as the point in which the growth starts to decline along with its primary product. The adaptation phase occurred until the 2nd hour and followed by the exponential phase until the 20th hour. Here, the stationer phase was unseen at the 20th hour and there was a reduction of density caused by the more declining amount of living LAB.

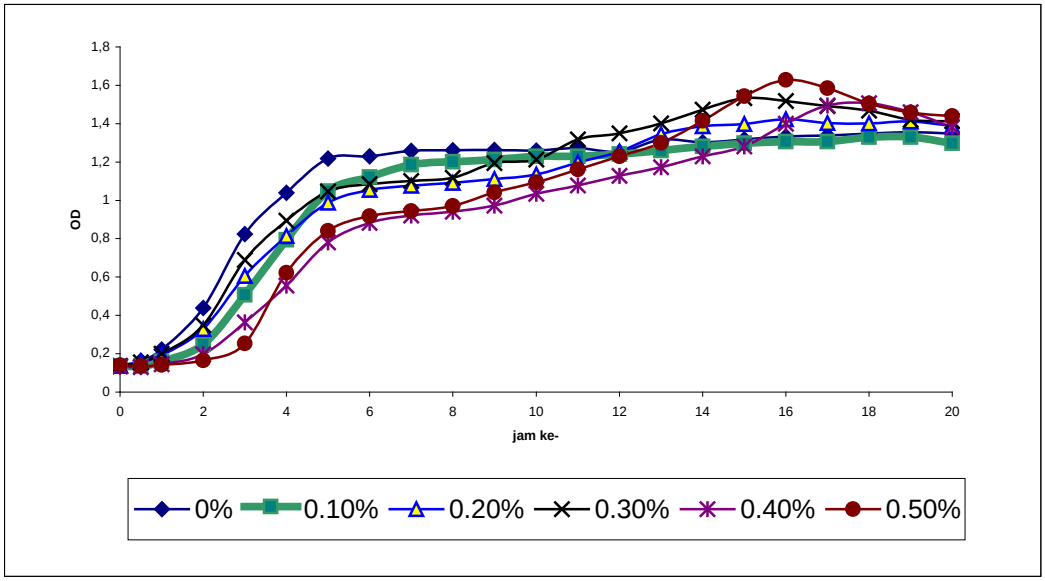

Figure 1. LAB growth graphic in the medium of MRS with the addition of bile salt

According to the findings, it can be seen that the average lag phase was only occurred until the first half hour. The lag phase was only happened quickly because the medium used in activation was the same with the medium used in the growth medium. The MRS medium nutrient level can be seen in the Appendix. The average exponential phase started to occur on the 1st hour. After the exponential phase, the microbes entered the stationer phase. LAB growth pattern can be seen in the Figure 8 here. The increase of bile salt concentration in the LAB growth medium caused the average density to be lesser significantly ($P<0.01$). According to Dune (2001) that the bile acid shows antibacterial activities which halt the growth of *Escherichia coli* strain, *Klebsiella* sp, and *Enterococcus* sp by in vitro. According to Oh et.al. (2000) the bile acid shows a retardation effect towards the growth of microbes and this retardation activity is greater than the other organic acids.

According to Bezkorovainy (2001) that the probiotic resistance towards bile salt by in vitro can be divided into two types, they are survival and growth. The survival variance depends on the concentration and the interaction length between the microbes and the bile salt. Other research about the growth of microbes in the medium contained bile salt connect to another variable that is the presence of unconjugated bile acid in the medium. The presence of unconjugated bile acid is the better bacterial lysing agent compared to the conjugated bile acid. The deconjugation of bile salt is done by the bile salt hydrolase enzyme. This enzyme is also produced by Lactobacilli and Bividobacteria. Thus, the increase of bile salt concentration could increase the unconjugated bile acid that could halt the LAB growth.

The presence of bile salt in the LAB growth medium was only as inhibitor. The LAB in the bile salt concentration of 0.3% still showed the growth although it was really different compared to the control (without bile salt).

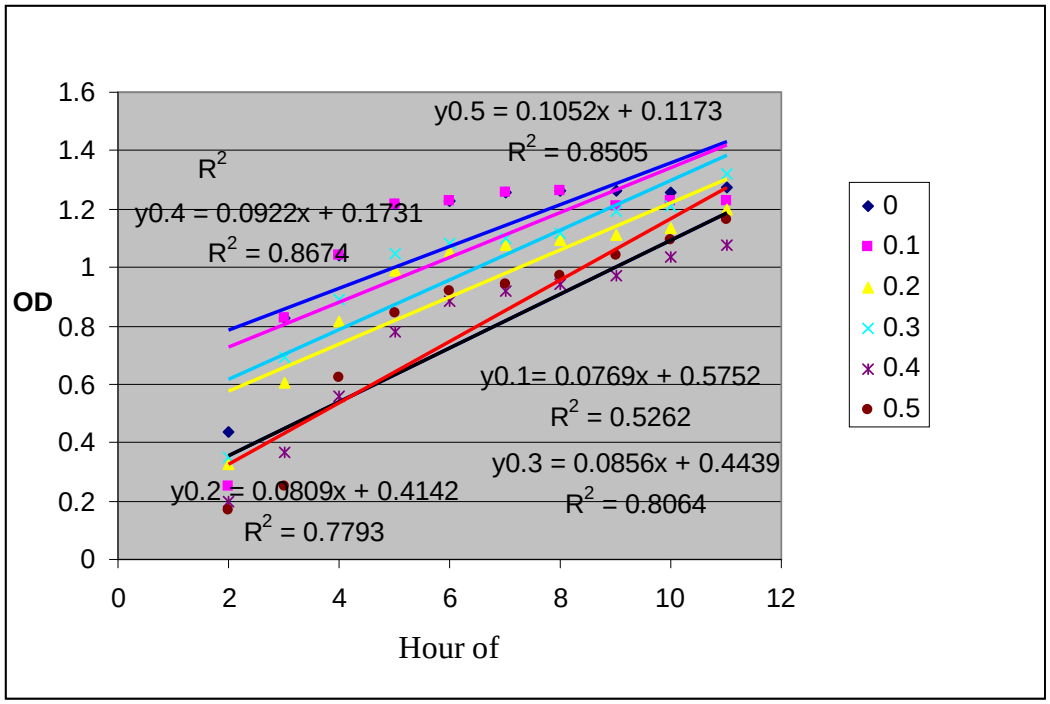

Figure 2. Bile Salt Slope

According to Table 1, there is a difference in occurrence between examinations. The exponential phase for bile salt level examination consecutively 0%, 0.1%, 0.2%, 0.3%, 0.4%, and 0.5% occurred at the hour of: 1-5, 1-7, 1-6, 1-14, 2-16, 1-15. The exponential phase tended to occur longer in the same way as the higher bile salt level. However if the growth slope was observed, the higher the level of bile salt in the medium, the lower was its slope (figure 2).

The lower of the slope showed that there was a growth obstacle in the medium contained bile salt. Noh et al (1997) explained that the bile salt shows the retardation effects towards the growth of microbes and the retardation activity is bigger than the other organic acids.

The Level of Acidity

pH measurement was done at the 20th hour in order to see the acid products resulted by LAB AST 6. The average pH scores of the medium in the various bile salt are presented in the Table 2.

In the Table 2, until the 20th hour there is occurred a decline in the medium pH from the starting pH 6.5. The decline in pH value during the fermentation time was resulted by the accumulation of fermentation products; they were lactate acid and other organic acids such as acetate and propionate acid. Those organic acids are the final results of glucose hydrolysis by LAB (Mc Donald, 1991).

Table 2. The pH value of LAB fermentation in the medium contained various bile salt at the 20th hour

Repetition	Bile Salt Level					
	0%	0,1%	0,2%	0,3%	0,4%	0,5%
1	4,64	4,75	4,94	5,01	5,04	5,13
2	4,59	4,72	4,93	5,00	5,06	5,17
3	4,6	4,74	4,90	4,99	5,07	5,15
4	4,59	4,75	4,91	5,01	5,06	5,15
5	4,59	4,74	4,91	5,01	5,04	5,17
Average	4,60[a]	4,74[b]	4,92[c]	5,00[d]	5,05[e]	5,15[f]
± sd	0,022	0,012	0,016	0,09	0,013	0,016

[a,b,c,d,e,f] Different superscript in the different column shows a very real difference (P<0.01)

The research findings showed that the bile salt gave a real influence (P<0.01) to the pH in the final fermentation. The level of acidity in the final fermentation was higher and directly proportional with the increase of bile salt concentration in the medium.

The difference in average value of pH related to the retardation effect of bile salt to the growth of LAB. The retardation to the growth caused the LAB abilities to decline in producing the final product which was in the form of organic acid especially lactate acid. Organic acids resulted during the fermentation were very determining the decline of pH during fermentation. At the higher concentration of bile salt, the pH of final fermentation was also higher. The retardation effects of bile salt to the growth of LAB resulted in the decline of LAB abilities in producing final products which was in the form of organic acids especially lactate acid. The presences of these organic acids were very influencing to the decline of the medium's pH. With the increase of bile salt concentration in the growth medium caused an increase to the retardation effect to the LAB growth (Table 1). It can also be seen in Table 2, the increase of bile salt concentration follows by the increase of average medium's pH.

Although there was growth retardation activities by bile salt, LAB was still able to survive and grow in the medium contained bile salt until the concentration of 0.3%. It could be seen by the increase density (Table 5) and the lesser pH (Table 2) at the final observation time, although showed a real difference compared to the control (without bile salt). At the end of observation, the average medium's pH could reach critical pH that is about 4. At this critical pH, the pathogenic microbes could not survive (Gilliland, 1990). According to Pereira and Gibson (2002) that the survival ability and growth parameter at the pH of 3.0 during 2 hours and grows in the medium contained 1.000 mg/1 bile used as consideration standard of the culture microbe's survival abilities towards the acids and bile.

Bile Salt Deconjugation

pH measurement in the 20th hour to know acid product that produced by LAB AST 6. Tabel 3, show that observe in 20th the decreasing is happened from the beginning pH (pH=6,5). The decreasing pH value during fermentation is consequence of fermentation product accumulation that is lactic acid and another organics acids like acetat and propionate acid. That organic acid is the final result of glucose hydrolysis by LAB (Mc Donald et al, 1991).

Tabel 3. The pH value of LAB AST 6 fermentation in the medium content various bile salt at the 20th hour

Replication	Bile Salt Level (%)					
	0	0,1	0,2	0,3	0,4	0,5
1	4,64	4,75	4,94	5,01	5,04	5,13
2	4,59	4,72	4,93	5,00	5,06	5,17
3	4,6	4,74	4,90	4,99	5,07	5,15
4	4,59	4,75	4,91	5,01	5,06	5,15
5	4,59	4,74	4,91	5,01	5,04	5,17
Average	4,60^{a}	4,74^{b}	4,92^{c}	5,00^{d}	5,05^{e}	5,15^{f}

[a,b,c,d,e,f] The different Supercrip in same row show there are singnificat difference (P<0,01)

The result of research show taht bile salt give significant influence (P<0,01) toward final fermentation pH. The final pH as more and more high as high of concentration of bile salt in the medium. The difference average pH value related with the blocking bile salt of LAB growth. The blocking of growth caused the ability LAB to produced final product like organic acid especially lactic acid go down. Organic acid that produced during fermentation establish decrease pH during fermentation very much. This organic acid existence very influence of decreasing medium pH.

Lactate acid bacteria which could do the bile salt deconjugation are bacteria which can produce bile salt hydrolase enzyme. The bile salt hydrolase enzyme will hydrolyze the glycolic acid and taurocholic acid from the bile salt to form cholic acid and cenodeocicolate acid. Cholic acid has no role in fat emulsion and does not absorb back in the intestine in the enterohephatic cycle. Cholic acid will be thrown out along with the feces (Drassar and Barrow, 1995).

The results of statistical analysis showed that the cholic acid produced was really increasing (P<0.01) at the addition of bile salt 0.1% until 0.5%. These results showed that the observed LAB isolate had the ability to do bile salt deconjugation.

Freed cholic acid was increasing in a very real way (P<0.01) at the addition of bile salt until 0.2%, but the bile salt level between 0.2% until 0.4% showed no real changes. At the addition of 0.5% bile salt, the freed cholic acid decline in a very real way (P<0.01%) lower than the addition of bile salt 0.3%. This result showed that the observed LAB had the abilities to do bile salt deconjugation maximally at the level of 0.2%. Although at the level of 0.4% the deconjugation activities were still detected. At the concentration level of 0.5% bile salt, the LAB's abilities to do deconjugation would lesser. The decline in abilities to do deconjugation in this case related to the decline of LAB's growth as a process resulted from the retardation by bile salt.

The LAB's abilities to do this bile salt deconjugation showed that LAB AST 6 had a potency to be probiotics which was able to lessen the collesterol level. As it had explained by

Tanaka (1999) that the ability to do bile salt deconjugation is the main mechanism in lowering cholesterol level. The reduction of cholesterol level resulted from the bile salt deconjugation is occurred in the alimentary tract within the body. In the alimentary tract, it is occurred the digestive reduction of food cholesterol, because in digesting the cholesterol, bile salt is needed to role as emulsion (Guyton, 1974). The lessening availability of bile salt to help cholesterol digestion causes the cholesterol digestion to decline. Undigested cholesterol will be thrown away along with the feces (Lubbadeh, 1999).

Lost bile salt after deconjugation in the alimentary tract and being thrown away along with the feces will be replaced by new bile salt synthesized in the lever. Synthesized bile salt in the lever takes cholesterol tissue as the basic materials (Volwiler et.al. 2006). Through that process, the cholesterol level in the body can decline.

IV. CONCLUSION AND SUGGESTION

Conclusion

From the research findings, it can be concluded that isolated LAB from the alimentary tract are able to do bile salt deconjugation. The high deconjugation happened at the bile salt level of 0.2%. The deconjugation still occurred well at the bile salt level of 0.4%.

Suggestion

This research should be continued with the examination of LAB's abilities to be able to grow and attach on the wall of the alimentary tract as one of the requirements for LAB to be able to role as probiotics.

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Utility of irreducible group representations in differential equations

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Abstract- Group representations play a central role in the classification of problems with group symmetries. In this paper we deal with the algebraic setup that provides this classification. In particular we relate the irreducible representations to the conjugacy classes of the symmetry group.

Index Terms- conjugacy classes,irreducible group representations

I. Introduction

Conjugacy classes and irreducible representations of Lie groups:

1.1 *Definition*: an equivalence relation on a group$G$, its equivalence classes partition G. The equivalenceclasses under this relation are called the conjugacy classes of G. So, the conjugacy class of $g \in G$ is

$$C[g] = \{g = xgx^{-1} \mid x \in g\} \quad (2.1)$$

conjugacy classes C[a],C[b] are equal if and only if a and b are conjugate i.e. $gag^{-1} = b$, $g \in G$, and *disjoint otherwise* .

for some $x \in G$. *The relation is symmetric, since* $g = yhy^{-1}$*with* $y = x^{-1}$. *When* $xgx^{-1} = h$, *we say* x *conjugates* g *to* h.

Example: .When G is abelian, each element is its own conjugacy class. *1.1*

*1.2 Example:*The conjugacy class of (12) in$S_3$is $\{(12), (13), (23)\}$, as we saw In S_3, the conjugates of (12) , When we make a table of $\sigma(12)\sigma^{-1}$ forall $\sigma \in S_3$.

σ	(1)	(12)	(13)	(23)	(123)	(132)
$\sigma(12)\sigma^{-1}$	(12)	(12)	(23)	(13)	(23)	(13)

Similarly, the reader can check the conjugacy class of (123) is $\{(123), (132)\}$. The conjugacy class of (1) is just $\{(1)\}$. So S_3 has three conjugacy classes:
$\{(1)\}, \{(12), (13), (23)\}, \{(123), (132)\}$.

3 Example: In $D_4 = \langle r, s \rangle$, there are five conjugacy classes: *1*
$\{1\}, \{r^2\}, \{s, r^2s\}, \{r, r^3\}, \{rs, r^3s\}$.

The geometric effect on a square of the members of a conjugacy class of D_4 is the same: a90 degree rotation in some direction, a reflection across a diagonal, or a reflection across an edge bisector.

1.4 Example: There are five conjugacy classes in $Q_8 = \{\pm 1, \pm i, \pm j, \pm k\}$:
$\{1\}, \{-1\}, \{i, -i\}, \{j, -j\}, \{k, -k\}$.
Example*:* There are four conjugacy classes in A_4: 1.5
$\{(1)\}, \{(12)(34), (13)(24), (14)(23)\}, \{(123), (243), (134), (142)\}$,
$\{(132), (234), (143), (124)\}$.

Notice the 3-cycles (123) and (132) are not conjugate in A_4. All 3-cycles are conjugate inthe larger group S_4, e.g., (132) = $(23)(123)(23)^{-1}$ and the conjugating permutation (12) isnot in A_4.[2].

II. Some basic properties of conjugacy classes

2.1 Theorem : Any two elements of a conjugacy class have the same order.

Proof. This is saying g and xgx^{-1} have the same order. That follows from the formula $(xgx^{-1})^n = xg^nx^{-1}$, which shows $(xgx^{-1})^n = 1$ if and only if $g^n = 1$.

A naive converse to Theorem 3.1 is false: elements of the same order in a group need not be conjugate. This is clear in abelian groups, where different elements are never conjugate.

Looking at the nonabelian examples , in D_4there are five elements of order two spread across 3 conjugacy classes. Similarly, there are examples of non-conjugate elements of equal order in $Q_8$and A_4. But in S_3, elements of equal order in S_3 are conjugate. Amazingly,this is the largest example of a finite group where this property holds: up to isomorphism, the only nontrivial finite groups where all elements of equal order are conjugate are Z/(2)and S_3.

A proof is given in [1] and [2], and depends on the classification of finite simple groups. A conjugacy problem about S_3 that remains open, as far as I know, is the conjecture that $S_3$is the only nontrivial finite group (up to isomorphism) in which different conjugacy classes always have different sizes.

Let's verify the observation in Section 2 that different conjugacy classes in a group are disjoint.

2.2 Theorem: Let G be a group and $g, h \in G$. If the conjugacy classes of g and h overlap,then the conjugacy classes are equal.

Proof. We need to show every element conjugate to g is also conjugate to h, and vice versa.Since the conjugacy classes overlap, we have $xgx^{-1} = yhy^{-1}$ for some x and y in the group.Therefore

$g = x^{-1}yhy^{-1}x = (x^{-1}y)h(x^{-1}y)^{-1}$,

so$g$ is conjugate to h. Any element conjugate to g is zgz^{-1} for some $z \in G$, and

$zgz^{-1} = z(x^{-1}y)h(x^{-1}y)^{-1}z^{-1} = (zx^{-1}y)h(zx^{-1}y)^{-1}$,
which shows any element conjugate to g is conjugate to h. To go the other way, write
$h = (y^{-1}x)g(y^{-1}x)^{-1}$and carry out a similar calculation.□

2.3 Theorem : Eeach element of a group belongs to just one conjugacy class. We call any element of a conjugacy class a representative of that class.

A conjugacy class consists of all xgx^{-1} for fixed g and varying x. Instead we can look at all $xgx^{-1}$for fixed x and varying g. That is, instead of looking at all the elements conjugate to g we look at all the ways x can conjugate the elements of the group. This "conjugate-by-x" function is denoted $\gamma_x : G \to G$, so
$\gamma_x(g) = xgx^{-1}$.

2.4 Theorem : Each conjugation function $\gamma_x : G \to G$, is an automorphism of G.

Proof. For any g and h in G,
$\gamma_x(g)x(h) = xgx^{-1}xhx^{-1} = xghx^{-1} = \gamma_x(gh)$,
so$x$ is a homomorphism. Since $h = xgx^{-1}$ if and only if $g = x^{-1}hx$, the function γ_x hasinverse $\gamma_{x^{-1}}$, so x is an automorphism of G.□

2.5 Theorem: explains why conjugate elements in a group are "the same except for the point of view": there is an automorphism of the group taking an element to any of its conjugates, namely one of the maps γ_x.

Automorphisms of G having the form $\gamma_x$are called inner automorphisms. That is, an Inner automorphism of G is a conjugation-by-x operation on G, for $\mathbf{somex} \in G$. Inner automorphisms are about the only examples of automorphisms that can be written down without knowing extra information about the group (such as being told the group is abelian or that it is a particular matrix group). For some groups every automorphism is an inner automorphism. This is true for the groups S_n when $n \neq 2,6$ (that's right: S_6 is the only nonabelian symmetric group with an automorphism that isn't conjugation by a permutation). The groups $GL_n(\mathbb{R})$ when $n \geq 2$ have extra automorphisms: since$(AB)^T = B^TA^T$and $(AB)^{-1} = B^{-1}A^{-1}$, the function $f(A) = (A^T)^{-1}$ on $GL_n(\mathbb{R})$ is an automorphism andit is not inner.

Here is a simple result where inner automorphisms tell us something about all automorphisms of a group.

2.6 Theorem : If G is a group with trivial center, then the group $Aut(G)$ also has trivial center.

Proof. Let $\varphi \in Aut(G)$ and assume φ commutes with all other automorphisms. We will seewhat it means for φ to commute with an inner automorphism γ_x. For $g \in G$,
$(\varphi \circ \gamma_x)(g) = \varphi(x(g)) = \varphi(xgx^{-1}) = \varphi(x)\varphi(g)\varphi(x)^{-1}$
and
$(\gamma_x \circ \varphi)(g) = \gamma_x(\varphi(g)) = \gamma_x\varphi(g)x^{-1}$,

so having φ and γ_x commute means, for all $g \in G$, that
$\varphi(x)\varphi(g)\varphi(x)^{-1} = \gamma_x\varphi(g)x^{-1} \Leftrightarrow x^{-1}\varphi(x)\varphi(g) = \varphi(g)x^{-1}\varphi(x)$.

so$x^{-1}\varphi(x)$ commutes with every value of φ. Since φ is onto, $x^{-1}\varphi(x) \in Z(G)$. The centerof G is trivial, so $\varphi(x) = x$.

This holds for all $x \in G$, so φ is the identity automorphism.

We have proved the center of $Aut(G)$ is trivial.[2]

Let Gdenotes a reductive algebraic group, possibly non-connected.We use the notation $\mathfrak{g}$for $Lie\ G$; likewise for closed subgroups of G.Frequently, we consider the diagonal action of Gon G^n, the *n*-fold cartesian product of $G$with itself, by simultaneous conjugation:
$g.(x_1,\dots,x_n) := (gx_1g^{-1},\dots,gx_ng^{-1})$; (2.2)

for all $g \in G$and $(x_1,\dots,x_n) \in G^n$.Note that any subgroup $H$of Gacts on G^nin the sameway. We also consider the action of Gon $g^n$by diagonal simultaneous adjoint action.If $H$is a closed subgroup of G and $x = (x_1,\dots,x_n) \in G$for some $n \in \mathbb{N}$, then we say $H$is *topologically generated by* x (or *by* $x_1,\dots,x_n$) if $H = \overline{\langle x_1,\dots,x_n\rangle}$.[10].

III. Irreducible representations of Lie group

Given a real Lie algebra $\mathfrak{g}$, its complexification $\mathfrak{g} \otimes \mathbb{C}$ is a complex Lie algebra. Consider in particular the real Lie algebra $\mathfrak{su}(n)$. Its complexification is the Lie algebra $\mathfrak{sl}(n,\mathbb{C})$. Indeed,
$\mathfrak{sl}(n,\mathbb{C}) = \mathfrak{su}(n) \oplus i\mathfrak{su}(n)$
is the decomposition of a trace-free complex matrix into its skew-adjoint and self-adjoint part.

3.1 Remark: Of course, $\mathfrak{sl}(n,\mathbb{C})$ is also the complexification of $\mathfrak{sl}(n,\mathbb{R})$. We have encountered a similar phenomenon for the symplectic groups: The complexification of $\mathfrak{sp}(n)$is $\mathfrak{sp}(n,\mathbb{C})$,which is also the complexification of $\mathfrak{sp}(n,\mathbb{R})$.

We will be interested in representations of Lie algebra $\mathfrak{g}$ on complex vector spaces , i.e. Lie algebra morphisms $\mathfrak{g} \to End_{\mathbb{C}}(V)$. Equivalently, this amounts to a morphism of complex Lie algebras $\mathfrak{g} \otimes \mathbb{C} \to End_{\mathbb{C}}(V)$. If V is obtained by complexification of a real $\mathfrak{g}$-representation ,then$V$ carries an $\mathfrak{g}$-equivariant conjugate linear complex conjugation map $\mathbb{C} : V \to V$. Conversely,we may think of real $\mathfrak{g}$-representations as complex $\mathfrak{g}$-representations with the additional structure of a $\mathfrak{g}$-equivariant conjugate linear automorphism of V.

Given a $\mathfrak{g}$-representation on , one obtains representations on various associated spaces. For instance, one has a representation on the symmetric power $S^k(V)$ by

$$\pi(\xi)(v_1 \cdots v_k) = \sum_{j=1}^{k} v_1 \cdots \pi(\xi)v_j \dots v_k$$

and on the exterior power $\Lambda^k(V)$ by

$$\pi(\xi)(v_1 \wedge \cdots \wedge v_k) = \sum_{j=1}^{k} v_1 \wedge \cdots \pi(\xi)v_j \dots \wedge v_k.$$

A similar formula gives a representation on the tensor powers$\otimes^k(V)$, and both $S^k(V)$,$\Lambda^k(V)$are quotients of the

representation on $\otimes^k(V)$. One also obtains a dual representation on $V^* = Hom(V, \mathbb{C})$, by
$\langle \pi(\xi)\alpha, v\rangle = -\langle \alpha, \pi(\xi)(v)\rangle, \ \alpha \in V^*, v \in V.$ [11]

3.1 Definition : A non-zero representation $V$of Gor $\mathfrak{g}$ is called *irreducible* or *simple* if it has no sub representations other than 0, V. Otherwise $V$is called *reducible.*

3.1 Example : Space $\mathbb{C}^n$, considered as a representation of $SL(n, \mathbb{C})$, is irreducible.

If a representation V is not irreducible (such representations are called *reducible*), then it has a nontrivial subrepresentation $W$and thus, Vcan be included in a short exact sequence $0 \to W \to V \to V/W \to 0$, thus, in a certain sense it is built out of simpler pieces. The natural question iswhether this exact sequence splits, i.e. whether we can write $V = W \oplus (V/W)$ as a representation.If so then repeating this process, we can write Vas a direct sum of irreducible representations.

3.2 Definition: A representation is called completely reducible (or *semi-simple*) if it is isomorphic to a direct sum of irreducible representations: $V \simeq \oplus V_i$, $V_i$irreducible.

In such a case one usually groups together isomorphic summands writing $V \simeq \oplus n_i V_i$,
$n_i \in \mathbb{Z}_+$, where V_i are pairwise non-isomorphic irreducible representations. The numbers n_i are called *multiplicities.*

However, as the following example shows, not every representation is completely reducible.

3.2 Example: Let $= \mathbb{R}$, so $\mathfrak{g} = \mathbb{R}$. Then a representation of $\mathfrak{g}$ is the same as a vector space V with a linear map $\mathbb{R} \to End(V)$, obviously, every such map is of the form $t \mapsto tA$ for some$A \in End(V)$ which can be arbitrary. The corresponding representation of the group $\mathbb{R}$ is given by $t \mapsto exp(tA)$. Thus, classifying representations of $\mathbb{R}$ is equivalent to classifying linear maps $V \to V$up to a change of basis. Such a classification is known (Jordan normal form) but non-trivial.

If v is an eigenvector of A then the one-dimensional space $\mathbb{C}v \subset V$is invariant under Aandthus a subrepresentation? . Since every operator in a complex vector space has an eigenvector, this shows that every representation of $\mathbb{R}$ is reducible, unless it is one-dimensional. Thus, the only irreducible representations of $\mathbb{R}$ are one-dimensional.

Now one easily sees that writing a representation given by $t \mapsto exp(tA)$ as a direct sum of irreducible ones is equivalent to diagonalizing A. So a representation is completely reducible iff$A$is diagonalizable. Since not every linear operator is diagonalizable, not every representation is completely reducible.
Thus, more modest goals of the representation theory would be answering the following questions:

(1) For a given Lie group G, classify all irreducible representations of G.

(2) For a given representation $V$of a Lie group G, given that it is completely reducible, find explicitly the decomposition of Vinto direct sum of irreducibles.

(3) For which Lie groups Gall representations are completely reducible?

One tool which can be used in decomposing representations into direct sum is the use of central elements.

3.3 Lemma:Let V be a representation of G(respectively, $\mathfrak{g}$) and $A: V \to V$ a diagonalizable intertwining operator. Let $V_\lambda \subset V$ be the eigenspace for A with eigenvalue λ. Then each V_λ is asubrepresentation, so $V = \oplus V_\lambda$ as a representation of G(respectively $\mathfrak{g}$).

3.4 Lemma: Let V be a representation of G and let $Z \in Z(G)$be a central element of G suchthat $\rho(Z)$is diagonalizable. Then as a representation of G, $V = \oplus V_\lambda$, whereV_λ is the eigenspace for $\rho(Z)$with eigenvalue λ. Similar result also holds for central elements in $\mathfrak{g}$.

Of course, there is no guarantee that $V_\lambda$will be an irreducible representation; moreover, in many cases the Lie groups we consider have no central elements at all.

3.5 Example: Consider action of $GL(n, \mathbb{C})$on $\mathbb{C}^n \otimes \mathbb{C}^n$. Then the permutation operator $P : v \otimes w \mapsto w \otimes v$commutes with the action of $GL(n, \mathbb{C})$, so the subspaces$S^2\mathbb{C}^n$, $\wedge^2 \mathbb{C}^n$of symmetric and skew symmetric tensors (which are exactly the eigenspaces of P) are $GL(n, \mathbb{C})$-invariant $\mathbb{C}^n \otimes \mathbb{C}^n = S^2\mathbb{C}^n \oplus \wedge^2 \mathbb{C}^n$as a representation. In fact, both $S^2\mathbb{C}^n$, $\wedge^2 \mathbb{C}^n$are irreducible (this is not obvious but can be proved by a lengthy explicit calculation; later we will discuss better ways of doing this).Thus, $\mathbb{C}^n \otimes \mathbb{C}^n$is completely reducible.[12] .

3.1 Theorem: *Any finite-dimensional representation of a compact Lie group is unitary and thus completely reducible.*

IV. Orthogonality relations for finite groups

Let v_i be a basis in a representation. Writing the operator $\rho(g) : V \to V$in the basis v_i , we get a matrix-valued function on G. Equivalently, we can consider each entry $\rho_{ij}(g)$ as a scalar-valued function on G. Such functions are called *matrix coefficients* (of the representation).

4.1 Theorem:.

(1) *Let , W be non-isomorphic irreducible representations of G. Choose bases $v_i \in V$, $i = 1, \dots, n$ and $w_\alpha \in W, \alpha = 1 \dots m$. Then for any i, j, α, β, the matrix coefficients $\rho_{ij}^V(g)$, $\rho_{\alpha\beta}^W$ are orthogonal: $\langle \rho_{ij}^V(g), \rho_{\alpha\beta}^W \rangle = 0$, where $\langle , \rangle$ is the inner product on $\mathbb{C}^\infty(G, \mathbb{C})$ given by*

$$\langle f_1, f_2 \rangle = \int_G f_1(g)\overline{f_2(g)}\, dg.$$

(2) *Let V be an irreducible representation of G and let $v_i \in V$ be an orthonormal basis with respect to a G-invariant inner product* (*which exists by Theorem* 2.19). *Then the matrix coefficients $\rho_{ij}^V(g)$ are pairwise orthogonal, and each has norm squared $\frac{1}{\dim V}$.*

$$\langle \rho_{ij}^V(g), \rho_{kl}^V \rangle = \frac{\delta_{ik}\delta_{jl}}{\dim V}$$

V. Conjugacy classes for Lie algebra

5.1 Definition:Let $\mathfrak{g}$be a Lie algebra and Gits adjoint group. Let X be any element of $\mathfrak{g}$.

Then, the conjugacy class of $X$is denoted by $\mathcal{O}_X$and is given by

$$Ox = \{Y \in g | \exists h \in G\ (ad(h)Y = X)\}$$

Note. When we say *orbit* we mean *adjoint orbit*. In the context of Lie algebras, we use the words *orbit* and *conjugacy class* interchangeably.

Finally, an adjoint orbit$\mathcal{O}_X$is called *nilpotent* (resp. *semisimple*), if $X$is nilpotent (resp. semisimple). That the orbits should fall naturally into these two categories can be seen by an example.

5.1 Example : Suppose $X$is in$\mathfrak{sl}(2)$ and is of the form$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$. Then, over $\mathbb{F}$, its characteristicpolynomial is $(t-\lambda_1)(t-\lambda_2)$. Corresponding to the cases $\lambda_1 = \lambda_2$or $\lambda_1 \neq \lambda_2$, we conclude that any $X$is similar to either

$$\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} \text{or} \begin{pmatrix} a & 0 \\ o & -a \end{pmatrix}$$

for some a. In the former case, $X$is nilpotent and in the latter, it is semi-simple. Clearly, there are infinitely many semisimple classes.

Thus the semisimple orbits in $\mathfrak{sl}(2)$can be parameterized by the set $K/(a \sim -a)$. Recall that the Weyl group $W = \{1; s_\alpha\}$ acts on a Cartan subalgebra h by reflecting the origin.

Thus we may identify $K/(a \sim -a)$with $\mathfrak{h}/W$. This result extends to any semisimple algebra.

5.1 Theorem : (Classification). *: Let*g*be a semisimple Lie algebra ,* $\mathfrak{h}$ *a Cartan subalgebra, and* W *the associated Weyl group. Then the set of semisimple orbits is in bijective correspondence with* $\mathfrak{h}/W$*. In particular, there are infinitely many semisimple classes.*

Although the set of all semisimple orbits is infinite, it has a finite subset of a certain semisimple orbit called *distinguished*. The so-called weighted Dynkin diagrams that parameterize them.

We will define them later for nilpotent elements. The work of Jacobson-Morozov and Dynkin-Kostant proves that there is a bijective correspondence between the set of nilpotent orbits and the set of distinguished semisimple orbits in g. In particular, the nilpotent orbits in g are finite. Richardson proves the result generally.

5.2 Theorem: (Richardson's Finiteness Theorem). *: Let* H*be a closed subgroup of* $G = GL(n, K)$*, and* $\mathfrak{h}$ *its Lie algebra. Let* $\mathfrak{h}$ *satisfy the following condition:*

(*) There exists a subspace m*of , stable under* $Ad(H)$*, for which* $\mathfrak{g} = \mathfrak{h} \oplus m$

Then, any G*-orbit in*gintersects $\mathfrak{h}$ *in only finitely many* H*-orbits. In particular,* $\mathfrak{h}$*has only finitely many nilpotent orbits.*[6] .

Note that condition (*) is satisfied by all reductive (hence semisimple) Lie algebras.

The following theorem in positive characteristic is due to Lusztig

5.3 Theorem: *If* $\mathfrak{g}$ *is simple and char* K *is positive, then* g *has only finitely many nilpotent orbits.*

In classical cases, the weighted Dynkin diagrams can be replaced by partitions. Now we quote some parameterization results with examples.

5.4 Theorem: In $\mathfrak{sl}(n)$*, there is a one-to-one correspondence between the set of nilpotent orbits and the set of partitions of* n*. The correspondence sends a nilpotent element X to the partition determined by the block sizes in its Jordan normal form.*

Here is the explicit correspondence: Let $[d_1, d_2, \ldots, d_k]$ be a partition of n satisfying the conditions $d_1 + d_2 + \ldots + d_k = n$ and $d_1 \leq d_2 \leq \ldots \leq d_k > 0$.

Definition : Let J_i be the i by i *5.2*

matrix given by

J_i is called a Jordan

$$\begin{pmatrix} 0 & 1 & 0 & 0 & \ldots & 0 \\ 0 & 0 & 1 & 0 & \ldots & 0 \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ 0 & 0 & 0 & \ldots & 0 & 1 \\ 0 & 0 & 0 & \ldots & 0 & 0 \end{pmatrix}.$$

Then

$$X_{[d_1, d_2, \ldots, d_k]} = J_{d_1} \oplus J_{d_2} \oplus \ldots \oplus J_{d_k}$$

is a nilpotent element of $\mathfrak{sl}(n, k)$. Henceforth, we will refer to $X_{[d_1, d_2, \ldots, d_k]}$ as the nilpotent element associated with the partition $d_1, d_2, \ldots, d_k$. Two distinct partitions give disjoint nilpotent classes.

5.2 Example: In $\mathfrak{sl}(3)$, *n* = 3. The partitions of 3 are: $[3], [1\,2], [1\,1\,1]$.

The corresponding nilpotent elements (representatives) are given by,

$$\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

respectively.

5.5 Theorem: Nilpotent orbits in $\mathfrak{so}(n)$*,* n *odd are in one-to-one correspondence with the set of partitions of* n *in which even parts occur with even multiplicity* .

*5.3 Example:*In $\mathfrak{so}(5)$, *n* = 5. The partitions that give nilpotent orbits are

$[1\,1\,1\,1\,1], [1\,1\,3], [1\,2\,2],$[6].

5.4 Lemma: *Let* $\mathcal{O}_X$ *be the orbit containing the element* X*. Then* $\mathfrak{g}^X$*is a subalgebra of* $\mathfrak{g}$*and*

$dim(\mathcal{O}_X) = dim(\mathfrak{g}) - dim(\mathfrak{g}^X)$.[6]

n-tuples in $L(G)$ and conjugacy classes of subalgebras .

Let $\mathfrak{g}$ denotes a finite-dimensional Liealgebra over $\mathbb{F}$ and G is a closed subgroup of the algebraic group $Aut(\mathfrak{g})$ of all Lie algebra automorphisms of $\mathfrak{g}$. Recall that if $= (x_1, \ldots, x_n) \in \mathfrak{g}^n$, then $c(x)$ denotes the Lie subalgebra of generated by $\{x_1, \ldots, x_n\}$.

Two subalgebras $\mathfrak{a}$ and $\mathfrak{b}$ of are G-conjugate if there exists $g \in G$ such that $g.\mathfrak{a} = \mathfrak{b}$.

We let $L_n = L(X_1,\dots,X_n)$ denote the free Lie algebra over $\mathbb{F}$ on the indeterminates $X_1,\dots,X_n$. Each n-tuple $x = (x_1,\dots,x_n) \in \mathfrak{g}^n$ determines a Lie algebra homomorphism $\eta_x: L_n \to \mathfrak{g}$ given by $\eta_x(X_i) = x_i\ (i = 1,\dots,n)$. The image of $\eta_x$is$c(x)$. For each $a \in L_n$ the map $x \to \eta_x(a)$ is a morphism from $\mathfrak{g}^n$ to $\mathfrak{g}$.

Let δ denote the integer-valued function of $\mathfrak{g}^n$ given by $\delta(x) = \dim c(x)$.

5.1 PROPOSITION : δ is a lower semicontinuous function.

Proof Let $x \in g^n$ and let $d = \delta(x)$. Then there exist dements $a_1,\dots,a_d$ ofL_n such that $(\eta_x(a_1),\dots,\eta_x(a_d))$ is an F-basis of $c(x)$. The map $:g^n \to g^d$, given by $\tau(y) = (\eta_y(a_1),\dots,\eta_y(a_d))$ is a morphism of algebraic varieties. Thus the set U of all $y \in g^n$ such that the vectors $\eta_y(a_1),\dots,\eta_y(a_d)$ are linearlyindependent is an open neighborhood of $x$in g^n. Clearly, if $y \in U$, then$\delta(y) \geq \delta(x)$. This proves that δ is lower semicontinuous.

5.1 COROLLARY: For each $d > 0$, let $V(d) = \{x \in g^n | dim\ c(x) \leq d\}$ and let $V(d)' = \{x \in g^n | dim\ c(x) = d\}$. Then $V(d)$ is a closed subset of g^n and $V(d)'$ is relatively open in $V(d)$.

Let $Gr_d(g)$ be the Grassmann variety of all d-dimensional subspaces of g andlet $A_d = A_d(g)$ be the closed subvariety of $Gr_d(g)$ consisting of all d-dimensional sub algebras of g. Let $X = \{(a,x) \in A_d \times g^n | x \in a^n\}$; X is a closedsubvariety of $A_d \times g^n$. Let $p_1: X \to A_d$ and$p_2: X \to g^n$ denote the restrictionsto X of the projections $pr_1: A_d \times g^n \to A_d$and $pr_2: A_d \times g^n \to g^n$. Then $p_1$defines X as a vector bundle over A_d; the fibre over a $a \in A_d$ is isomorphic to a^n.

It is clear that $V(d) \supset p_2(X)$. Let $X' = p_2^{-1}(V(d)')$. Then X' is an open subset of X. Let $\pi_2: X' \to V(d)'$ denote the restiction of p_2.Then π_2 is a bijection.

The inverse bijection $\psi\ V(d)' \to X'$ is given by $\psi(x)\ (c(x), x)$,[1]

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Cytogenetic Analysis of Red Rust Flour Beetle *Tribolium castaneum*, Herbst (Coleoptera: Tenebrionidae)

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Abstract- Chromosomal information of species are essential since species are considered to be the objective reality of some particular genetic continuity and karyological studies has come to recognized as an important tool in understanding the problem of taxonomy and biology. In the present investigation *T. castaneum* has been studied with the view to determine the diploid (2n) number, morphology, centromeric index, sex determination mechanism, C-banding pattern and NOR localization which are essential to obtain a complete knowledge of cytogenetics of any animal. The observations revealed that karyotype of *T. castaneum*, showed a diploid number of 2n = 20 chromosome and sex determining mechanism was of "parachute type" due to the X and y chromosome (9AA + Xy_p). C- banded preparations showed positive staining in centromeric regions of all autosomes. In sex chromosomes only Xp chromosome indicated heterochromatised block. Nucleolar organizing regions were also localized.

Key words- chromosomes, sex determination, autosomes, heterochromatised, NOR (Nuclear organizing regions)

INTRODUCTION

The red rust flour beetle *Tribolium castaneum* (Herbst) is a word wide distributed stored grain pest which contributes to maximum spoilage of the stored grains at the larval as well as the adult stages. It belongs to order Coleoptera and Family Tenebrionidae. The order Coleoptera has approximately 350,000 known species; the total number may be ten times higher. With the advances of technique s for observing animal's chromosomes, an increasing number of investigations on coleopteran karyotypes have been reported by many authors. Integration of the earlier list of chromosome number of Coleoptera (Smith, 1960) and that of the events available data (Due and Kacker, 1980) make general karyotypic comparison possible and promise a fruitful future.

The family Tenebrionidae comprises about 6% of this order (Costa, 1999). According to Smith and Virkki (1978) and Juan and Petitpierre (1989), 200 species of Tenebrionidae have well characterized karyotypes, i.e. diploid number, the chromosome morphology and the type of sex chromosome determination system are known.

Inconsistent reports on the cytogenetics of Tenebrionids in India are available. Some efforts have been made by (Dutt, 1953; Agarwal 1960; Juneja, 1960; Sharma et al. 1977and Dua and Kacker, 1980) are probably the only workers who had paid some attention towards this problem. The main reason for the lack of attention toward Tenebrionidae for Cytogenetical studies could have been its small sized body and also the chromosomes. In the last few decades significant vigor have been observed in the chromosome compliments and karyotypes of *Tribolium* due to the perennial problem of control of stored grain pests.

According to Smith (1950, 1951, 1952, 1953, 1960 and 1962) the primitive number in this order is nine pairs of autosomes, and X about the size of autosome and minute Y. This formula is characteristic of Tenebrionidae as a whole but a good number of variation

has also been observed. The sex chromosome appears to be V shape and associated during division at two terminal contact points in the form of a "parachute". An additional symbol have been introduced by Dua and Kacker (1980) for comparison the association of X and y, in meiotic metaphase by calling it either like parachute (Xyp) or end to end (Xyr). When the association is not known between the sex chromosome then the symbol Xy is resumed. A fourth category of the Xy system in which y is larger than X was also reported by John and Lewis (1960).

In Tenebrionidae the diploid number of chromosomes varies from 14 to 36 with 20 as the model number (Juan and Petitpierre, 1990). *Tribolium* has been also observed to provide the total number 20 in their diploid set. The nomenclature of chromosomes was standard followed on the pattern of the nomenclature of the vertebrates (Levan *et al.*,1964). According to which the chromosome categories depending upon their centromeric position. Both acro and metacentric types of chromosomes are met with in the karyotypes of Tenebrionids. The relative average length is variable among the species, ranging from 3.25µ-0.75µ. The variation is brought about by the structure of sex chromosomes and autosomes.

The question whether there are morphologically differentiated single mechanism for *T. castaneum* is still unresolved. Sokoloff (1972) stated that the male and female presented identical number of karyotype. Constitutive effects of banding are essential help in this regard because they provide differentiated labeling of heterochromatised area. Advanced techniques are now showing tremendous potential for providing valuable cytogenetical information on *Tribolium*.

In the present investigation *T. castaneum* has been studied with the view to determine the diploid (2n) number, morphology, centromeric index, sex determination mechanism, C-banding pattern and NOR localization which are essential to obtain a complete knowledge of cytogenetics of any animal. These information's would add to the reportoir of the cytogenetics of the *Tribolium* on the whole.

MATERIAL AND METHODS

For cytogenetic analysis chromosomes were prepared from fourth instar larvae. Chromosome preparations have been done according to the procedure given by Wolf in 1997 with some modifications. Larvae were immersed in hypotonic solution i.e. KCl (0.075M) having 0.05% colchicine for 10 minutes which is followed by fixation for 10 minutes in fixative (ethanol : chloroform : acetic acid) in the ratio of 6:3:1. Then larvae was minced in a droplet of 70% acetic acid on a clean glass slide and this cell suspension was covered with the cover slip and placed on a hot plate for about 1 minute allowing part of the droplet of acetic acid to evaporate. Remaining acetic acid was discarded and the coverslips and slides were air dried. Then these slides and coverslips having chromosome preparation were utilized for Giemsa staining, C-banding and NOR staining. For Giemsa staining the procedure as described by Trivedi (1993) was followed with slight modification.

For C – banding , technique of Sumner *et al.*,(1972) was utilized with some modifications. C- banding is almost invariably induced by treatment with hydrochloric acid followed by either sodium hydroxide or, more commonly barium hydroxide treatment and incubation in a warm salt wash and finally Giemsa staining. The one step method of silver staining was used (Howell and Black, 1980) for NOR localization. The chromosome preparations were analysed with Olympus microscope with oil immersion objective at 100 x and photographed with Canon Power Shot A1100IS Digital Camera (12.1 megapixels).Chromosome terminology of Levan *et al.*,1964 has been followed.

RESULTS

Observations of cytogenetical investigation are presented in Fig.1. The total cell count index made from the metaphase stages of both mitotic and meiotic cells was shown in the Table-1 which shows that the diploid number of chromosomes per cell varied from 16 to 20. Out of 395 counts 2n is equal to 20 has been observed 207 times and referred to as model number. This confirms the uniformity in 2n values in the Tenebrionids.

The total arm length as depicted in the Table- 2 of *T. castaneum* has been found to be 6 to 16mm with metacentric, submetacentric, subtelocentric and telocentric chromosomes. The metaphases shows that the diploid complement is formed by 9 pairs of autosomes and 1 pair of sex chromosomes (Fig. 2) out of which 7 pairs were metacentric, 1pair submetacentric, 1 pair subtelocentric and in sex chromosomes X is metacentric while y is telocentric.

Autosomal metacentric chromosomes range between 0.05 to 0.14 where 1^{st} pair of metacentric chromosome have 0.14, 2^{nd} pair have 0.13, 3^{rd} pair have 0.12 and 4^{th}, 5^{th} and 6^{th} pair have 0.08 relative length. 7^{th} pair is submetacentric with 0.07 relative length, 8^{th} pair is again metacentric with 0.06 relative length and the 9^{th} pair is subtelocentric with 0.07 relative length. X chromosome is metacentric with 0.12 relative length while y chromosome is telocentric with 0.05 relative length. The shape of the chromosome is rod like and take deep stain. The ratio of the total length of autosomes (TA) and the length of "X", (TA/X) is 14.46.

Sex determining mechanism is of "parachute type" in which the y represents the aviator and the X resembling the open canopy of the parachute (X denoted as X_p and y chromosome as $y_{p)}$. The X_p chromosome is metacentric of medium size and usually is difficult to be identified due to its similarity with autosomal chromosomes of the same size. The y_p is telocentric and is characterized as the smallest chromosome of the karyotype (Fig.3).

The metaphase of *T. castaneum* cells showed a diploid number of 2n = 20 chromosome (Fig. 1A). The chromosome meioformula 9 + X y was observed in all cells in metaphase I. The haploid complement n = 9 + X or n = 9 + y was observed, indicating that chromosomes segregate normally during anaphase I. The nomenclature of chromosomes was the same standard based on centromeric position was followed on the pattern of the vertebrates (Levan *et al.*, 1964).

The karyotype of *T. castaneum* metaphases shows that the diploid complement is formed by metacentric, submetacentric, subtelocentric and telocentric chromosomes. The X chromosome is metacentric of medium size and usually is difficult to be identified due to its similarity with autosomal chromosomes of the same size. The y is telocentric and is characterized as the smallest chromosome of the karyotype.

C- banded preparations of *T. castaneum* showed positive staining in the centromeric regions of all the autosomes (Fig 1A,1B). The X chromosome also shows the blocks of constitutive heterochromatin in the centromeric region while in y chromosome no constitutive heterochromatin blocks were detected.

Silver nitrate staining has been used to study nucleolar activity and the distribution and position of NORs. Amorphous masses corresponding to nucleolar remnants were observed by silver nitrate staining (Fig. 1C). Silver nitrate also labeled the constitutive heterochromatin blocks and the sex chromosomes showed affinity for silver and continued to be labeled during different phases of meiosis.

The sex chromosomes of the observed *T. castaneum* appear to be primitive type with the X about the size of autosomes while the Y is minute (Fig.1A) and appears to be a total heterochromatised body. The association of X and Y is by two terminal contact points the shape appears like a “parachute”. Although this type of association is characteristic of Tenebrionids as a whole but in the present study has been also observed by C- banding and NOR. This is the possible confirmation of the existing primitive association of the sex chromosomes. The presence of small Y chromosome rubs out the possibility of neo-X and neo-Y mechanism in this group.

The bivalents as observed during the meiotic study consists of rod shaped, condensed heavily stained chromosomal segments with occasional patches of diffused stained portions in centromeric position. These diffused areas could be the sight of ongoing functions of the euchromatin chromosomes. The Xy bivalents differ from the other bivalents in stainability with only small unstained area at the centromeric position of X chromosome while y chromosome is deeply stained. During meiosis, the associated X and y observed to be oriented on the spindle with the y more closer to the “equatorial plate”.

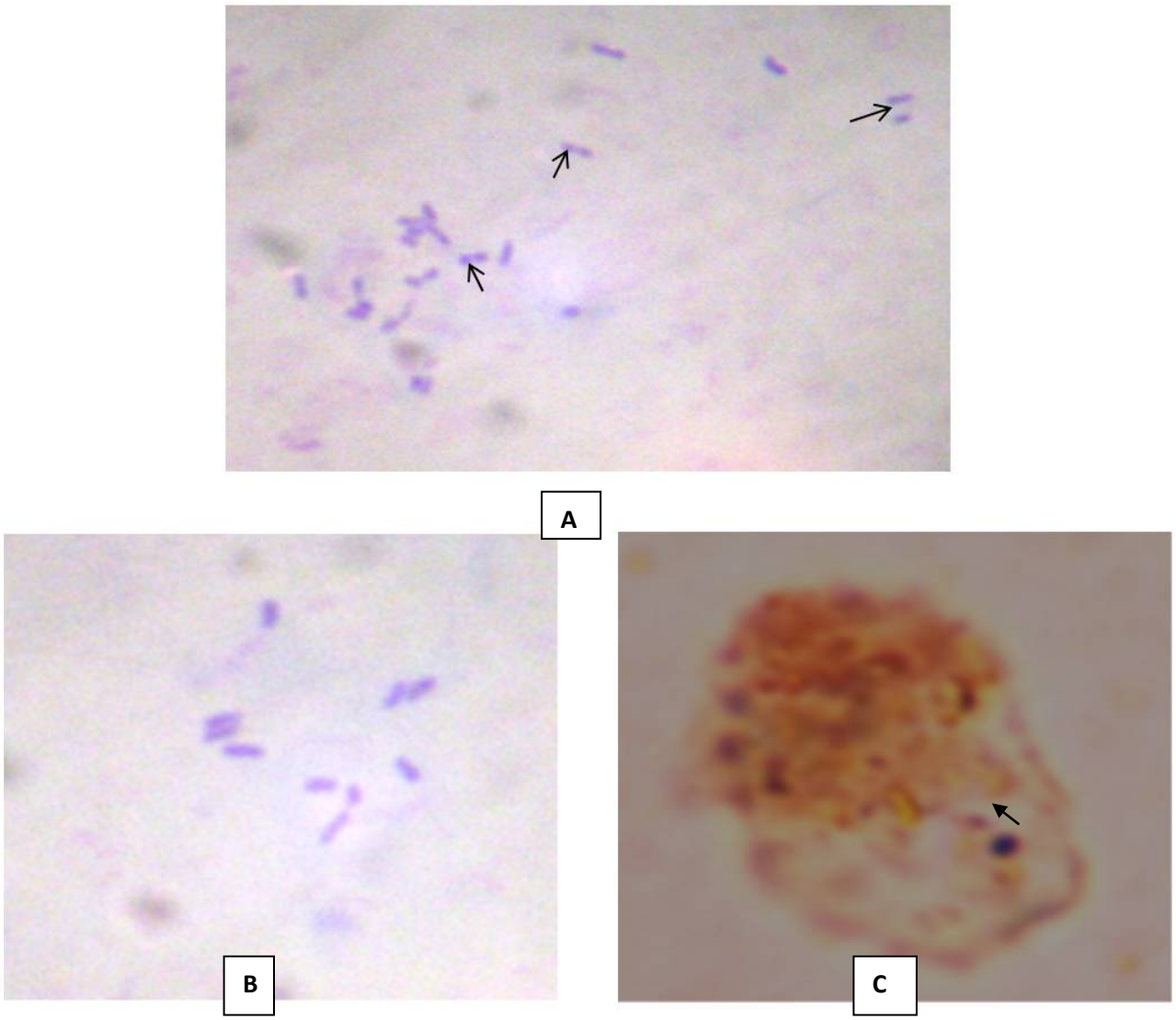

Fig.1 A. Metaphase plate showing - diploid no. (2n=20) of chromosomes, C- banding in centromeric region of chromosome and Xy_p chromosomes. B. Metaphase showing haploid (n=10).chromosome. C. Silver impregnated micronuclei in interphase

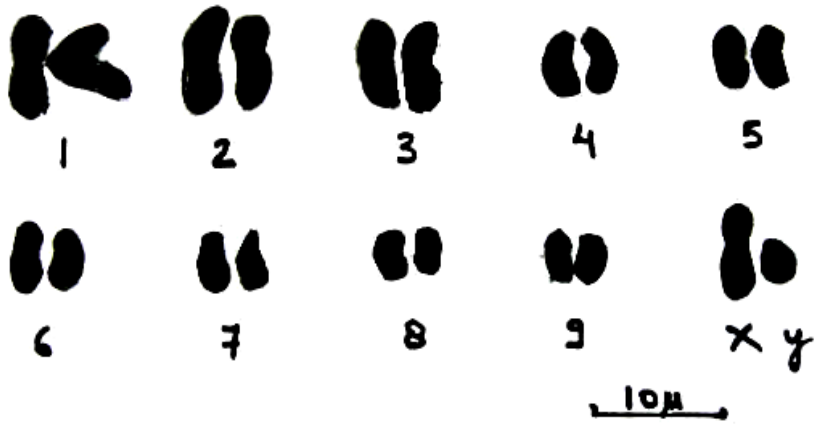

Fig.2 Karyotype of *Tribolium castaneum*

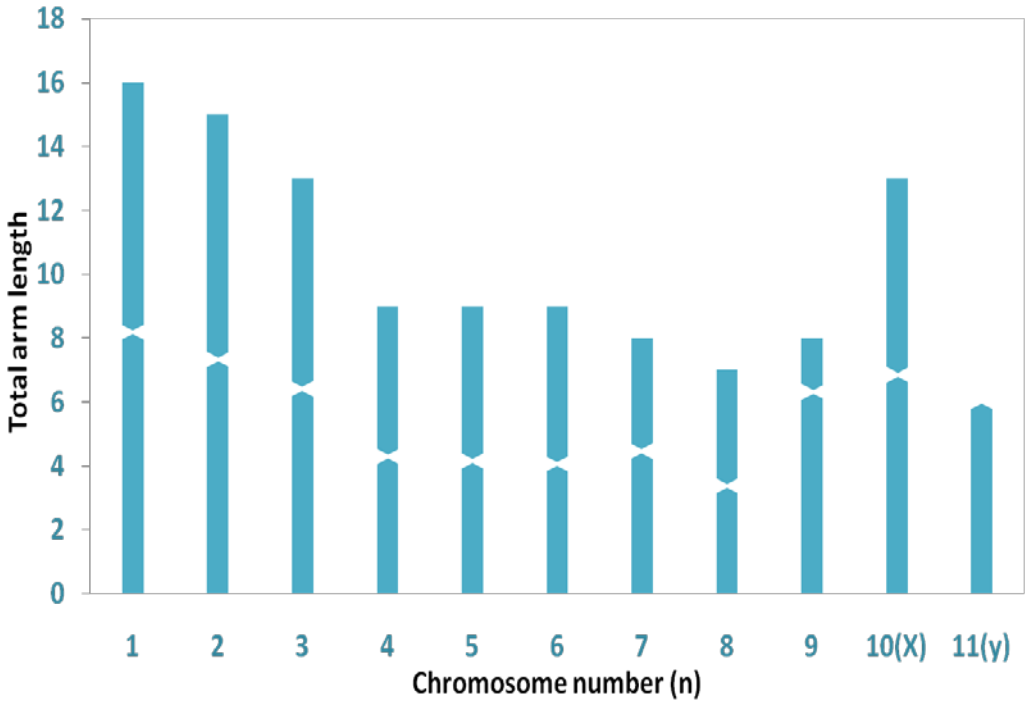

Fig-3 Idiogram of *T. castaneum* karyotype

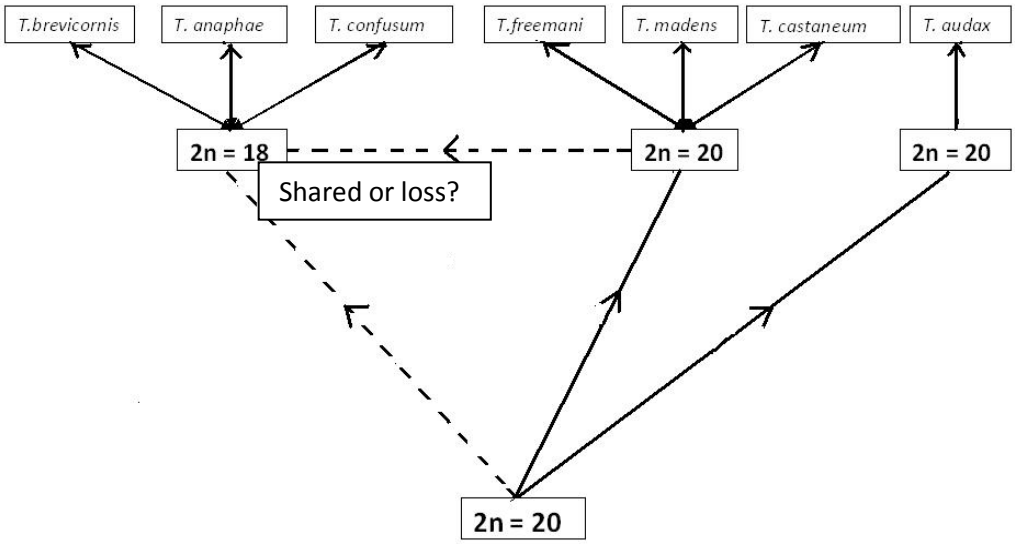

Fig. 4 Probable path of cytotaxonomical status of *Tribolium*

Table - 1 Cell count index

STAGES	CELL COUNT	CHROMOSOME FREQUENCY COUNT		
		16	18	20
Mitotic Metaphase	132	12	38	82
Meiotic Metaphase	263	48	90	125
Total	395	60	128	207

Table-2 Karyometrical analysis

Chromosome pair	Short arm length (mm)	Long arm length (mm)	Total arm length (mm)	Relative length (%)	Arm ratio (r)	Chromosome Type
1	8	8	16	0.14	1	M
2	8	8	16	0.14	1	M
3	7	8	15	0.13	1.14	M
4	7	8	15	0.13	1.14	M
5	6	7	13	0.12	1.16	M
6	6	7	13	0.12	1.16	M
7	4	5	9	0.08	1.25	M
8	4	5	9	0.08	1.25	M
9	4	5	9	0.08	1.25	M
10	4	5	9	0.08	1.25	M
11	4	5	9	0.08	1.25	M
12	4	5	9	0.08	1.25	M
13	3	5	8	0.07	1.66	Sm
14	3	5	8	0.07	1.66	Sm
15	3	4	7	0.06	1.33	M
16	3	4	7	0.06	1.33	M
17	2	6	8	0.07	3	St
18	2	6	8	0.07	3	St
19(X)	5	8	13	0.12	1.6	M
20(y)	0	6	6	0.05	∞	t

DISCUSSION

Karyotypic status **-** Advances of techniques has brought about increasing number of investigations on coleopteran karyotypes and integration of the earlier list of chromosome number of Coleoptera (Rozek and Lachowska, 2001) and that of the events available data (Costa, 2003) make general karyotypic comparison possible and promise a fruitful future. Currently inconsistent reports on the

cytogenetics of Tenebrionids in India are available. Some efforts have been made by (Dutt, 1953; Agarwal 1960; Juneja, 1960; Sharma *et al*. 1977and Dua and Kacker, 1980) are probably the only workers who had paid some attention towards this problem.

The diploid complement in the Tenebrionids varies from 14 to 36 numbers of chromosomes with a model number being 20. *T. castaneum*, as observed during the present study, confirms similar patterns of chromosomes, although the range varies between 16 to 20. The total frequency count of the chromosome number is fixed at 20 (Table 1). Overview of the earlier result reasserts the hypothesis according to which the pest among the tenebrionid have the basic karyotype of 10 bivalent chromosomes (White, 1979).

Karyological studies often are able to distinguish between closely related taxa and played some role in the evolution of karyotype of the species. Metaphase count reveals the diploid chromosome number as 20 in *T. castaneum*. Yosida (1958) studied that in the order Coleoptera, there exists a relative constancy in the ratio of the total length of the autosomes (TA) and length of the 'X' chromosome. Robertson (1959) also studied seven species of Cucujidae and observed different TA/X values. In the present study the TA/X value is 14.46.

On comparing the chromosome morphology of *T. castaneum* with other *Tribolium*, one is struck by apparent uniformity of relative chromosome size and centromeric position but differences in chromosome number. The *T. confusum* and *T. destructor* have only 18 chromosome in their diploid set. It is believed that the reduction in number in the latter two *Tribolium* is probably due to pericentric inversion /deletions during evolution (Sharma *et al*.,1973; White, 1979; Kacker, 1980). Since *T. castaneum* has the basic karyotype, it is highly probably that it belong to the primitive stock in the genus.

Karyometrical relationships with other Tenebrionids **-** On the available data on the Tenebrionids, the diploid number of chromosomes varies from 14 to 36 as observed in *T. castaneum, T. destructor, T. confusum, Alphitobius diaperinus, Sphenariopsis impolita* (Dutt, 1953; Sharma, 1954; White, 1979; Dua and Kacker, 1980; Rich and Bell, 1980). Of the three species of *Tribolium* , *T. castaneum*, has 20 in both sexes while *T. destructor* and *T. confusum* have only 18 chromosomes in their diploid sets. *Alphitobius* has 2n is equal to 19 and *Sphenariopsis* has 20. The average mean length of chromosome varies, for example the length of *A. diaperinus* varies from 2.5 to 1.25µ whereas in *T. castaneum* and *S. impolita* it varies from 3.25- 0.75µ.

Hinton (1948) classified the extent species of *Tribolium* into five groups based on its morphological characters. Considering our species of *Tribolium castaneum* and other seven species, as described by Juan *et al*., (1993), they can be grousped under Hinton's criteria as follows : *confusum* species group with *T. confusum* and *T. anaphe*, *castaneum* species group *T. castaneum, T. audax* and *T. brevicornis* . The latter is considered most primitive and well differentiated from others. Based on cytogenetic data of Smith (1952) claimed that *T. confusum* with 2n = 18 chromosomes were derived from similar ancestors of *Tribolium* 2n = 20 by translocation of one autosome to the X chromosome.Samollow *et al.*,(1983) provided genetic support of this hypothesis.. The data derived from dot –blot hybridization of DNA also supports this view (Juan and Petitpierre, 1990) based on the comparison of phylogenetic model can be prepared by the occurrences and relationship between the *Tribolium* can be made. Fig.4 depicts that the ancestral chromosome number to be the 20 which forms the base. The *T. freemani, T. castaneum* and *T. madens* appear to be closely related. The earliar concept of confusum is now not valid because *T. anaphe, T. confusum* and *T. brevicornis* form a separate species group with 2n=18.*T. audax* although has 2n=20 chromosome but yet differ in chromosome structure and hence, depicted in Fig.4 as having arisen from the common ancestral stem.

Sex determining mechanism - A diversity of opinion exists for the sex chromosomes of Coleopterans among the investigators. According to Smith (1963) there are three different type of sex chromosome mechanism available in this group. The first category of sex chromosome is the XO system but this mechanism has been restricted to some selected families (Lycidae, Lampyridae, Cantharidae). This reflects the idea that Y is not an essentially male determining mechanism. Probably it becomes in a similar manner to the Y of *Drosophila.* However, generalization of this category for the order Coleoptera is rather doubtful.

The second category is an XY system in which the minute y is associated by both its arms with X. This two terminal contact points result in the form of "parachute" bivalent (terminology according to Smith) in which the y represents the aviator and the X resembling the open canopy of the parachute. This is by far the commonest type of sex mechanism in Coleopteran this formula is characteristic of Tenebrionidae as a whole.

There had been two attempted interpretations of these parachute bivalents. One is that are two terminal pairing segments in each sex chromosome, that is, the parachute is really ring bivalent composed of two metacentric chromosomes of quite different sizes held together by a terminalised chiasmata (Smith, 1960). The other interpretation (John and Lewis, 1960) assumes that there are no chiasmata, the X and y being held together by a nucleolar formation which is suppose to occupy the space between them.

Our observation with the *T. castaneum* indicate the existence of the parachute association of the X and y chromosomes (9AA + Xy). *T. confusum* and *T. destructor* on this basis have been considered to be the derived species, the first having eight pairs of autosomes, a large X and large Y (Neo X and neo-Y). In *T. destructor* the size of the Neo- X and Neo- Y is reduced. According to Smith (1952) *T. castaneum* following fusion of the X chromosome with one pair of autosome. The homologue of which took over the mechanism function of the minute y chromosome. The purpose for using the statement here is to indicate the primitiveness of *T. castaneum* in comparison to the other *Tribolium.*

The third category is a Xy system in which the y is quite large and about the same size as one limb of X chromosome. Such mechanism are reffered to as Neo- XY mechanism by Manna (1969). These mechanism are interpreted to have arisen from XO system in the same way as in the Orthoptera. Such mechanism have been reported in *T. destructor* and the *T. confusum* but it has never been seen in the *T. castaneum* during our investigation. The another hypothesis for the above fact may be that the minute y chromosome of *T. castaneum* increases in size by duplication of some reason without the incorporation of the autosomal material into the sex chromosome pair. Throughout our studies we have always found that y to be minute and associated in parachute form. This gives a feeling that the *T. castaneum* are a conservative group in terms of the sex determining mechanism.

C- banding studies- C-banding of chromosomes used to define regions of constitutive heterochromatin. This type of DNA often contains highly repetitious sequences, such as satellite DNA, and is thought to be genetically inert. C- banding is very species specific or even individual specific.

The order Coleoptera has the highest species diversity within the animal kingdom, yet cytogenetic data using specific banding techniques are still scarce. C- banding data have revealed a preferential localization of autosomal constitutive heterochromatin (CH) in the centromeric area and less so observed in interstitial and telomeric areas. Sex chromosomes also show a variable CH distribution, as it has been observed in the pericentromeric region or along the entire chromosome (Ennis, 1974; Vidal *et al.*,1977; Angus, 1983; Drets *et al.*,1983; Virkki, 1983; Juan and Petitpierre, 1989).

Another phenomenon which has been observed during the C-banding studies is that chromosomes are better observed by this method then by routine giemsa stain method. It is true that many species of Coleopterans are chromosomaly conservative in terms of lacking gross xx chromosomal changes. If the karyotype in an evolutionary series consists of degree of completely biarmed chromosome than the probability that *Tribolium* species are in the process of undifferentiation.

The C-banding results on the mitotic chromosomes of the *T. castaneum* (Fig. 1A) shows positive staining in the centromeric regions of all the autosomes. The X_p chromosome also shows the blocks of constitutive heterochromatin in the centromeric region while in y_p chromosome no constitutive heterochromatin blocks were detected.

NOR studies- Silver nitrate staining of both mitotic and meiotic chromosomes of eukaryotic species has been a very useful approach for the analysis of the structure and variability of nucleoli, nucleolar organizer regions (NORs) and kinetochores (Goodpasture and Bloom, 1975; Virkki and Denton, 1987; Virkki *et al.*,1991). Although in Coleoptera this technique has been considered unsuitable to identify active rDNA clusters (Colomba *et al.*,2000). It is generally accepted that silver impregnation is indicative of rRNA synthesis and that it stains functionally active NORs (Miller *et al.*,1976; Hubbell, 1985).

Silver nitrate staining has been used to study nucleolar activity and the distribution and position of NORs. Amorphous masses corresponding to nucleolar remnants were observed by silver nitrate staining. Silver nitrate also labeled the constitutive heterochromatin blocks and the sex chromosomes showed affinity for silver and continued to be labeled during different phases of meiosis.

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Effect of Temperature and Humidity on the Culture of *Tribolium castaneum*, Herbst (Coleoptera: Tenebrionidae) in the laboratory

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Abstract- In the present study for the establishment of culture in the laboratory adults of *Tribolium castaneum* were collected from two different areas, Dayalbagh and Cantonment area of the Agra city and pooled together to have a heterogeneous population with large variability. The progeny thus reared in the laboratory was designated as parental strain (P1). Effect of temperature and humidity were studied on the strains of this laboratory culture.

Key words: culture, heterogeneous, variability, temperature, humidity

INTRODUCTION

Tribolium belongs to the order Coleoptera, which is the largest order of insects and contains the most common and important stored product pests. The name "Coleoptera" was given by Aristotle for the hardened shield- like forewings (coleo=shield + ptera= wing). The Coleoptera contains more described species than in any other order in the animal kingdom, constituting about 25% of all known life-forms. Forty percent of all described insect species are beetles (about 350,000 species), and new species are frequently discovered.

This is a large and varied group of insects that contains more than 15,000 species of which about 600 are associated with stored products. Most of the Tenebrionids are black or dark brown in colour and mainly phytophagous. Infestation by these beetles results in an unappealing smell due to the secretion of benzoquinones from abdominal glands. Adult beetles may be distinguished by their hardened protective forewings, the elytra. They usually have membranous hind wings which are folded beneath the elytra. Like other insects with a complete metamorphosis, beetles have four distinct stages in their life cycle: egg, larva, pupa and adult. The larvae of the beetles are found associated with stored food products.

Tribolium, being most cosmopolitan and abundant among the stored grain pests, has always attracted researchers for experimenting for their control. The Red flour beetle was identified and classified as early as 1797 by Herbst. In the late eighties, the process of adaptation to new environment and genetic aspect of cannibalism in flour beetles were discussed (Bergerson and Wool *et al.,* 1988; Stevens and Lori, 1989) but no systematic effort was made on its study throughout the 19th century. The possible reason for it may be the lack of micro instruments to visualize such small beetles.

Among the genus *Tribolium* two species have been reported in India *T. confusum.* and *T. castaneum. T. confusum* is now reported to be absent from major part of the India and restricted to only few pockets of colder zones of Kashmir and parts of Himachal Pradesh **(**Sarup, personal communication**).** We have selected *T. castaneum* for our studies as it is suggested that this group has now advanced to a critical point from where they are now ready to break into newer environment (attacking previously uninfested grains), developing new mutations and increasing cross resistance day by day to various control measures. Reproductive performance of *Tribolium* exposed to various conditions like temperature, food availability and structural complexity, genetic

variation and the ability to colonize new niches (food media) on the capture of *Tribolium castaneum* in simulated warehouses were studied. (Langer and Young, 1976; Bergerson, and Wool, 1986; Arnaud et al., 2005; Toews, 2005).

Review of literature available on red flour beetle reveals that work on *Tribolium* in India is extremely scanty in comparison to the work done in the rest of the world. In the present study culture of *Tribolium castaneum* was established in the laboratory and maintained. For maintaining a culture in the laboratory it is necessary to study the effects of environmental factors on the development or growth of culture. Organisms adapted to live in a given area are subjected to fluctuation in temperature and humidity because of seasonal changes. Temperature and humidity are two physical variables seemingly easy to control and modify in experimental research with laboratory organisms, upon which future applied studies, can be based. The present study was undertaken to determine the effect of temperature and humidity on the development of *T. castaneum*.

MATERIAL AND METHODS

Sampling- Adults of *Tribolium castaneum* were collected from two different areas of the city of Agra, Dayalbagh and Cantonment area and pooled together to have a heterogeneous population with large variability (Fig.1). These adults were identified according to the identification proposed by British Museum of Natural History (Freeman, 1990).

Media- The laboratory culture of *Tribolium* was maintained under standard food medium of wheat flour supplemented with 5% brewer's yeast.

Rearing of strains- The standard routine procedure (prescribed by WHO) for the strain isolation and culture were utilized. Adults of *Tribolium* from two different sampling sites were mixed and allowed to oviposit for 5days in the food medium and then they were removed. The larvae obtained were counted and allowed to pupate. It is technically impossible to separate eggs from the media therefore larval selection ensured the number of viable eggs.

The adults obtained from this laboratory maintained culture were introduced for oviposition in a glass rearing jar containing sterilized food media. Replicates of such jars were initially prepared and kept in a B.O.D Incubator where the temperature was maintained at 30 ± 1ºC. After allowing five days for oviposition the adults were removed by passing the wheat flour through a 20 mesh sieve. The sieved wheat flour containing the eggs was replaced in the same jar and kept in the incubator for the completion of the life cycle. The insect start emerging 30ºC ± 2 days after oviposition. To maintain uniformity in age, the rearing jars were regularly examined. Beginning with the first emergence of adult, the wheat flour was sieved every third day to obtain 1-3 days old adults. Such adults are later transferred in the glass rearing jars having fresh sterilized wheat flour supplemented with 5% brewer's yeast. On emergence of appreciable number of adults, insects were sieved out and used either for experiments or rearing the next generation. Subsequent generations of experimental strain were maintained in similar manner. The progeny thus reared in the laboratory was designated as parental strain (P1) which can be used for other studies. Effects of temperature and humidity on the development of *Tribolium* were observed.

RESULTS

Effect on the larval stage

Larvae of this species are more sensitive than eggs to extreme conditions. No larvae pupated at 40^0C and 90, 30 and 10 percent humidity, but a few are pupated at this temperature and 70, 50 percent relative humidity. At 28^0C no pupae formed at 10 percent relative humidity, but high proportions of larvae became adults at higher relative humidity. At 20^0C no larvae reached the adult

stage at any humidity. The optimum temperature for larval development to wheat feed is 35^0C (Table-1). At every temperature the larvae develop most quickly at the highest relative humidity except the temperature 20^0C or below it.

Table: 1 Effect of temperature and humidity on the larval stage

Temperature (ºC)	Humidity (%)	Effect
40	90, 30, 10	No larvae pupated
40	70, 50	Few pupated
28	10	No pupation
28-35	70, 75	High proportion of larvae pupated
20	Any	No pupation

Effect on the pupal stage

The length of the pupal period is not affected by humidity, but it is affected by temperature. The shortest period for the pupa stage was 4 days at 40^0C. The period is slightly increased with decreasing temperature : 4 days at 40^0C, 5 days at 35^0C, 8 days at 30^0C, 12 days at 25^0C, and 24 days at 20^0C. Below 20^0C all pupae died at emergence (Table- 2).

Table- 2 Effect of temperature on the pupal stage

Temperature (ºC)	Length of pupal period
40	4 days
35	5 days
30	8 days
25	12 days
20	24 days
<20	All pupa died at emergence

Effect on the total developmental time

Table-3 and Fig.1 shows temperature conditions for development of *T. castaneum.* The optimum temperature for rapid growth of *T. castaneum* lie between 30 and 37^{0}C at a relative high humidity, *T. castaneum* larvae at 35^{0}C develop in about 13 days (Howe, 1960), while at 34^{0}C they develop in 15.5 days (Park, 1948). In our results larvae at 35^{0}C and 70 % relative humidity develop in about 27 days. The differences here could be attributed to characteristic genetic differences of the strains themselves. Beetle may complete their life cycle in 32-40 day, at optimum conditions.

Table-3 Temperature conditions for *Tribolium csataneum* development

TEMPERATURE / LIFE STAGES	25^{0}C	30^{0}C	35^{0}C
Egg	**4-5 Days**	**3-4 Days**	**11-12 Days**
Larva	**40-41 Days**	**27-28 Days**	**25-27 Days**
Pupa	**12-14 Days**	**6-8 Days**	**5-6 Days**
Adult	**2-3 Days**	**3-4 Days**	**5-6 Days**

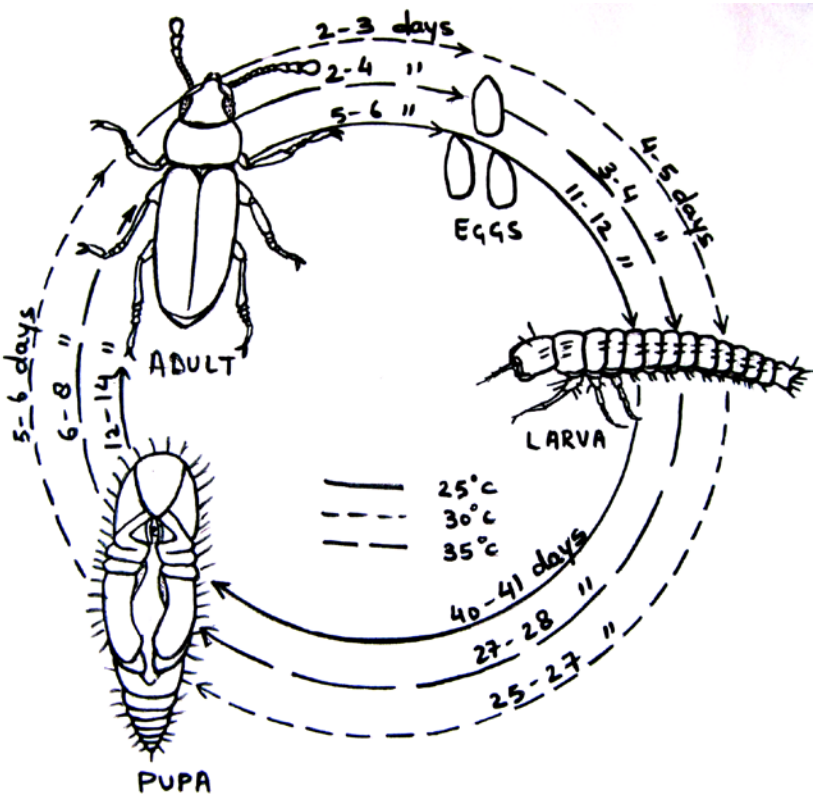

Fig.1 Life cycle of *T. castaneum* at different Temperature

CONCLUSION

The results of the present study revealed that the standard optimum temperature for *T. castaneum* fitness lie between the range of 30-35^{0}C and a relatively high humidity of 70 percent. This standard is valid only to the *Tribolium* reared on a standard feed. Larval mortality has been found to be due to the combination of temperature and humidity rather than any other. Low temperature

(<20^{0}C) and a low humidity (< or = 30%) combination has been found to be the critical point from where mortality begins. The pupa incidentally is not affected by humidity for its period of pupation but increase in temperature greater than 30^{0}C may reduce the pupal period.

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Partial Replacement of Sand by Quarry Dust in Concrete

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Abstract- The paper describe the role of quarry dust In the construction of buildings and other structures to eliminate the demand of natural sand by using quarry waste to replace the use of natural sand. We are investigating the potential of using quarry waste and its effect on the strength and workability of concrete. This paper reports the experimental study which investigated the partial replacement of sand with quarry dust. Initially cement concrete cube was studied with various proportions of cement concrete + quarry dust (M 20, AND M25). The experimental results showed that the addition of quarry dust as fine aggregate ratio of 30%, 40% and 50% was found to enhance the compressive properties.

Index Terms- Sand, flash, quarry dust (QD), sieve analysis, slum cone test. Compressive test

I. INTRODUCTION

Some developing countries are facing a shortage in the supply of natural sand. The expertise of construction industries is investigating the other alternatives to eliminate the demand of natural sand. There were some alternatives that have been used in concrete mixing such as fly ash, slag and limestone.

Another alternative is by using quarry waste to replace the use of natural sand. Quarry dust can be defined as residue, tailing or other non-voluble waste material after the extraction and processing of rocks to form fine particles less than 6mm. Natural sand in many parts of the country is not graded properly and has excessive silt. On the other hand, quarry dust does not contain silt or organic impurities and can be produce to meet desired gradation and fineness as per requirement. Consequently, it improves the strength of concrete. Besides, waste can be used to produce new products or can be used as admixtures so that natural sources are used more efficiency and environment is protected from waste deposits.

II. PROPOSED METHODOLOGY

Material used

SAND: Sand aggregates accounts for at least 75% of the volume of masonry mortar and grout. Manufactured sands have sharp, angular grains, while natural sands obtained from banks, pits and river beds have particles that are smooth and more rounds

CEMENT: Portland cement has become the most widely used material of its kind. Portland cement is a carefully controlled combination of lime, silica, alumina and iron oxide. When mixed with water, Portland cement undergoes hydration-a change in the chemical composition of the ingredients in crystals of various complex silicates are formed, causing the mass to harden and set.

AGGREGATES: Aggregates are important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy.

QUARRY DUST: Crushed rock aggregate quarrying generates considerable volumes of quarry fines, often termed "quarry dust". Quarry dust can be defined as residue, tailing or other non-voluble waste material after the extraction and processing of rocks to form fine particles less than 4.75mm.

Test on Materials

Test on Aggregate and Sand

1. Sieve Analysis (Fineness Modulus)
2. Specific Gravity

Sieve Analysis: This is the name given to the operation of dividing a sample of aggregate into various fractions each consisting of particles of the same size. The sieve analysis is conducted to determine the particle size distribution in a sample of sand or aggregate, which we call gradation.

Specific Gravity: Specific gravity of aggregates is made use of in the design calculations of concrete mixes. With the specific gravity of each constituent known, its weight can be converted into solid volume and hence a theoretical yield of concrete per unit volume can be calculated. Specific gravity of aggregate is also required in calculating the compacting factor in connection with the workability measurements.. Average specific gravity of the rocks varies from 2.6 to 2.8

Test on Cement: Normal Consistency: For finding out initial setting time, final setting time and soundness of cement, and strength a parameter known as standard consistency has to be used.

Test on Concrete

Slump Cone Test: The concrete slump test is an empirical test that measures the workability of fresh concrete. More specifically, it measures the consistency of the concrete in that specific batch. This test is performed to check the consistency of freshly made concrete. Consistency is a term very closely related to workability

Compression Test:

This test is most common but important test conducted on Hardened concrete. The test is easy to perform and the most desirable characteristic of concrete are qualitatively related to its compression test.

The compression test is carried out on cubical specimen; the cube specimen is of size 150mm×150mm×150mm. The aggregate size of 20mm will be used to make concrete mixes.

This test will be done for conducted for concrete cubes of 30% then 40% and 50% replacement of sand by Quarry dust for M20 and M25 mixes.

III. SIMULATION/EXPERIMENTAL RESULTS

TABLE 1. RESULT OF SIEVE ANALYSIS FOR SAND

IS Sieve Size	Wt. Retained (gm)	Cumulative wt. retained (gm)	Cumulative % wt. retained	Cumulative % passing
10mm	0	0	0	100
4.75mm	10	10	2	98
2.36mm	50	60	12	88
1.18mm	50	110	22	78
600µ	95	205	41	59
300µ	175	380	76	24
150µ	85	465	93	7
<150µ	35	500		
Total	500		246	
F.M.= 246/100 = 2.46				

TABLE 2: RESULT FOR SPECIFIC GRAVITY OF SAND

SR. NO.	W1(GM)	W2(GM)	W3(GM)	W4(GM)	G(M/SEC^2)	GAVG(M/SEC^2)
1	650	1422	2006	1518	2.72	2.51
2	650	1552	2087	1550	2.47	
3	625.5	1459.7	2004.2	1515.5	2.41	

TABLE 3: RESULT FOR NORMAL CONSISTENCY OF CEMENT

SR. NO.	PERCENTAGE OF WATER	PENETRATION(MM)
1	26%	36
2	27%	9
3	27.5%	6
NORMAL CONSISTENCY=27.5%		

TABLE 4: RESULTS FOR SLUMP CONE TEST FOR QUARRY DUST MIX CONCRETE

GRADE OF CONCRETE	AMOUNT OF QUARRY DUST	SLUMP VALUE(CM)
M20	30%	9
	40%	10
	50%	15
M25	30%	10
	40%	11
	50%	13

TABLE 5: Results for Compressive Strength Test for Quarry Dust mix Concrete (7 Days)

Grade of Concrete	Amount of Q.D.	W/C Ratio	Hydraulic Force (KN)	Compressive Strength (N/mm^2)
M20 (1 :1.5: 3)	30%	0.7	221.69	9.85
			220.5	9.8
			222.56	9.89
	40%	0.7	172.3	7.66
			169.12	7.52
			173.86	7.73
	50%	0.7	200.65	8.92
			199.13	8.85
			189.54	8.42
M25 (1:1:2)	30%	0.7	191.74	8.52
			177	7.86
			187.96	8.35
	40%	0.7	160.2	7.12
			177	7.86
			181.14	8.05
	50%	0.7	222.71	9.89
			182.89	8.12
			192.54	8.56

TABLE 6:.Results for Compressive Strength Test for Quarry Dust mix Concrete (28 Days)

Grade of Concrete	Amount of Q.D.	W/C Ratio	Hydraulic Force(KN)	Compressive Strength (N/mm^2)
M20 (1 :1.5: 3)	30%	0.7	399.19	17.74
			401.23	17.83
			412.84	18.35
	40%	0.7	421.12	18.72
			424.01	18.84
			404.1	17.96
	50%	0.7	430.2	19.1
			428.31	19.04
			418.24	18.6
M25 (1:1:2)	30%	0.7	512.8	22.8
			510.43	22.7
			515.55	22.91
	40%	0.7	531.41	23.62
			523.04	23.25
			520.32	23.13
	50%	0.7	551.1	24.5
			541.45	24.06
			536.21	23.83

Chart no. 1

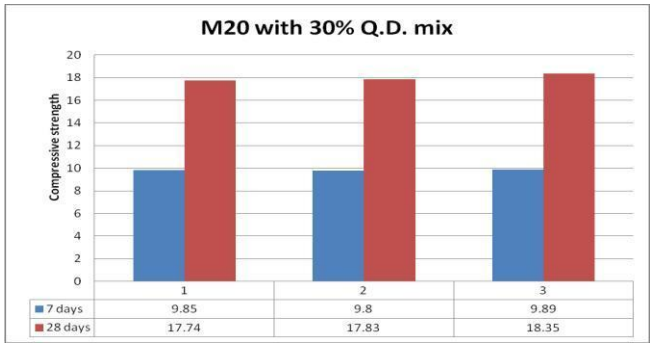
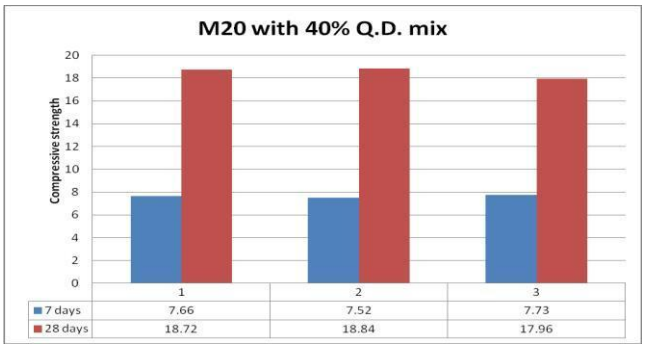


Chart no. 2



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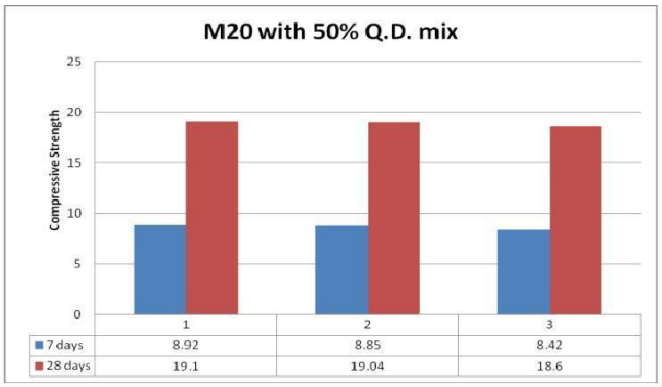

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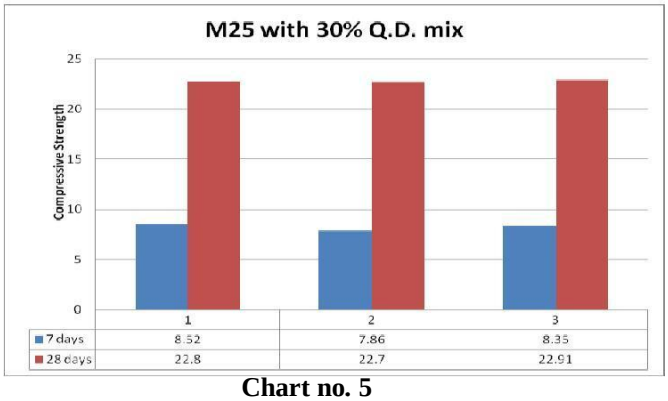

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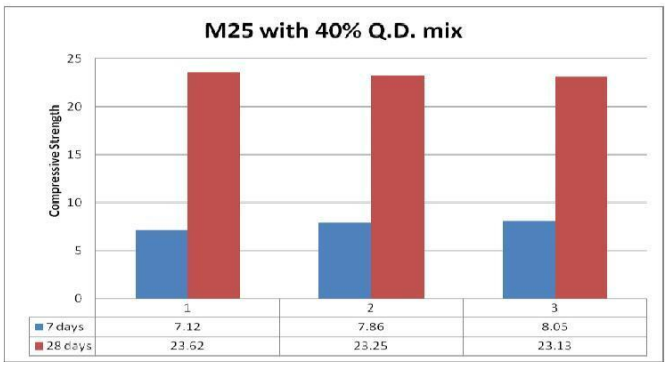

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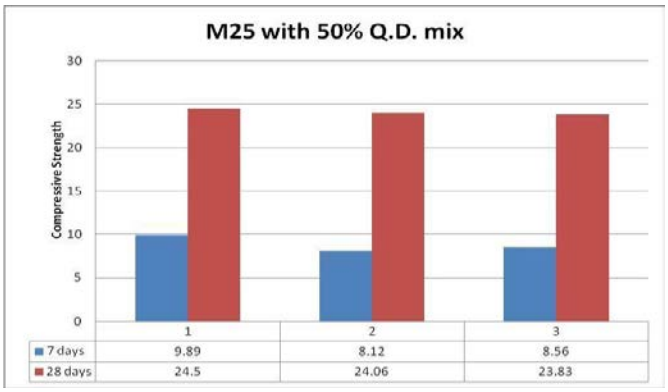

IV. CONCLUSION

Based on the results and discussion mentioned above, the following conclusions are obtained:

1. Mix ratio of 1:1.5:3 (cement: aggregate: sand+ quarry dust) give the optimum strength in this study. (refer Table 6,7)
2. As the percentage of Quarry Dust gradually increases, the Compressive strength of concrete will also increase with condition that percentage of Quarry Dust should not exceed 50%.
3. The compressive strength of compressed concrete increase with the increase of age of maturity. The value of strength for 28 days higher than the strength for 7 days. (refer Table6,7)
4. According to the value of compressive strength collected, the value is high and it show that quarry dust suitable to use as sand replacement. All the value of compressive strength surpasses the minimum value of compressive strength for normal concrete that is 7N/mm . So, quarry dust can apply as sand replacement in concrete mix for construction industry.

V. FUTURE SCOPES

According to the value of compressive strength collected, the value is high and it show that quarry dust suitable to use as sand replacement The industrial waste or by product from crushing & construction company i.e. Quarry Dust can be well utilized. The utilization of Quarry dust as a partial replacement of sand in concrete can reduce the cost of construction.

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Comparison of sonosalphingography and laparoscopy in evaluation of tubal patency in infertility patients

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Abstract-
OBJECTIVE: To assess sonosalphingography whether it can be used to test tubal patency in infertility patients which is less invasive instead of diagnostic laparoscopy with chromopertubation which is associated with many complications?
METHODS: Total 60 patients attending Gynaec OPD were studied. 2 groups, each of 30 patients were randomly selected. One group underwent sonosalphingography and other group underwent diagnostic laparoscopy with chromopertubation. Results were analyzed to compare both groups.
RESULTS: Tubal non patency was found more often on sonosalphingography than on diagnostic laparoscopy with chromopertubation. However subsequent diagnostic laparoscopy, non-patency came only in one case
CONCLUSION: Sonosalphingography is simple, less invasive, can be done rountinely on OPD basis, but tubal block suspected on sonosalphingography, needs confirmation by diagnostic laparoscopy.

Index Terms- Infertility, laparoscopic chromopertubation, sonosalphingography(SSG), tubal factor.

INTRODUCTION

In India, which is already overpopulated, we are trying very hard to check increase in population. At the same time female infertility is still a baffling problem which we have to face. Main causes of infertility in women include anovulation, a tubal or peritoneal factor, uterine, cervical, and idiopathic factors. The role of a tubal factor in infertility is increasing, and currently, it determines 30% to 35% of all infertility cases[5] There are multiple etiologic factors responsible for the involvement of the fallopian tube in infertility, which include tubal damage from pelvic inflammatory disease (PID), Endometriosis, the use of intrauterine devices, a history of a perforated appendicitis, ectopic pregnancy, and septic abortion. Tubal adhesions and tubal obstruction can result in infertility.
The problem of diagnosing and correcting the tubal obstruction in infertile patient continues to be challenging one.
Briefly the main function of tubal factor is depends on fimbrial motion, peristalsis and patency. Malfunction of this may be due to many causes.

Ever since Rubin[14-17] described the tubal insufflation test in 1920 by using carbon dioxide numerous methods have been developed for evaluation of factors. Hysterosalpingography (HSG) and laparoscopic chromopertubation are widely employed. Laparoscopy is considered as gold standard for diagnosing tubal and peritoneal diseases.it allows visualization of all pelvic organ and permits detection and potential concurrent treatment of intramural and subserosal uterine fibroids , peritubal and periovarian adhesion and endometriosis. Direct visualization on laparoscopy using chromopertubation involves the transcervical instillation of dye such as indigo carmine or methylene blue to directly visualize tubal patency and fimbrial architecture. Recently the newer technique of sonohysterosalpingography popularly known as sonosalpingography (SSG) is evolved.

AIMS AND OBJECTIVES

The aims and objectives of the study are to compare the diagnostic laparoscopy and sonosalphingography in evaluation of tubal patency in infertility.
To compare the advantages and disadvantages, complications and time required for these procedures and to suggest suitable recommendations based on study findings.

MATERIALS AND METHODS

This is a prospective clinical Study.
60 women attending the gynecology OPD with primary and secondary infertility included in this study 30 in each group as study group. Patients selected randomly in each group.
Exclusion criteria were pelvic inflammatory disease,
Patients which are surgically unfit and any major detected cause of infertility
These patients studied and evaluated in details with proper history taking, clinical examination and relevant investigations such as Hemogram, Blood Grouping and Rh Typing , Urine routine and microscopy, Ultrasonography in required cases, Husband semen analysis, HIV (ELISA) and VDRL in both partners after proper counseling, Thyroid function tests, HBsAg
After these investigations respective procedures were done
Diagnostic laparoscopy is a gold standard investigation for diagnosis of tubal patency. In Patient from sonosalphingography group suggesting tubal block (spillage is not seen) Diagnostic laparoscopy was performed on those patient .These two groups were compared according to the factors time required, comfort of patient, hospital stay and complications by statistical methods

TECHNIQUE

Sonosalpingography was done in mid proliferative phase (day 6-10 of a menstrual cycle), Oral analgesic, ibuprofen 400-600 mg may be given 1-2 h before the procedure. A detailed transvaginal ultrasound scan was done to assess the position of pelvic organs and to rule out any pathologies, which would come in the way of the procedure. Moreover, any free fluid in pelvis was also checked for.

The probe was removed and speculum was placed in the vagina to visualize the cervix. Vagina and cervix were cleaned with antiseptic solution.Foley's catheter no. 10 was introduced through cervix into the uterus. Balloon is distended with 2-3 ml of distilled water or normal saline and was placed just beyond the internal os. Once the catheter is fixed, tenaculum and speculum are removed and transvaginal probe is introduced into the vagina for further assessment.

Saline was injected through the catheter slowly. Scanning was done to assess the uterine cavity that was distended by saline and also passage of saline (fluid) seen through the tubes.. Once the procedure was completed, the instruments were removed. Patient was informed that she might get some pelvic cramping or spotting, but the symptoms are short termed and should not worry about it..

DIAGNOSTIC LAPAROSCOPY-

In the other group,Dignostic Laparoscopy and chromopertubation along with endometrial biopsy was done on day 21 or 22 of the cycle. During laparoscopy the whole of the pelvis was first inspected and then diluted methelene blue was injected and the passage of the dye through the fimbrial ends of the tubes was looked for.

TABLE NO :1
COMPARISION OF LAPAROSCOPIC CHROMOPERTUBATION AND SONOSALPINGOGRAPHY FOR TUBAL PATENCY

	Tubes non patent	**Tubes patent**	**Total**	**Chi square Df=1**	**P (one-tailed)**
Laparoscopic chromopertubation (n = 30)	3	57	60	3.106	0.037
Sonosalpingography (n=30)	10	50	60		

TABLE NO. 2
LAPAROSCOPIC FINDINGS IN PATIENTS WHO HAD BILATERAL TUBAL BLOCK ON SONOSALPINGOGRAPHY

Patient 1	Bilateral fallopian tubes patent
Patient 2	Bilateral fallopian tubes patent
Patient 3	Bilateral fallopian tubes patent
Patient 4	Bilateral tubal block and extensive adhesions in pelvic structure s/o pelvic inflammatory disease
Patient 5	Bilateral fallopian tubes patent

TABLE NO. 3

COMPARISON OF ABNORMALITIES FOUND DURING DIAGNOSTIC LAPAROSCOPY AND SONOSALPINGOGRAPHY

Abnormality	**Diagnostic laparoscopy**	**Sonosalpingo Graphy**
Uterine	3	0
Pelvic adhesions	3	0
Fallopian tube abnormalities	1	0
Ovarian abnormalities	3	6
Endometriosis	1	0
Upper abdomen abnormality	1	0

TABLE NO. 4

COMPARISON OF SIDE EFFECTS OF DIAGNOSTIC LAPAROSCOPY AND SONOSALPINGOGRAPHY

Side Effects	Diagnostic laparoscopy	Sonosalpingography
Nil	0	24
Nausea and vomiting	13	0
Pain in abdomen	30	6
Pain in shoulder	8	0

TABLE NO: 5

COMPARISON OF COMPLICATIONS OF DIAGNOSTIC LAAPROSCOPY AND SONOSALPINGOGRAPHY

Complications	Diagnostic laparoscopy	Sonosalpingography
Nil	20	30
spinal headache	7	0
Crepitus(Subcutaneous emphysema)	2	0
intestinal perforation	1	0

TABLE NO 6

COMPARISION OF TIME REQUIRED FOR DIAGNOSTIC LAPAROSCOPY AND SONNOSALPINGOGRAPHY

Time required	Median time	Mean time in min	SD	Unpaired t	P
Diagnostic laparoscopy	45min	52.0	7.61	20.707	<0.001 HS
Sonosalpingography	20min	21.5	2.67		

TABLE NO: 7

COMPARISON OF HOSPITAL STAY BETWEEN DIAGNOSTIC LAPAROSCOPY AND SONOSALPINGOGRAPHY

Hospital stay	Median stay	Mean Stay in days	Sd	Unpaired t	P
Diagnostic laparoscopy	3.0	3.23	0.430	41.168	<0.001 HS
Sonosalpingography	0.0	0.0	0.0		

DISCUSSION:

A total of sixty patients of Infertility were studied at Tertiary Care centre for assessment of Tubal Patency. On 30 patients Sonosalpingography was carried out for assessment of Tubal Patency and in the remaining 30 patients Tubal Patency was assessed by Diagnostic Laparoscopy and chromopertubation.

Median Age of patients for Sonosalpingography was 26.97 years and that for Diagnostic Laparoscopy was 27.03 years. Both groups were comparable as there was no significant difference between median ages of two groups. Majority of patients were from group 25-29 years (63.33%). Primary Infertility was present in 44 out of 60 patients (73.33%) and the rest were suffering from Secondary Infertility (26.67%).

Table1: Bilateral tubal block was found in 1 case in diagnostic laparoscopy and in one case (3/60 (5%) fallopian tubes studied) unilateral tubal blockage seen (right fallopian tube non patent) rudimentary horn was present in this case. On the other hand, sonosalpingography found bilateral tubal block in 5 cases (10/60 fallopian tubes studied (16%)). The difference between these findings was statistically significant (p=0.037). Unilateral tubal blocks were not found on sonosalpingography

Tubal non-patency was found more often on sonosalpingography than on diagnostic laparoscopy. However in patients who underwent subsequent diagnostic laparoscopy (n=5), non-patency was confirmed only in one case. This indicates high rates of false positives for non-patency compared to the gold-standard laparoscopic technique. Therefore all non-patent fallopian tubes suspected on sonosalpingography should be confirmed by further evaluation with Laparoscopy.

Table 2: 5 cases of bilateral tubal block found on sonosalpingography underwent followup diagnostic laparoscopy. Tubal block could be confirmed only in one of these cases (20%).

Table 3: In our study, in 90% of the patients no uterine abnormality was found, However Bicornuate uterus was seen in 1 case (3%), fundal fibroid was seen in 1 case (3%) and rudimentary horn on right side was seen in 1 case (1%). This

indicates that Diagnostic Laparoscopy is better method to evaluate ovarian and uterine factors in infertility cases. Pelvic adhesions found in 2 cases(7.14%) which is suggestive of pelvic inflammatory diseases. Uterosacral ligaments are one of the most common sites for endometriosis. In present study we found Endometriotic patches in one case out of 30 cases (3.33%)

In present study, during Diagnostic Laparoscopy, endometriotic patches were seen on uterosacral ligament in 1 out of 30 cases (3.33%), adhesions on the uterosacral ligament were found in 1 out of 30 cases (3.33%) and in the remaining 28 out of 30 cases (93.33%) uterosacral ligaments were normal. Perihepatic adhesions were seen in 3 cases (10%) in diagnostic laparoscopy, suggesting Fitz-Hugh-Curtis syndrome. Bilateral tubes were normal in 29 cases out of 30. In one case bilateral tubal abnormality found. Tubes were congested and sacculations and peritubal adhesions were seen in this case .Bilateral tubal block was present with concurrently performed chromopertubation with methylene blue

Isao Tsuji et al [1] from Japan studied benefits of Diagnostic laparoscopy in patients with unexplained infertility. They found abnormality in 80.7% cases.Kanal et al[2] in 2006 studied 40 patients of infertility they found abnormality in 70% of cases on laparoscopy performed in infertile patients. Adhesions found in 44.5% cases. They found genital tract tuberculosis in 5% cases, endometriosis in 5% cases and hypoplastic uterus in 5% cases

In diagnostic laparoscopy out of thirty cases three are found to be having polycystic ovaries (10%) where ovarian drilling was done.

Seal Subrata Lall et al[3] in their study found that ovarian cysts and polycystic ovary best detected by Diagnostic laparoscopy followed by Sonosalpingography followed by Hysterosalpingography

Table 4: Minor procedure adverse-effects: Minor adverse effects such as abdominal pain (7/30 – 23%), nausea and vomiting (15/30 – 50%) and shoulder pain (8/30 – 27%) occurred in diagnostic laparoscopy. In sonosalpingography, minor adverse effects such as abdominal pain (6/30 – 20%) were seen.

Table 5: Major procedure adverse-effects: In diagnostic laparoscopy, spinal headache occurred in 7/30 patients (23%), subcutaneous emphysema (2/30 patients – 7%) were seen Intestinal perforation requiring major surgery occurred in 1 case. In a large Finnish follow-up study, the major complication rate of diagnostic laparoscopy was 0.6 per 1000 procedures (Harkki-Sirenet al., 1999)[4] .. Sonosalpingography was not associated with any major complications. Junjira Suttipichate et al[48] in their study found that adverse effects of Sonosalpingography include mild pelvic pain during Injection of saline through uterine cavity in 71.43% cases. In 4.76% cases patient complained of severe pelvic pain which was relieved by oral analgesics and rest. And in one case (2.38%) required medications for shoulder pain. No other immediate or remote complication was encountered.

A.K.P. Ranaveera et a[5] l in their study observed that only in 4.7% cases experienced significant pain during procedure requiring medications. And mild pain observed in many patients not requiring medications

Table 6: In present study 30 patients underwent Diagnostic laparoscopy at tertiary care centre. Mean time required for laparoscopy was 52 min and median time was 45 min. standard deviation was 7.61 min For Sonosalpingography mean time required was 21.5 min and median time was 20 min. Suttipichate et al[6] in their study found that duration of sonosalpingography ranged from 5-12 min. Mean value was7.52 min. Unpaired t-test applied to this data and p value was <0.001 which is highly significant.

Table 7: Mean hospital stay in Diagnostic laparoscopy in present study was 3.23 in days. Average stay is of 3 days whereas Sonosalpingography is OPD procedure. Hospital stay is not required in Sonosalpingography. Unpaired t test applied to this data and p value found to be < 0.001 which is highly significant.

CONCLUSION:

Our study shows that sonosalpingography is a simple, convenient and effective method in evaluation of fallopian tube patency. It is much less invasive than diagnostic laparoscopy. Procedure is associated with very few complications and can be done on an outpatient basis. However tubal block suspected on sonosalpingography needs confirmation by diagnostic laparoscopy. Furthermore sonosalpingography is not effective in the evaluation of uterine structural abnormalities, endometriosis, pelvic inflammatory disease, liver and ovarian pathology. In essence, sonosalpingography has good value as a screening test for tubal patency on OPD basis.

Limitations of study

Number of cases studied in this study are 30 in each procedure, which is a very small number, we need to do further studies on large number of cases so as to give conclusive results.

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Secure Element

An evolution to existing secure technology

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Abstract — This paper outlines the very basic concept of secure element. Also it talks about various types of secure elements, what were the needs which lead to the evolution of each type, how one better over the other, what are the challenges is faced by each step of this technology!

Index Terms — SE (Secure Element), NFC (Near Field Communication), POS (Point of Sale), UICC (Universal Integrated Circuit Chip), SIM (Subscriber Identity Module), TEE(Trusted Execution environment)

1 INTRODUCTION

Technology progresses each day each step! A truly justifying example to this statement can of course be NFC technology and associated secure element (SE).

Until few years back we had to carry our ID cards, health cards, payment cards in the form of a typical A4 size paper sheet.

With a further techno step; we moved to carry these cards in the form of a plastic cards some of them being smart as they carry a smart chip inside them.

Again, with a bigger move our world is now ready to migrate to all these cards in the form of the virtual smart cards residing in our mobile phones or other devices.

These mobile phones are NFC enabled i.e. they have the ability to interact with their surroundings without actually making a physical contact with them. Such a communication is often referred as contactless technology and is widely used in NFC i.e. near field communication.

When a user uses an NFC enabled device the NFC controller inside the device goes into the card emulation mode. Just to brief, NFC device have three operational modes.

- **Reader/Writer mode –** Device can read/write any defined NFC tags. In this mode the device can read information stored on smart posters or smart displays. This act as perfect marketing opportunities for various companies, for eg: user can get to know various offers, upcoming sale, can read the various schedules etc.
- **Peer to peer mode –** Two NFC devices can exchange data amongst each other in physical proximity. With this mode the NFC users can share various information qucikly like sharing photos, contacts, links, files, etc.
- **Card emulation mode –** In this mode NFC device acts a contactless smart card which communicates with external often called POS i.e. point of sale. With this mode a NFC device user can easily make payments, do ticketing, use coupons etc.

So, when NFC controller works in card emulation mode, desired information is securely shared between device and a POS terminal. But NFC controller only acts as an interface that allows the secure communication, however an imperative question here is where this information is stored? Where the flow of information is managed? Who claims this information to be secure?

The answer to these questions is Secure Element (SE).

To quote the definition from standard;

"Global platform defines secure element as a tamper-resistant hardware/platform capable of securely hosting applications; their confidential and cryptographic data (e.g. key management) in accordance with the defined rules and security requirements"

To be more explanatory;

SE simply is a secure chip residing traditionally in a NFC-enabled device.

A typical archiecure of a secure chip consists of various components like secure microcontrollers, CPU, operating system, memory RAM – ROM - ERPORM, crypto engines, timers, communication ports etc.

When a NFC application demands high levels of security – such as payment applications – it is stored inside these secure chips called secure element.

SE provides dynamic environment where the application code, its confidential data is stored and the application code is securely executed. For eg: for a payment application all the personal data like account number, expiry date, passwords, card numbers are stored in secure element and then the safety of its secret information can be trusted upon.

To be more specific, application inside the SE performs several tasks like; handshaking with the POS terminal, responding to queries received from terminal, authenticating the card, filtering data to be shared etc; but it is the SE that provides secure execution environment for applications to perform all their defined tasks.

2 Architecture of SE

Secure Element follows the widely accepted HTTP Client – Server communication model. Due to this fact its deployment becomes compatible with existing infrastructure and also inherits the advantages of HTTP communication like scalability and high availability.

To initiate interaction, a communication session is estalished between client and server. All further communication taken place within that session. Often the client is responsible for initiating the communication session.

The main components involved in SE architecture are:

1. Service provider
2. Admin Server
3. Mobile phone
4. Secure Element
5. Application

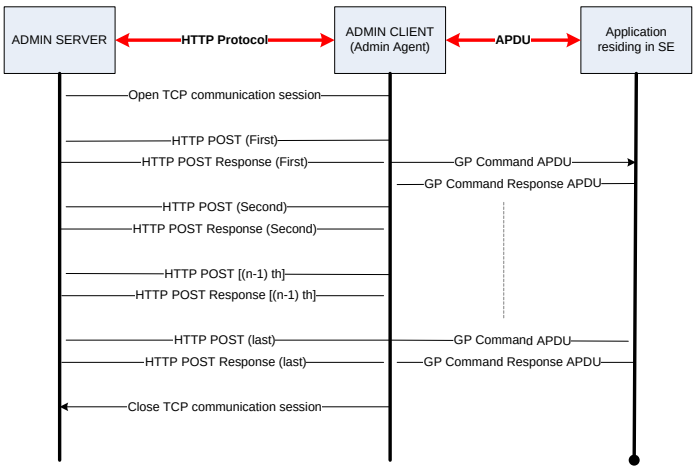
In this arrangement the admin server acts as HTTP server and admin agent act as HTTP client. The communication session is termed as administrative session. The initiation of this admin session can be triggered by:

- a device external event, for example a Push message sent by an Admin Server. Here the request is initiated by admin server
- an Admin Agent internal event, for example a timer. Here the request is initiated by admin agent (client)
- an administered SE application request. Here the request is initiated by application residing in SE.
- a device application request. Here the request is initiated by a mobile application.

The communication between the admin server and admin agent takes place by using HTTP protocol. The admin agent is responsible for interpreting these HTTP responses from server and further converting them into APDUs understandable by application residing in SE. This structure of HTTP request/response and APDUs exchanged between admin agent and application is defined by Global platform specification [1].

Depending on the type of secure element (discussed over later sections of this paper) the admin agent can be implemented in following ways:

1. For UICC SE: Admin agent is implemented in the application security domain i.e. APSD. The application resides in the secure element which inturn resides in the UICC card.
2. For Embedded SE: Admin agent is implemented in the trusted execution environment in mobile phone
3. For a micro SD card SE: Admin commands will be forwarded to SE through mobile application implemented using JSR 177 for java ME.



3 Types of Secure Element

Depending on the place where SE resides inside a NFC device; there are three form factors of SE:

- UICC SE
- Micro SD card SE
- Embedded SE (eSE)

UICC SE

- In this the SE is housed inside the UICC operating system.
- UICC communicates with the NFC controller in the handset through a Single Wire Protocol (SWP)
- Is detachable from the device

Advantages of UICC SE:

- UICC and SWP interface are standardly defined by ETSI so supported by majorly all MNO's. Thus savind additional cost of deployment
- UICC is removable so can be changed among devices. In case of a change the SE and associated application remains with the UICC giving in some way portability and compatibility features.
- Since application resides in SE, SE further in UICC so in case of lost the app secure data can be destroyed thus protecting from threaths and mishandling.

Challenges for UICC SE:

- Quite known fact that memory has always been a critical issue for a UICC or SIM card so in some cases the applications find insufficient memory in UICC. In order to have some more memory some how the compromise has to be done for performnace so again an issue for such secure and critical applications.
- Controlled mainly by MNO so conflicts come with business needs of other entities

Micro SD SE

- SE is stored in a standalone microcontroller chip.
- Chip can be plugged in and out of device as and when needed.
- Can be with or without embedded Antenna
- Issued and owned by a 3rd party (banks, etc.). No involvement of MNO and OEM

Advantages of Micro SD SE

- A minimum NFC device can be converted easily into a highly secure NFC device by just inserting a micro SD card
- Highly portable as it can be easily removed and replugged into a device. Applications can also be easily removed
- Many applications can exists in same SD card

Challenges for Micro SD SE

- Costly as compared to other SE's
- Applications have to share space in SE
- The keys remain with service provider so business conflicts with application providers

Embedded SE (eSE)

- SE is stored in a microcontroller chip which is directly housed into the device mother board.
- Cannot be removed from the device.
- Issued and managed by either the OEM (Original equipment manufacturer) or MNO (mobile network operator)

Advantages of eSE:

- Since it is embedded into the device so offers more performance
- Power consumption is also less

Challenges for eSE:

- An intact dependency on the device manufacturer
- Applications can only be accessed with the same device

All the above described SE's have interdependencies on each other for a complete solution deployment to customer. For eg: an application developer have to depend on the SE manufacture to allow a space in SE. SE has to depend on the handsets for further deployment. All in all, the entire ecosystem is much coupled thereby making the system as complex and less flexible. A solution to breach such dependencies is moving SE to a remote location i.e. Cloud Based SE.

Cloud Based SE

- Sensitive data is stored in the cloud rather than locally on the mobile phone or any other device.
- When the user conducts a transaction, the data is pulled from a remote virtual secure element in the cloud in encrypted format

Advantages of Cloud Based SE:

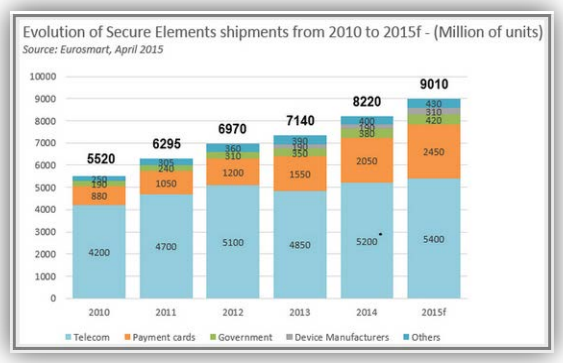
- **Cost Effective:** The cost is directly proportional to the amout of data hold by SE. Since the data increases timely with more and more applications and usgae so the cost of SE significantly increases. Such a cost is avoided in cloud based SE where it will only handle the user and mobile authnetication rather than storing data.
- **Easier delopyement:** Easier to implement the NFC services as there is no need to explicitly integrate the SE in phone.
- **Support multiple applications:** In other SE space is shared with various applications and as discussed above cost α space, so keeping the tradeoff, there exists always a limit to support the number of appicatons. In cloud based, no such limit exists.
- **Single store for all data:** User will be easy to access all applications from a single NFC enabled device as all the data will be stored in a single cloud umbrella.
- **Less chances of stealing:** Since the complete ecosystem is working online in this case so, one it will be easy to detect the crime source and second the stealers would have fear in doing so.
- **Easy for user access via web browser:** Since the virtual seccure element is stored in cloud so user can access their services via any standard web browser. Additionally there is no nedd to maintain a seprate mobile wallet to mange the services.
- **Complete secure even in case of Lost and found:** No threat as everything resides in cloud and nothing on users device.
- **Linking to multiple could SE:** Single NFC device can esily be linked to muliple cloud SE's

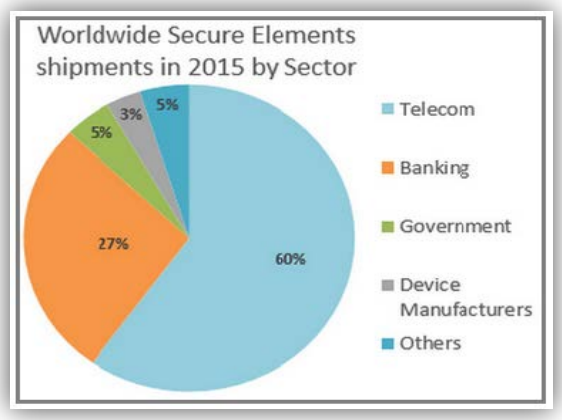
Challenges for Cloud based SE:

Although the processing time will be fast enough as much more computing can be applied on server than on the SE residing on device but it is predicted that it can take much more time for the request initiated from user to reach the cloud and return the response to POS terminal.

4 End Note

To end this paper, it can be just said that Secure element is underneath technology which is showing an escalating growth in various sectors. An evidence to this statement is the below representation collected from web.





Being a telecom professional or a simple user of this technology it's worth to know about it..

ACKNOWLEDGEMENT

I would like to acknowledge my co-workers organization for supporting and encouraging me throughout the course work.

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The Unreliable Narration and the suppression of Emotions in Kazuo Ishiguro's the Remains of the Day

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I. INTRODUCTION

Kazuo Ishiguro a Japanese born British novelist has been celebrated as one of the renowned contemporary British writer. He has been nominated for several awards and possess' Booker Prize for the novel *The Remains of the Day*. As a product of Nagasaki, he has the very feeling of the post war dilemmas and deliberations. Though his family move to Britain, London when he is five, his natural instinct has the ideal nostalgia within himself but to a little extent. A kind of hybridity is chief in his novels, serving as a dual background for his novels. He quotes "I have this experience of another culture. I m also a very Japanese writer, keeping back the really scary and important emotions". The novels of Ishiguro are set in the past reflecting the 20th century confronting nasty life style. The novels are expressive about self-denial in the face of preserving the dignity that the protagonist faces. This self-denial is a fascinating feature that is associated with Japanese background. The setting of the novel deliberately changes to an English background narrating the story of an English butler who is the representative feature of Ishiguro's and 20th century modern Britain. Ishiguro quotes that he has a liking towards both the pre and post war settings as that they try to test the values and ideas. The post war tensions are seen in all of Ishiguro's narrative protagonists exhibiting human failings and the disclosing of their flaws of dilemmas.

Narration is the gushing forth of events form the mind of the individual. Sometimes it is the flourishing of events being explained with some strong interpretations in the beginning. It makes the reader impossible to change their interpretation though the actual information is revealed in the end. There is another type of interpretation that changes frequently giving forth so many interpretations. In this way, Narrative can be distinguished from the type of context in which the events are told. Such a narrative technique is well furnished and employed with a mixed chronology of the past in the novel of Ishiguro. The novel of Kazuo Ishiguro, "The Remains of the Day" involves first person narration observing the protagonist's memory and imagination. The historical events balance with the narration of the protagonist's experience of the past. The pouring forth of words and the technical employment bring before the real journey as well as the mental and the emotional journey of the protagonist. This narrative technique is a perfect pitch voice that enumerates the cherished moments of the protagonist, along with the proper historical and the psychological analysis. The narrative is powerful in the sense that it brings tears on how the protagonist has wasted his life and career throughout his life; as such every post war human does with the mental dilemma. The Butler's life is an example to showcase the 20th century Britain's individual in most of the circumstances. Though the narration is dull, it embarks a spirit in the mind of the reader alerting the sense of an expectation .The real narration brings in, the real pathos or the preserved dignity as well as the perfection of the butler.

The narration is reliably unreliable as the protagonist doesn't undergo all the experience and the past events are just included as a part of the imagination of the protagonist. The narration is an accumulation of several incidents of the past and the present involving the protagonist's personal and historical trauma. Despite the physical condition, the pre-war or post-war period, the action unfolds the mentally anguished interior mental landscape of the protagonist. Thus the narrative of the protagonist's memory trip acts as a covering of his repression that finally breaks out. This narration has in itself the real life of Stevens at Darlington Hall and also his present journey. The journey is a relieve for the protagonist out of the Darlington Hall and also for his mental anguish. The concealed narrative again goes back to the old sentimental myth of the past. The butler doesn't follow the traditional way of revealing the aristocratic master's faults instead conceal the aristocratic faults.

The first person unreliable narration is "a gap between appearance and reality", quotes David Lodge. This sort of narration makes it impossible for the readers to find out the real truth behind the narration until the narrator leaves behind some witness like additional information or characterization being provided in one or the other way unconsciously. Bruno Zerweck describes "narrator's unintentional self-incrimination" as an essential part of unreliable narration which the readers sense out of the intended way. As such the narrator extends to picturise himself through long monologues that reveals the facts unconsciously to highlight the positive side and bury the other side unintentionally. Stevens also warns of the unintentional memory as 'It is possible this is a case of hindsight colouring my memory". A profound truth lying beneath the mind of the narrator is purely shadowed by the memory just upbringing the ideological perspectives unintentionally, hiding behind the rest.

Amit Marcus calls this as "Self-Deceiving memory narrations" surfacing the complete and accurate truth with a tissue of lies. This kind of narration rejects a part of the disagreeable or the loathsome and projecting only the better side. The memory brings out the "Residues of the character's own conscious life". The unconsciously accessible memory holds the power to narrate the pleasant happenings making the reader to realize the narrator as a character. The title itself signifies the remaining-the residues of the memory. Similar to Plato's views "art is twice removed from the reality", here the memory presents not the real happenings but the secondary interpreted incidents –the interpretation of the narrators own. The memory is aware of what to include and what not. This is properly

accomplished by the protagonist where the unexpressed thoughts dominate the reader to make up a new story. Accordingly the memory of Stevens suppresses the conscious feelings, emotions unconsciously under the name "emotional restraint".

The eccentric holiday in the life of the hero, Stevens unfolds the narration of an unspoken passion and undeserved loyalty that the butler has for Miss. Kenton and Lord Darlington respectively that flows without being expressed."The Remains of the Day" occurs within a large country house of an aristocratic lord, after the immediate outbreak of World war-I. The psychological trauma in the mind of the post war individual is narrated in an autobiographical design. The prominent aristocratic figure, Lord Darlington as brought out of the memory of the protagonist is not a single figure but the representative of postwar England. The truthfulness of the servants of England is portrayed with reference to Stevens, a loyal butler. The perfect butler discloses a suspicion in the course of the novel, the evil intentions of his master to whom he has spent most of his life, sacrificing even his love. It is the memory that focuses on the unreciprocated love of the Butler. It is shown further that Stevens and the lady regret for not having admitted their love to each other. The elderly butler serves under Lord Darlington similar to the butler's father in Darlington Hall, one of the esteemed mansions of Britain. After the old master passes away and according to the new employer's suggestion, the Butler opens forth his memory of events, the tragic situation that unfolds about his own blunder of perfection for an undeserved and the professional cum personal attention towards his lady love. In the walk of preserving his dignity towards his profession, he denies proposing his love and concerns the duty even when his natural father is on death bed simply by attending the drunken guests. Highly satisfying his surrogate father, Lord Darlington the Butler utterly cares not his natural father. The memory perspective narrates the Butler's sincerity touching the heart, his mental make up to hide his love and affection towards his girl and father finally showcase how fool or innocent he is extracting respect from others. Through the memory trip, a terrible t example is revealed with firing the two Jew servants where Stevens simply stays pale looking at his master being a pawn in the world of Hitler. Out of his memory he realizes the true nature of his master, but he compromises it as a way of preserving his dignity and loyalty asserting this dignity as the highest qualification of a butler. The mind and memory of Stevens tries to recover his past by looking for a solution but fails consequently. Thus the memory shows the protagonist to be a victim in the hands of history's deeds, including his lack of practical self or maturity to act accordingly. The memory takes the reader to the West Country of England, its landscape cum the mental landscape of the protagonist and also the political turbulence from 1920-1930.

The Butler's suppression of emotions reveals out the present and also bulk of incidents of past in an epistemological order. It's the mind that brings the mistakes that he has committed in the past and regrets the things that he should have avoided. Stevens makes use of repression to conceal or control some events from his conscious to unconscious mind revealing only the selected events. This repression of his love towards his girl and loyalty towards his master is intentionally done to avoid mental anguish. The memory portrays the honeycomb through which Stevens hides his inner wishes. This clothing of lies hides his personal self, his past regards and loses. This clothing that is been dipped in the name of professional dignity comes out in the form of revelation of his repression. This suppression as Freud reveals is a vehicle to conceal avoiding mental pain and unpleasuring, also to maintain some sort of ethical standards. The protagonist plans to go for the remains of the day looking out positively.

The protagonist quits worrying for his lost love and his undeserved faith of Lord Darlington's Nazi's sympathies and switches over for making the "best of the remains of the day". He quotes, "I gave my best to Lord Darlington and hoping his life makes a small contribution to the creation of the better world". The protagonist preserves his dignity refusing to take up his own identity and not realizing his self worth, and his autonomy goes to the grave. Stevens acts forth according to the social role and doesn't accept his own mistake sprouting forth "I can't say I made my own mistake-Really one has to ask oneself what dignity is there that?"This act of preserving the dignity forms the chief in the life of the 20th century westerner. The explosion on Hiroshima and Nagasaki preach a new kind of redefined values and the public are bound to be bound together by a sense of duty consciousness towards the family, superiors and the country .Kazuo Ishiguro's protagonist is an example of the native values that has held Japan organized before a long time. Also there are some uncultured, uncivilized values that have evidence in it. Though the post colonial world has made people ineffective, every individual has some sort of pathos towards their culture that has been utterly damaged in the war. Stevens too possesses some nostalgia towards his master and the dignified values. In this way, the novelist also recounts the validity of his own prestigious culture though he is brought up as a British man. The loss of the aftermath of the post-war is big as such the loss of the butler, Stevens. The novelist's act of bringing out the flaws, accepting the past is the Japanese unawareness and their effort to come out of their mental anguish.

Henceforth the narration is unreliable and the protagonist suppresses his emotions totally shadowing his real emotions and becomes aware of it in the final section only. Kazuo's protagonist well furnishes his narration digging his deep lying facts bringing it to the surface unintentionally.

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Multi Imsi – Subscription Based Mobile Service

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Abstract- Today, it's almost true to say that we live in a mobile world. There are over 5 billion mobile connections world-wide, almost 4 connections for every 5 people on globe. When people's are roam across the world they most important things is to carry is Mobile phone but when they don't have valid subscription with network operator for roaming, communication with external world is affected. There is two option either he can subscribe for expensive Roaming & other way to buy the local SIM of corresponding roaming location (which may lead to carry multiple SIM). With this White paper we try to solve the issue of National / International Roaming without carrying multiple SIM card. With this concept a single SIM card may contain multiple International Mobile Subscriber Identity (IMSI) belongs to unique mobile phone number known as Mobile Station International Subscriber Directory Number (MSISDN) where MNO (or MVNO) are manage the MSISDN mapping with currently used IMSI at server end.

Index Terms- SIM, IMSI, MSISDN, MULTI IMSI

I. INTRODUCTION

Most of the people use mobile phones are generally familiar with terminology SIM (subscriber identity module) cards. SIM card are tamper proof microprocessor cards & are inserted into mobile device in order to authenticate the device to access a particular mobile network. SIM card have its own OS, memory and built-in security features, the SIM card also contains an 8-byte field that provides the subscriber with an International Mobile Subscriber Identity (IMSI). When the user of a mobile phone connects to his or her network, the IMSI basically acts as a "password" that says it is okay for that device to access that network**.** This security token may not work to access network if it's not in the range of network meant for it. This range of network depends on user subscription and the location SIM is registered for. In terms of location we meant is Roaming, It could be National or International. These national / International Roaming subscription are very expensive & if user have plan to buy a local SIM card of Roaming location then user need to carry multiple SIM to access the mobile network. The biggest disadvantage of this approach is user phone number will be change with each SIM & caller needs to update with users latest mobile number.

This concept would help not only to high end user who travels regularly between different geographic location and it help to those also who is having international office branches. Here only one Subscriber identity will be active at a time which is purely depend on subscriber location.

II. PROPOSED IMPLEMENTATION

With this white paper implementation, a User account is defined as subscriber of MNO (or MVNO). Here MNO already have agreement to provide national or international roaming to their subscriber. To take this Multi IMSI approach user need to select / buy different IMSI according to their need. Like if users are frequently travel between India & Germany then he/she need to buy IMSI for these two countries. All the number subscribers buy must be active but at a time only one IMSI will latch on network.

Here MNO need to establish a system where a Multiple IMSI could belong to Unique Number. Here Multiple IMSI may belong to local, national or International account but serving MSISDN must be unique.

When a new subscriber signs up for the Multi IMSI facility, the subscriber will allocated for the quantity of roaming account (let say for India and Germany & allocated quantity is two). A new service to the existing SIM will be updated to subscriber SIM with a full complement of IMSIs. Here subscriber account within the MNO will be created and registered with the HLR with the IMSI, MSISDN subscriber have. if required at later stage the subscriber may opt for a more number for any country, The available new IMSI will be loaded on SIM via OTA & subscriber MSISDN will become immediately active and can be used straight away, this allows a user to add a new IMSI immediately prior to travelling to the new country, or even once the user is already there.

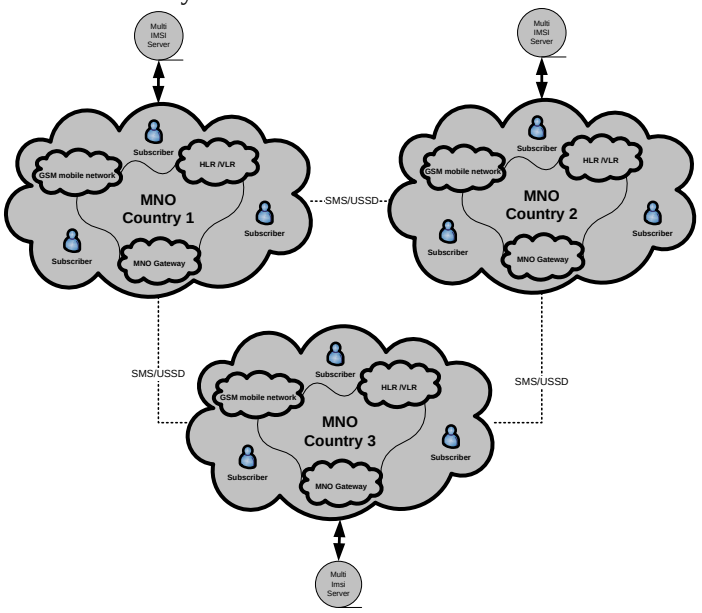

Figure1: MNO connectivity

While allocating IMSI, MNO may order SIM vendor to personalize multiple IMSI on card during personalization of SIM or any temporary IMSI could be personalized on card during personalization. The IMSI value that is allocated to a SIM card when it is manufactured is temporary and is
Overwritten by the definitive value. When ordering SIM cards, A unique MSISDN will be associated with IMSI personalized on card (here may be multiple IMSI may have single MSISDN), When SIM card is latch on network for the first time & If MNO want user to allocate different IMSI based on Roaming requirement (or based on user request) then MNO will used subscriber temporary IMSI to get authenticated on network (Only for first time), This Temporary authentication required from subscriber Home Location Registrar (HLR). Once subscriber get authenticated on network any Toolkit application may notified to MNO about current serving MCC/MNC. This notification to server from SIM application Toolkit can be done by SMS/USSD/GPRS channel. Once MNO get the notification they can check if subscriber has registered for Multi IMSI special service for specified MCC/MNC (i.e. for Particular Country and operator) then MNO may update the local IMSI value of current serving location over the air onto SIM card. Note: Here there must be an agreement between different MNO to follow the same standard across the gloab where this service supposes to provide. With this concept local MNO to which service provider has agreement can map the local IMSI to the users unique MSISDN at backend. So that called party do not need to worry for new number of subscriber and subscriber do not need to worry to carry the multiple SIM, as single SIM is updated with different IMSI which map to same MSISDN.

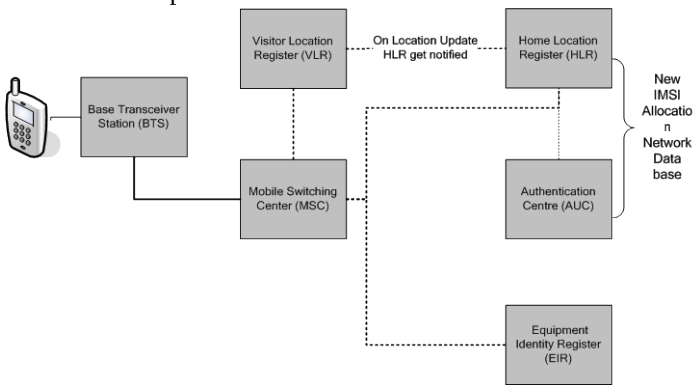

Figure2: HRL Notification & Database Update

Here HLR notified on network side when a mobile device registers on the network, SIM Toolkit application reside on SIM card may also send notification to HLR with some parameter like current location to which new IMSI is required. The registration procedure is the cornerstone of mobility management in a GSM network & allowing the mobile device to inform the network of its location. A mobile device will register when it is first switched on as well as periodically when power on.
The figure shows that the solution is addressed as if it were an HLR when the device is first power on. The way out allocates a static MSISDN requested by user which establish a connection for the mobile equipment. The SIM profile allows device to take part in registration procedure via either SMS (Short Message Service) or USSD (Unstructured Supplementary Service Data). This communication may be interactive or silently done by SIM toolkit is depending on MNO requirement. The solution ensures that all network databases, such as the AUC and HLR, are updated correctly with the definitive values. Finally, the solution updates the SIM card to change the temporary IMSI to the definitive value. This is followed up with a short message reminding the user of the number has been activated for roaming location.

III. Conclusion

The Multi IMSI concept offers a scalable and robust solution for use with multiple MNOs. Anytime if a new IMSI is required, it can be easily added to the user with unique MSISDN. The SIM Application automatically changes to the correct IMSI when it detects a new country.
This makes frequent travel life easy without changing SIM card or Phone.

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The Cortisol Awakening Response for Using Fuzzy Time Series and Genetic Algorithms

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Abstract- A growing body of data suggests that a significantly enhanced salivary cortisol response to waking may indicate an enduring tendency to abnormal cortisol regulation. More methods have been proposed to deal with forecasting problems using fuzzy time series. In this paper, our objective was to apply the response test to a population already known to have long-term hypothalamo–pituitary–adrenocortical (HPA) axis dysregulation. We hypothesized that the free cortisol response to waking, believed to be genetically influenced, would be elevated in a significant percent age of cases, regard less of the afternoon Dexamethasone Suppression Test (DST) value based on fuzzy time series and genetic algorithms. The proposed method adjusts the length of each interval in the universe of discourse for forecasting the Longitudinal Dexamethasone Suppression Test (DST) data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout the experimental results show that the proposed method gets good forecasting results.

Index Terms- Fuzzy Time Series, Genetic Algorithms, Fuzzy Logical Relationship, Fuzzy Logical Relationship Groups, Mean Square Error, glucocorticoids, salivary cortisol, bipolar disorder, lithium, Dexamethasone Suppression Test, DST.

2000 Mathematics Subject Classification: Primary 90B22, Secondary 90B05; 60K30**1.**

I. INTRODUCTION

A growing body of literature points to hypothalamo–pituitary–adrenocortical (HPA) axis dysregulation as a critical factor in the development of mood disorders. Long-term enhanced cortisol secretion may have important health ramifications in addition to its contribution to mood syndromes. The free cortisol response to waking is a promising series of salivary tests that may provide a useful and non-invasive measure of HPA functioning in high-risk studies. The small sample size limits generalizability of our findings. Because interrupted sleep may interfere with the waking cortisol rise, we may have underestimated the proportion of our population with enhanced cortisol secretion. Highly cooperative participants are required [**1**].

Forecasting activities play an important role in our daily life. In order to solve the forecasting problems, many researchers have proposed many different forecasting methods [**2**], [**3**], [**4**], [5]. In [**6**], Song et al. proposed the definition of fuzzy time series. They also proposed the time-invariant model [**7**] and the time-variant model [**8**] of fuzzy time series to forecast enrolments of the University of Alabama. Both the time-invariant model and time-variant model used Max-Min Composition operations. In [**2**], Chen presented a method to forecast enrolments of the University of Alabama using simple arithmetic operations to get good forecasting results. In [**9**], Huarng pointed out that the length of intervals affects forecasting results in fuzzy time series, and he proposed the distribution-based length method and the average-based length method for handling the forecasting problems. In [**4**], Chen used the high-order fuzzy time series model to forecast the enrolments of the University of Alabama. In [**10**], Sullivan et al. proposed the Markov model, which used linguistic labels with probability distributions to forecast the medical data.

II. FUZZY TIME SERIES

In this session, we briey review the concept of fuzzy time series from [**6**], [**7**], [**8**]. The main difference of fuzzy time series and traditional time series is that the values of fuzzy time series are represented by fuzzy sets [**11**] rather than real values.

Let D be the universe of discourse, where $D = \{d_i\}_{i=1}^{n}$. A fuzzy set A_i in the universe of discourse D is defined as follows:

$D = \{d_i\}_{i=1}^{n}$ $A_i = \sum_{i=1}^{n} \frac{f_{A_i}(d_i)}{d_i}$, where f_{A_i} is the membership function of the fuzzy set A_i, $f_{A_i} : D \to [0,1]$, $f_{A_i}(d_j)$ is the degree of membership of d_j in the fuzzy set A_i, $f_{A_i}(d_j) \in [0,1]$ and $1 \le j \le n$.

Recently, interest has turned to more refined testing and the probability that HPA dysregulation may even predate the onset of clinical illness [**12**]. Preliminary data suggest that this dysregulation may be concentrated within the families of individuals with mood disorders [**13**], suggesting the hypothesis that early abnormalities in cortisol regulation may confer a risk for the future development of mood disorders. To understand the temporal relation between HPA dysregulation and the onset of bipolar disorder (BD), it is essential to have a reliable and non-invasive test that can be repeatedly administered prospectively and is acceptable to high-risk populations. Promising candidates for such a test include the salivary free cortisol response to

waking and the short day time profile, a test that adds afternoon and evening measurements to the waking values[**12**].

Let $Y(t)(t=....,0,1,2.....)$ be the universe of discourse in which fuzzy sets $f_i(t)(i=1,2.....)$ are defined in the universe of discourse $Y(t)$. Assume that $F(t)$ is a collection of $f_i(t)(i=1,2.....)$, then $F(t)$ is called a fuzzy time series of $Y(t)(t=....,0,1,2.....)$.

Assume that there is a fuzzy relationship $R(t-1,t)$, such that $F(t)=F(t-1)\,o\,R(t-1,t)$, where the symbol "o" represents the max-min composition operator, then $F(t)$ is called caused by $F(t-1)$.

Let $F(t-1)=A_i$ and let $F(t)=A_j$, where A_i and A_j are fuzzy sets, then the fuzzy logical relationship (FLR) between $F(t-1)$ and $F(t)$ can be denoted by $A_i \to A_j$, where A_i and A_j are called the left-hand side(LHS) and the right hand side (RHS) of the fuzzy logical relationship, respectively.

Fuzzy logical relationships having the same left-hand side can be grouped into a fuzzy logical relationship group(FLRG). For example, assume that the following fuzzy logical relationships exist:

$A_i \to A_{ja}$,

$A_i \to A_{jb}$,

$A_i \to A_{jc}$,

.

.

.

$A_i \to A_{jm}$,

Then these fuzzy logical relationships can be grouped into a fuzzy logical relationship group, shown as follows:

$A_i \to A_{ja}, A_{jb}, A_{jc}, ...A_{jm}.$

III. A NEW METHOD TO FORECAST ENROLLMENTS BASED ON FUZZY TIME SERIES AND GENETIC ALGORITHMS

In this session, we present a new method to forecast the Longitudinal Dexamethasone Suppression Test (DST)[**13**] data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout, based on fuzzy time series and genetic algorithms.

Step 1: Let D_{min} and D_{max} be the minimum and the maximum known data. Based on D_{min} and D_{max}, define the universe of discourse D as $[D_{min} - D_1, D_{max}+D_2]$, where D_1 and D_2 are two proper positive integers. From Table 1,

Step 2: We can see that $D_{min} = 90$ and $D_{max} = 430$. Thus, we let $D_1 = 40$ and $D_2 = 20$. Therefore, the universe of the discourse D = [50, 450]. Firstly, divide the universe of discourse D into Eight intervals d_1, d_2, d_3, d_4, d_5, d_6, d_7 and d_8, where $d_1 = [50, x_1]$, $d_2 = [x_1, x_2]$, $d_3 = [x_2, x_3]$, $d_4 = [x_3, x_4]$, $d_5 = [x_4, x_5]$, $d_6 = [x_5, x_6]$, $d_7 = [x_6, x_7]$ and $d_8 = [x_7; 450]$; x_1, x_2, x_3, x_4, x_5, x_6 and x_7 are integer variables and $x_1 < x_2 < x_3 < x_4 < x_5 < x_6 < x_7$. We can see that the universe discourse D = [50, 450] into Eight intervals d_1, d_2, d_3, d_4, d_5, d_6, d_7 and u_8, where $d_1 = [50, 100]$, $d_2 = [100, 150]$, $d_3 = [150, 200]$, $d_4 = [200, 250]$, $d_5 = [250, 300]$, $d_6 = [300, 350]$, $d_7 = [350, 400]$ and $d_8 = [400; 450]$;

Define the linguistic terms A_i represented by fuzzy sets, shown as follows:

$$A_1 = 1/d_1 + 0.5/d_2 + 0/d_3 + 0/d_4 + 0/d_5 + 0/d_6 + 0/d_7 + 0/d_8,$$

$$A_2 = 0.5/d_1 + 1/d_2 + 0.5/d_3 + 0/d_4 + 0/d_5 + 0/d_6 + 0/d_7 + 0/d_8,$$

$$A_3 = 0/d_1 + 0.5/d_2 + 1/d_3 + 0.5/d_4 + 0/d_5 + 0/d_6 + 0/d_7 + 0/d_8,$$

$$A_4 = 0/d_1 + 0/d_2 + 0.5/d_3 + 1/d_4 + 0.5/d_5 + 0/d_6 + 0/d_7 + 0/d_8,$$

$$A_5 = 0/d_1 + 0/d_2 + 0/d_3 + 0.5/d_4 + 1/d_5 + 0.5/d_6 + 0/d_7 + 0/d_8$$

$$A_6 = 0/d_1 + 0/d_2 + 0/d_3 + 0/d_4 + 0.5/d_5 + 1/d_6 + 0.5/d_7 + 0/d_8,$$

$$A_7 = 0/d_1 + 0/d_2 + 0/d_3 + 0/d_4 + 0/d_5 + 0.5/d_6 + 1/d_7 + 0.5/d_8,$$
$$A_8 = 0/d_1 + 0/d_2 + 0/d_3 + 0/d_4 + 0/d_5 + 0/d_6 + 0.5/d_7 + 1/d_8,$$

where $A_1, A_2, ...and A_n$ are linguistic terms represented by fuzzy sets. Then, we can fuzzify the Longitudinal Dexamethasone Suppression Test (DST)[**13**] data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout, shown in Table 1. Furthermore, we can get the fuzzy logical relationship groups as shown in Table 2, where the ith fuzzy logical relationship group contains fuzzy logical relationships whose current state is A_i, where $1 \leq i \leq 8$. Then, apply the following forecasting method to forecast the data [**2**]:

Case 1: Assume that the fuzzified data of the ith year is A_j and assume that there is only one fuzzy logical relationship in the fuzzy logical relationship groups in which the current state of the fuzzy logical relationship is A_j , shown as follows:

"$A_j \rightarrow A_k$"

where A_j and A_k are fuzzy sets and the maximum membership value of A_k occurs at interval d_k, then the forecasted data of the i + 1th year is the midpoint m_k of the interval d_k.

Case 2: Assume that the fuzzified data of the ith year is A_j and assume that there are the following fuzzy logical relationships in the fuzzy logical relationship groups in which the current states of the fuzzy logical relationships are A_j, respectively, shown as follows:

$A_j \rightarrow A_{k1}$; $Aj \rightarrow A_{k2}$; ..... $Aj \rightarrow A_{kp}$;

where A_j, A_{k1}, A_{k2}, ... , and A_{kp} are fuzzy sets and the maximum membership values of A_{k1}, A_{k2}, ... , and A_{kp} occur at intervals d_1, d_2, ... , and d_p, respectively, and the midpoints of the interval d_1, d_2, ... , and d_p are m_1, m_2, ... , and m_p, respectively, then the forecasted enrollment the i + 1th year is equal to $(m_1+m_2+ ..... +m_p)/p$.

Case 3: Assume that the fuzzified data of the ith year is A_j and assume that there are no fuzzy logical relationship groups whose current state of the fuzzy logical relationship is A_j, where the maximum membership value of Aj occurs at interval d_j, then the forecasted data of the i+1th year is the midpoint m_j of the interval d_j. By applying the above forecasting method, we can get the forecasted data as shown in Table 4.

EXAMPLE 3.1

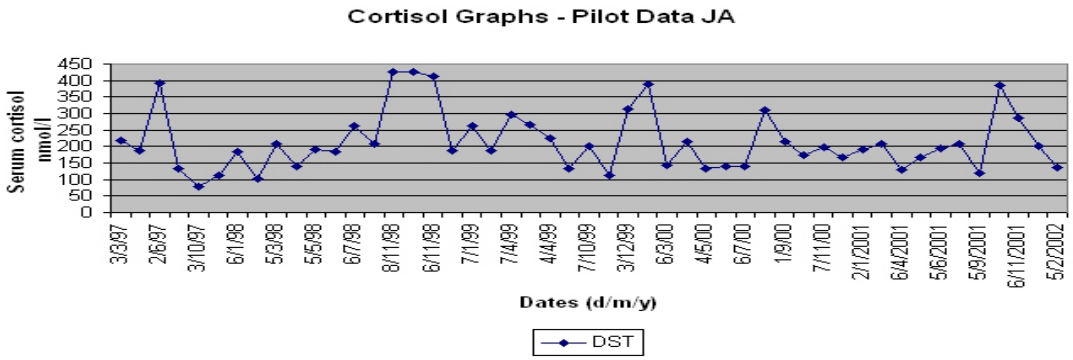

Figure 1: The Longitudinal Dexamethasone Suppression Test (DST) data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout.

We apply the proposed method to forecast the Longitudinal Dexamethasone Suppression Test (DST)[**13**] data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout based on high order fuzzy logical relationships. d_1 = [50, 100], d_2 = [100, 150], d_3 = [150, 200], d_4 = [200, 250], d_5 = [250, 300], d_6 = [300, 350], d_7 = [350, 400], d_8 = [400, 450]

Table 1: Corresponding Medical Data

S. No.	Actual Value	S. No.	Actual Value
1	225	26	120
2	190	27	315
3	395	28	390
4	140	29	145
5	90	30	210
6	120	31	135

7	180	32	140
8	110	33	140
9	210	34	310
10	145	35	210
11	190	36	180
12	185	37	195
13	260	39	175
14	210	39	190
15	430	40	210
16	430	41	135
17	420	42	175
18	190	43	195
19	260	44	210
20	190	45	120
21	295	46	385
22	270	47	290
23	230	48	195
24	140	49	140
25	199		

Table 2: Fuzzified value and Fuzzy logical relationships for Medical data

S. No	Actual Value	Fuzzy set	Fuzzy logical relationships
1	225	A_4	-
2	190	A_3	$A_4 \rightarrow A_3$
3	395	A_7	$A_3 \rightarrow A_7$
4	140	A_2	$A_7 \rightarrow A_2$
5	90	A_1	$A_2 \rightarrow A_1$
6	120	A_2	$A_1 \rightarrow A_2$
7	180	A_3	$A_2 \rightarrow A_3$
8	110	A_2	$A_3 \rightarrow A_2$
9	210	A_4	$A_2 \rightarrow A_4$
10	145	A_2	$A_4 \rightarrow A_2$
11	190	A_3	$A_2 \rightarrow A_3$
12	185	A_3	$A_3 \rightarrow A_3$
13	260	A_5	$A_3 \rightarrow A_5$
14	210	A_4	$A_5 \rightarrow A_4$
15	430	A_8	$A_4 \rightarrow A_8$
16	430	A_8	$A_8 \rightarrow A_8$
17	420	A_8	$A_8 \rightarrow A_8$
18	190	A_3	$A_8 \rightarrow A_3$
19	260	A_5	$A_3 \rightarrow A_5$
20	190	A_3	$A_5 \rightarrow A_3$
21	295	A_5	$A_3 \rightarrow A_5$
22	270	A_5	$A_5 \rightarrow A_5$
23	230	A_4	$A_5 \rightarrow A_4$
24	140	A_2	$A_4 \rightarrow A_2$
25	199	A_2	$A_2 \rightarrow A_2$
26	120	A_2	$A_2 \rightarrow A_2$
27	315	A_6	$A_2 \rightarrow A_6$
28	390	A_7	$A_6 \rightarrow A_7$
29	145	A_2	$A_7 \rightarrow A_2$
30	210	A_4	$A_2 \rightarrow A_4$
31	135	A_2	$A_4 \rightarrow A_2$

32	140	A_2	$A_2 \rightarrow A_2$
33	140	A_2	$A_2 \rightarrow A_2$
34	310	A_6	$A_2 \rightarrow A_6$
35	210	A_4	$A_6 \rightarrow A_4$
36	180	A_3	$A_4 \rightarrow A_3$
37	195	A_3	$A_3 \rightarrow A_3$
38	175	A_3	$A_3 \rightarrow A_3$
39	190	A_3	$A_3 \rightarrow A_3$
40	210	A_4	$A_3 \rightarrow A_4$
41	135	A_2	$A_4 \rightarrow A_2$
42	175	A_3	$A_2 \rightarrow A_3$
43	195	A_3	$A_3 \rightarrow A_3$
44	210	A_4	$A_3 \rightarrow A_4$
45	120	A_2	$A_4 \rightarrow A_2$
46	385	A_7	$A_2 \rightarrow A_7$
47	290	A_5	$A_7 \rightarrow A_5$
48	195	A_3	$A_5 \rightarrow A_3$
49	140	A_2	$A_3 \rightarrow A_2$

Table 3: Fuzzy logical relationship groups

Groups	Transformed second order fuzzy logical relationship
Group 1	$A_1 \rightarrow A_2$
Group 2	$A_2 \rightarrow A_1$, $A_2 \rightarrow A_2$, $A_2 \rightarrow A_3$, $A_2 \rightarrow A_4$, $A_2 \rightarrow A_6$, $A_2 \rightarrow A_7$
Group 3	$A_3 \rightarrow A_2$, $A_3 \rightarrow A_3$, $A_3 \rightarrow A_5$, $A_3 \rightarrow A_7$
Group 4	$A_4 \rightarrow A_2$, $A_4 \rightarrow A_3$, $A_4 \rightarrow A_8$
Group 5	$A_5 \rightarrow A_3$, $A_5 \rightarrow A_4$, $A_5 \rightarrow A_5$
Group 6	$A_6 \rightarrow A_4$, $A_6 \rightarrow A_7$
Group 7	$A_7 \rightarrow A_2$, $A_7 \rightarrow A_5$
Group 8	$A_8 \rightarrow A_3$, $A_8 \rightarrow A_8$

Then, based on the corresponding intervals of each medical data in Figure 1 shown in Table 1 and the forecasting method described above, we can calculate the forecasted data and calculate the mean square error (MSE) of each medical data, where the value of MSE is used as the fitness value of a data. If the MSE is higher, then the forecasted error is larger and the medical will not fit the environment enough. On the other hand, if the MSE is lower, then the forecasted error is lower and the medical data will better fit the environment, where the definition of MSE is shown as follows:

$$\mathrm{MSE} = \frac{\left(\frac{|\ \text{forecasted value}_i - \textit{acutual value}_i\ |^2}{n} \right)}{\text{forecasted value}_i}$$

where "Forecasted value$_i$" denotes the forecasted data of the ith value, and "Actual value$_i$" denotes the actual data of the ith value.

Table 4: Forecasted Value and MSE

S. No	Actual Value	Forecasted Value	MSE
1	225	-	-
2	190	242	0.0390
3	395	235	0.0578
4	140	200	0.0612
5	90	237	0.2333
6	120	125	0.0059
7	180	237	0.0452
8	110	235	0.1623
9	210	237	0.0183

10	145	242	0.0955
11	190	237	0.0353
12	185	235	0.0386
13	260	235	0.0137
14	210	225	0.0102
15	430	242	0.0624
16	430	300	0.0431
17	420	300	0.0408
18	190	300	0.0827
19	260	235	0.0137
20	190	225	0.0263
21	295	235	0.0290
22	270	225	0.0238
23	230	225	0.0031
24	140	242	0.1040
25	199	237	0.0272
26	120	237	0.1392
27	315	237	0.0353
28	390	300	0.0329
29	145	200	0.0541
30	210	237	0.0183
31	135	242	0.1132
32	140	237	0.0989
33	140	237	0.0989
34	310	237	0.0336
35	210	300	0.0612
36	180	242	0.0492
37	195	235	0.0293
38	175	235	0.0489
39	190	235	0.0338
40	210	235	0.0170
41	135	242	0.1132
42	175	237	0.0506
43	195	235	0.0293
44	210	235	0.0170
45	120	242	0.1452
46	385	237	0.0549
47	290	200	0.0443
48	195	225	0.0219
49	140	235	0.0969

Based on the corresponding intervals of each medical data shown in Table 1, and the forecasting method described above, we can calculate the forecasted value as shown in Table 4. Based on the actual data shown in Table 1, we can compute the MSE of the medical data shown in Table 4, which is equal to 76.5

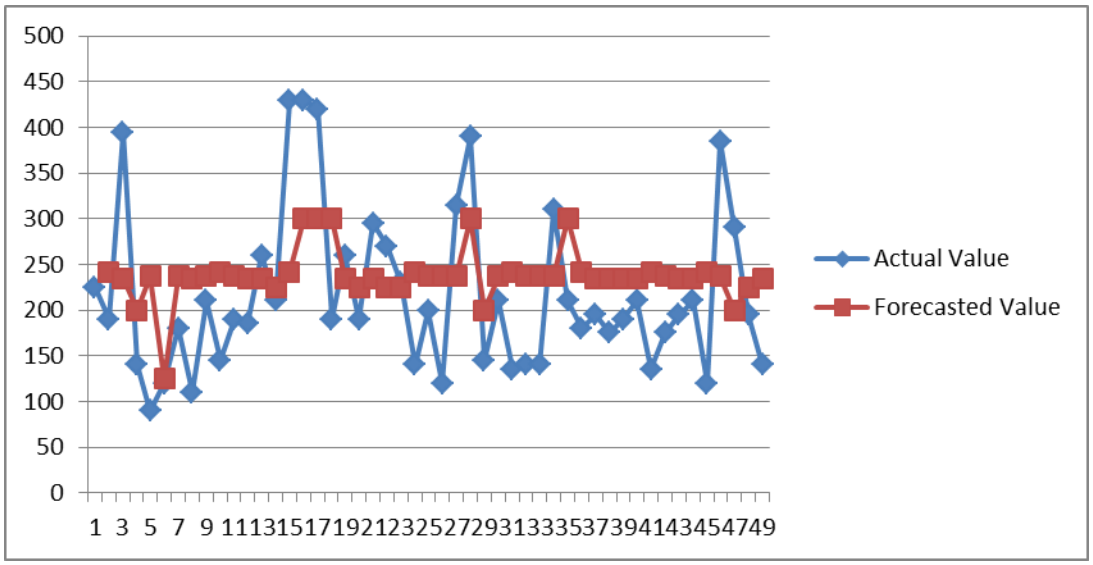

Figure 2: Actual value and Forecasted value for the Longitudinal Dexamethasone Suppression Test (DST)[10] data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout.

IV. EXPERIMENTAL RESULTS

There was a significant difference between BD patients and our control subjects in the maximum percentage rise of salivary cortisol response to awakening. Those showing a waking response also had significantly higher mean cortisol values at 30 minutes after waking, compared with 509 normal subjects described in Wust's and others study [**1**]. Base line values at time zero, immediately upon waking, did not differ significantly between our sample and Wust's control subjects [**1**]. Patients and our 5 control subjects did not differ significantly in the percent age decline from the peak morning value to the evening values. In this section we apply the proposed for forecasting the Longitudinal Dexamethasone Suppression Test (DST) data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout.

It means that the proposed method gets a higher average forecasting accuracy rate than other existing methods to forecast the maximum percentage rise of salivary cortisol response to awakening. we can see that the proposed method get the smallest RMSE than Huarng's method and Huarng's and Yu's method for forecasting the medical data.

V. CONCLUSION

In this paper, Our dysregulation, even when lithium-responsive BD patients are clinically well and their DSTs are observations support the hypothesis that the free cortisol response to waking can reflect relatively enduring HPA normal. Because the test is easy to administer, the free cortisol response to waking may hold promise as a marker in studies of high-risk families predisposed to, or at risk for, mood disorders, we have presented a new method for forecasting the Longitudinal Dexamethasone Suppression Test (DST) data on a fully remitted lithium responder for past 5 years who was asymptomatic and treated with lithium throughout based on fuzzy time series and genetic algorithms. We also make a comparison of the MSE of the forecasted medical data for different methods. In this paper, we use the MSE to compare the performance of prediction of salivary cortisol response to awakening. However, how to narrow the maximum deviation of predicted value from the actual one is more important than the MSE. Therefore, in the future, we will develop a new method to deal with a more accurate prediction by narrowing the maximum deviation of predicted value from the actual one. In this case, a more accurate prediction can provide the school authority to make right decision.

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IAFP: Integration of Apriori and FP-Growth Techniques to Personalize Data in Web Mining

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Abstract- Mining frequent patterns in transaction databases, time-series databases, and many other kinds of databases has been studied popularly in data mining research. Most of the studies adopt an Apriori-like candidate set generation-and-test approach. However, the candidate set generation is still costly, especially when there exist a large number of patterns and/or long patterns. Frequent-pattern tree (FP-tree) structure, which is an extended prefix -tree structure for storing compressed, crucial information about frequent patterns, and develop an efficient FP-tree based mining method, FP-growth, for mining the complete set of frequent patterns by pattern fragment growth. Training dataset repeatedly produces massive amount of rules. It's very tough to store, retrieve, prune, and sort a huge number of rules proficiently before applying to a classifier. In such situation FP is the best choice but problem with this approach is that it generates redundant FP Tree. In this paper, the limitation of these two methods and an integrated techniques of both Apriori and FP-Growth, is used to overcome the limitation of existing methods.

Index Terms- Apriori, FP-Growth, Association Rule, Item Set

I. INTRODUCTION

Discovery of frequent item sets [1] is a very important data mining problem with numerous practical applications. Informally, frequent itemsets are subsets frequently occurring on a collection of sets of items. Frequent itemsets are typically used to generate association rules. However, from generation of rules is a rather straightforward task, the focus of researchers has been mostly on optimizing the frequent item set discovery step. Many frequent item set mining algorithms have been developed. The two most prominent classes of algorithms are Apriori-like and pattern-growth methods. Apriori- like solutions, represented by a classic Apriori algorithm [3], perform a breadth-first search of the pattern space.

Apriori starts with discovering frequent itemsets of size 1, and then iteratively generates candidates from previously found smaller frequent itemsets and counts their occurrences in a database scan. The problems identified with Apriori are:

(1) Multiple database scans, and (2) huge number of candidates generated for dense datasets and/or low frequency threshold (minimum support).

To address the limitations of Apriori-like methods, a pattern-growth, which consists in a depth-first search of the pattern space. Pattern-growth methods also build larger frequent sets from smaller ones, but instead of candidate generation and testing, they exploit the idea of database projections. Typically, pattern-growth methods start by transforming the original database into some complex data structure, preferably fitting in main memory. A classic example of the pattern-growth family of algorithms is FP-growth, which transforms a database into FP-tree stored in main memory using just two database scans, and then performs mining on that optimized FP-tree structure [2].

II. APRIORI YECHNIQUE

Apriori algorithm is used for frequent item set mining and association rule learning. The algorithm use a level-wise search, where k-itemsets (An item set which contains k items is known as k-item set) are used to explore (k+1) -itemsets, to my frequent itemsets from the transactional database for Boolean association rules. In this algorithm, frequent subsets are extended one item at a time and this step is known as candidate generation process. Then groups of candidates are tested against the data. To count candidate item sets efficiently, Apriori uses breadth-first search method and a hash tree structure. It identifies the frequent individual items in the database and extends them to larger and larger item sets as long as those item sets appear sufficiently often in the database. Apriori algorithm determines frequent item sets that can be used to determine association rules which highlight general trends in the database. The following is the procedure for Apriori algorithm:

C_k: Candidate item set of size k
L_k: frequent item set of size k
L_1 = {frequent items};
For (k = 1; L_k!=∅; k++)
do begin
C_{k+1} = candidates generated from L_k;
for each transaction t in database do increment the count of all candidates in C_{k+1} that are contained in t
L_{k+1} = candidates in C_{k+1} with min_support
end
return $\cup_k L_k$.
The following example explains Apriori technique.

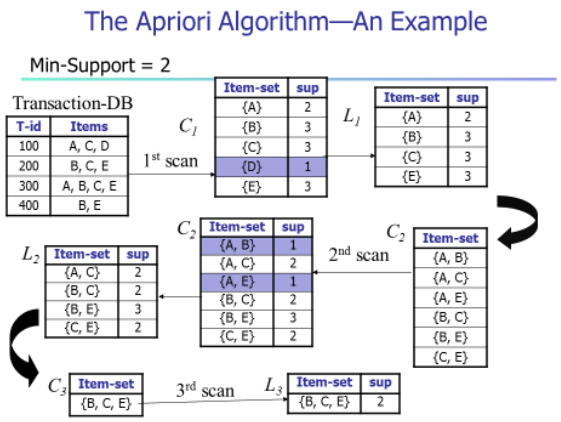

Figure 1.1 Apriori example

Limitation- the Apriori achieves good performance gained by reducing the size of candidate sets. However, in situations with a large number of frequent patterns, long patterns, or quite low minimum support thresholds, an Apriori-like algorithm may suffer from the following two nontrivial costs:

1) It is costly to handle a huge number of candidate sets. For example, if there are 104 frequent 1-itemsets, the Apriori algorithm will need to generate more than 107 length-2 candidates and accumulate and test their occurrence frequencies. Moreover, to discover a frequent pattern of size 100, such as $\{a_1,...,a_{100}\}$, it must generate $2100 - 2 \approx 1030$ candidates in total. This is the inherent cost of candidate generation, no matter what implementation technique is applied.

2) It is tedious to repeatedly scan the database and check a large set of candidates by pattern matching, which is especially true for mining long patterns [4].

III. FP-GROWTH TECHNIQUE

Let I ={a1,a2,...,am} be a set of items, and a transaction database DB(T1,T2……Ti(I belongs to (1…N))is a transaction which contains a set of items in I .The support 1 (or occurrence frequency) of a pattern A, where A is a set of items, is the number of transactions containing A in DB. A pattern A is frequent if A's support is no less than a pre defined minimum support threshold, ξ. Given a transaction database DB and a minimum support threshold ξ, the problem of finding the complete set of frequent patterns is called the frequent-pattern mining problem [3].

The FP- Growth algorithm for mining frequent patterns using FP-Tree by pattern fragment growth is: Input: a FP-Tree constructed with the algorithm mentioned in Algorithm for FP-tree construction [5].

D - Transaction database

ξ - Minimum support Threshold.

Output: The complete set of frequent patterns.

Method: Call FP-growth (FP-tree, null)

Procedure FP-growth (Tree, A)

{

if (Tree contains a single path P)

then for each (combination (denoted as B) of the nodes in the path P)

do generate pattern B ∪ A with support = minimum support of nodes in B;

else (for each a_i in the header of Tree)

do

{

generate pattern B = ai ∪ A with support =a_i.support;

construct B's conditional pattern base and

then B's conditional FP-Tree TreeB;

if (TreeB ≠ ∅)

{

call FP-growth (TreeB, B)

}

}

Above snippet written in **R** are essentially ephemeral, written for a single piece of data analysis.

Limitation- FP-Growth lack of good candidate generation method [1].

IV. IAFP TECHNIQUE

The main drawback of Apriori algorithm is that the candidate set generation is costly, particularly when massive number of patterns or long patterns subsist. The main drawback of FP-growth algorithm is the explosive quantity of lacks a good candidate generation method [6].

IAFP technique combines FP-Tree with Apriori candidate generation method to solve the disadvantages of both Apriori and FP-growth. The new algorithm will reduce the storage space, improves the efficiency and accuracy of the algorithm.

The outline of IAFP is given below:

- Initialization: Use an Apriori algorithm to mine all frequent patterns up to a small size.
- Iteration:
  - At each iteration, k seed patterns are randomly picked from the current pattern pool.
  - For each seed pattern thus picked, we find all the patterns within a bounding ball centered in the seed pattern.
  - All these patterns found are fused together to generate FP-tree and find a set of super-patterns. All the super-patterns, thus generated from a new pool for the next iteration.
- Termination: when the current pool contains no more than K patterns at the beginning of an iteration.

V. EXPERIMENTAL RESULTS

The proposed system is implemented using the Java language with a help of IDE called Eclipse and Jfreechart. jar file. Eclipse is an integrated development environment (IDE) for developing rich client applications. JfreeChart is an open source

library developed in Java, which can be used within Java based applications to create a wide range of charts.

The dataset considered for conducting analysis is given below.

ID	Transaction
1	Beer, Beans, Strawberries
2	Beans, Apple
3	Beer, Strawberries
4	Apple, Tomatos
5	Beans, Tomatos, Lemon, Computer
6	Apple, Lemon
7	Beans, Strawberries, Tomatos
8	Beans, Tomatos, Sugar
9	Apple, Tomatos, Sheets
10	Beer, Beans, Strawberries, Tomatos, Lemon
11	Beer, Beans, Lemon
12	Beer, Beans, Tomatos, Lemon, Sugar
13	Beer, Tomatos
14	Beer, Lemon
15	Beer, Beans, Strawberries, Apple, Tomatos, Lemon
16	Beans, Apple, Tomatos
17	Beer, Beans, Lemon, Sheets
18	Beans, Sugar
19	Apple, Sheets
20	Apple, Tomatos, Lemon, Sheets, Caviar

Figure 5.1 Dataset for Experiment

The following figure shows the comparison between Apriori, FP-Growth and IAFP algorithms.

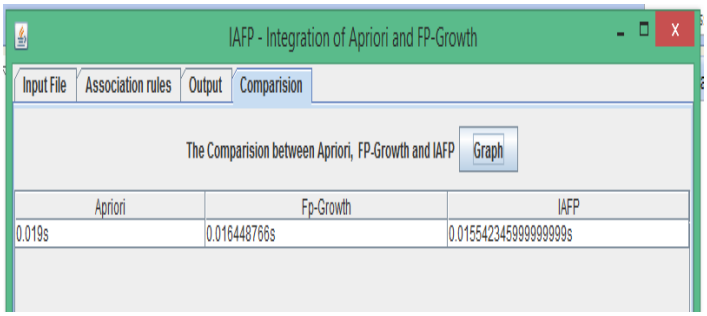

Figure 5.2 comparison between algorithms

The following figure shows comparison between Apriori, FP-Growth and IAFP algorithms in the form of a graph.

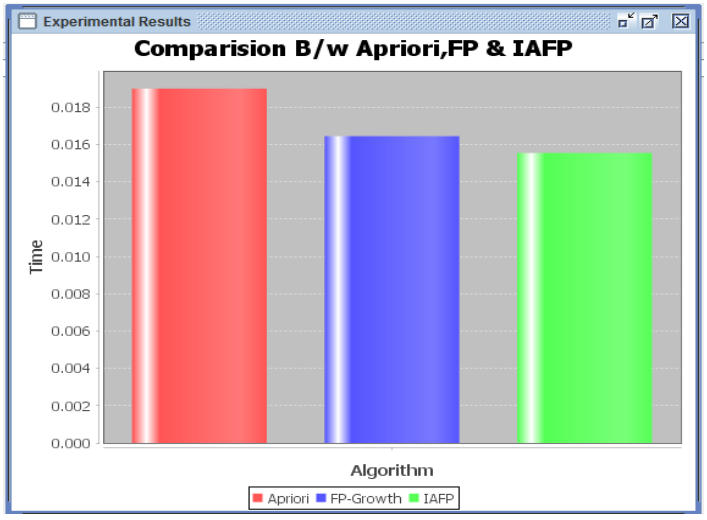

Figure 5.3 comparison between Apriori, FP-Growth &IAFP

VI. CONCLUSION

A new hybrid approach for data mining process is been proposed. Data mining is the current focus of research since last decade due to the enormous amount of data and information in modern day. The association is a topic of concern among various data mining techniques. This hybrid approach is to deal with large size data. Proposed system is the enhancement of both Apriori and Frequent pattern (FP) technique of association.

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Structural Model Design of Xanthone Compounds as Antimalarial Activity

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Abstract- *Xanthones* and their derivatives have been reported to exhibit inhibitory activities towards *Plasmodium falciparum*. In order to provide deep insight into the correlation between inhibitory activities and structures of *xanthones*, linear regression method was employed to establish QSAR models for 16 *xanthones* derivatives with different structure. The accuracy and predictive power of the proposed QSAR model were verified, optimized, and validated by semi empiric PM3 method. The result of this research showed that the best QSAR model was model 3.

Index Terms- Anti-plasmodialagents, Structural Models Design, xanthone.

I. INTRODUCTION

Malaria is the main health problems in subtropical and tropical countries. There are 105 countries in the world in malaria endemic and more than 500 million cases or more than 2.7 million people deaths by malaria each year. In Indonesia, malaria is still become a health problem, particularly in eastern Indonesia. In the year 2003 the *Annual ParactemiaIncidence* (API) reported that there were 175 - 558 cases. Further, annual malaria incidents are more than 2.48 million and 211 deaths among 227.5 million is people of Indonesian.

The spread of malaria is so quickly and wide because of its parasites resistant, especially *Plasmodium falciparum* toward *chloroquine*.Because of that, researchers want to find new malarial drugs which more potential. Several approaches had been conducted to find new antimalarial drugs, for examples through modification of chemical structure of antimalarial compounds so that they have higher anti-plasmodium activity. Exploration of natural product as drugs traditionally has been applied for malaria treatment (Mustofa, 2000). For instance, derivatives of *xanthone* (Figure. 1) compounds have been known as potential antimalarial activity against *Plasmodium falciparum*. Based on description above and considering some factors as mentioned by previous researchers, therefore the writer conducted the QSAR analysis toward 16 compounds of *xanthone* derivatives (1-16) as shown at table (1). The 16 of *xanthone* derivatives series have been tested the *anti-plasmodial* activity by Likhitwitayawuid*et al* (1998).

The QSAR analysis in this research is different from that which has been conducted by Mustofa and Tahir (2001). Mustofa and Tahir (2001) used atomic net-charge as a descriptor with semi empiric AM1 method, this research used not only atomic net-charge as descriptors but also dipole moment, Log P and polarizability with semi empiric PM3 method. Then, by performing QSAR analysis towards 16 *xanthone* derivatives, model equations were determined to predict and to get information about antimalarial activity of *xanthone* compounds. The use of the electronic structure of the molecule based on semi empirical calculation have also been reported. This can lead to useful model equations for the prediction of anti-malarial activity from the calculated atomic net charges (Mudasir, *et al*, 2003 and Tahir, *et al*, 2005). Furthermore, this approach has also been proven to be very helpful in obtaining an indication concerning the active center of molecules (Polman, *et al*, 1998).

II. METHODE

Model Set-up

The atomic electron net charges, dipole moment, Log P, polarizability have been evaluated by Mulliken population analysis based on standard semi empiricaly PM3 method using chemical software Hyper-Chem version 7,0. PM3 calculation is known to give quite satisfactory results for the chemistry of *xanthone* compounds derivatives containing hydroxyl groups. Geometries for stationary points were identified by medium of energy with respect to geometric parameters using Polak-Ribiere algorithm included in HyperChem package with convergence limit of 0.01 kcal $mol^{-1}A^{-1}$. Many possible linearrelationships between calculated atomic charges and anti-malarial activity were evaluated by using SPSS statistical software. The main objective is to obtain a model with a few variables descriptors as possible but still describing the anti-malarial activity satisfactorily.

Hanschequation of these relations are:

$$\text{Log } IC_{50} = A(\text{LogP}) - B(\text{LogP})^2 + C(E) + D(\rho\sigma) + E + \ldots \quad (1)$$

III. RESULT AND DISCUSSION

The calculated PM3 descriptors, such as atomic net charges, dipole moment, Log P and polarizability, of *xanthone* derivatives used in models are determined based on eq. 1 aqnd listed in table (2). This allows the exclusion of less relevant atoms and provides opportunity for a gradual evaluation of the atoms influencing significantly of the anti-malarial activity of molecules.

Selection for the Best Design Model

In order to obtain the best design model that correlates with independent variables (descriptors) and dependent variable (antimalarial activity), regression analysis using SPSS software package have been performed. Twelve independent variables consisting of 15 atomic net charges qC_1, qC_2, qC_3, qC_4, qC_5, qC_6, qC_8, qC_9, qC_{10}, qC_{11}, qC_{12}, qC_{13}, qC_{14}, qC_{15} and qO_7. As well as net charge of *xanthone* and dipole moment, Log P and polarizability were included in the model set- up. At the first step, all variables are included in the model and the less relevant variables were then eliminated gradual from the model. This procedure finally gave 12 QSAR models andValue R, F, F-hit/F-tab are as listed in table (3). *The statistical parameters obtained Standard Deviation (SD) model 1 and model 3 from linear according to Eq. (1). collected in table (4).* From table 3 it is evaluated that some models can immediately be eliminated because their $F_{elevated}/F_{table}$ value are lower than unity, which means that the models are statistically not exist or rejected. In Table 5, content Model 1, qC1,qC12,qC13, moment dipole,Log P, Log IC_{50eval} and Log $IC_{50exp.}$In Table. 6, content Model 3, qCO7,qC12,qC13, moment dipole, Log IC50eval and Log IC50 exp. In table. 7. Content,Log IC_{50}eval and Log IC_{50}exp Model 1 In table 8.content Log IC_{50}eval and Log IC_{50}exp Model 3 and in t able9.conten Value PRESS or Value Y

On the other hand, it is clearly shown that there are 2 selected models which show a relatively good correlation between anti-malarial activity of the best model among 12 models selected as listed in table 3 and 4 is not adequate only by comparing the R size, especially for model 1, and 3 because their R values are 0,970. and 0,843. Therefore we should also consider other statistical parameter of F (model significance) and SD (Standard Deviation), it seems that model 1 it the best model from the viewpoint of statistical parameters, Standard Deviation (SD) and F value (model significance). However, this model consisted of almost all descriptors avoilable and thus it is not the simplest model and therefore this model is excluded from selection.

Now, the remaining possible models are model 1 and 3. By comparing the parameters F and SD of two models, it is easily observed that model 3 is the best model because it has highest f and relatively lower SD and contains only 4 variables which means that the model is the quite sample, thus model 3 is selected as the best QSAR model. This model could therefore retionalize the search for new *xanthone*derivatives which have been antimalarial activity of these series *xanthone* derivatives, necessary due to the rapid resistance development of *Plasmodium falciparum.*

Model Validation

It has been conducted that model 3 is the best model from the point of view of statistical parameters of the linear analysis. To see how good the model predict the activity of the *xanthone* series, calculation of the antimalarial activity for each *xanthone*analogs has been performed using model 12 and results (predicted Log (IC_{50}) was plotted against those obtained by experiments (observed Log IC_{50}) by regression method to see how well they correlate each other (Fig 2). It is obvious from this figure that model 3 predicts very well the activity of the series of *xanthone* as indicated by the values of the slope and correlation coefficient (R) of the plot which is approaching unity, is 0.970 and 0.843, respectively.

Validation of the best model may be evaluated by comparing PRESS (predictive residual sum of square) value of the model 1 in table (5) and the model 3 in table (6). This parameter is defined as sum of square of difference between observed activity and predicted activity calculated by the corresponding model. The model with the smallest value of PRESS is the best model because it implies that the difference between the observed and the predict activities is minimal. Results of PRESS calculation for each model as listed in table (9) again confirms that model 3 is the most reliable model because in induces the smallest PRESS value.

Evaluation Model and Prediction of Most Influencing Atoms.

According to the fitting coefficient values obtained by the variation of descriptors included as summarized in table 3, we may concluded that atom C_1, C_{12}, C_{13} and q-ring seem to be the most responsible atoms for the anti-plasmodium inhibition activity of the molecules. Although some models listed in table (5 and 6) also include dipole moment and Carbon atoms of *xanthone*, the values of their coefficient are relatively small indicating that these atoms are of rather less importance and therefore can be eliminated from the model. By we immediately observed that C_1, C_{12} and C_{13} assume prominent role in most as compared with the others, and that either O_7, C_{12} and C_{13} has a significant influence, respectively.

IV. Conclusion

We have used a semi empirical molecular orbital calculation PM-3 to study the correlation between atomic net charge and the antimalarial activity of a series anti-plasmodium against wild type of the *xanthone* derivatives. The best overall correlation is given by the computed molecular properties of atomic net charges of *xanthone* derivatives and moment dipole, Log P, polarity. It is gratifying to observe that the most influencing atoms of the *xanthone*, in term of possible mode of docking of the molecule well to the targeted *xanthone* derivatives. It has also been demonstrated from this result that semi-empirical PM3, although induces possible error sources, still seem to be a necessary and acceptable compromise for quantum calculations on series of *xanthone* derivatives of this size, including the search for most influencing atoms.

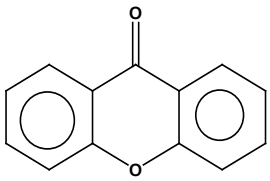

Figure 1. The molecular *xanthone* compounds

Table 1. The 16 of *xanthone* derivatives series and the anti-plasmodial activity

No	Compounds	Log IC_{50}
1	1	1.70
2	2	2.00
3	3	1.88
4	4	2.00
5	5	1.20
6	6	-.60
7	7	.70
8	8	-.40
9	9	.00
10	10	-1.00
11	11	2.00
12	12	-1.10
13	13	.40
14	14	.48
15	15	.18
16	16	.48

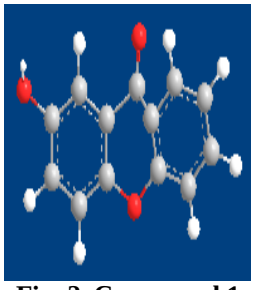

Fig 2. Compound 1

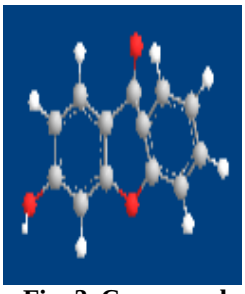

Fig 3. Compound

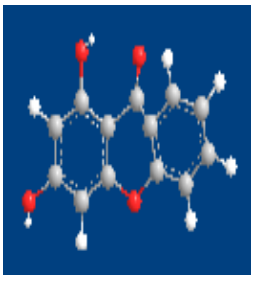

Fig 4 Compound 3

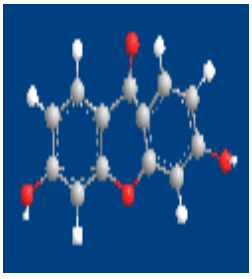

Fig 5 Compound 4

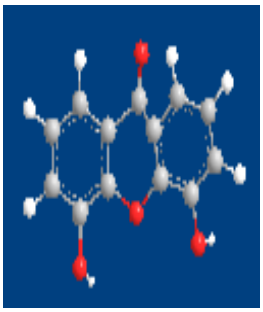

Fig 6 Compound 5

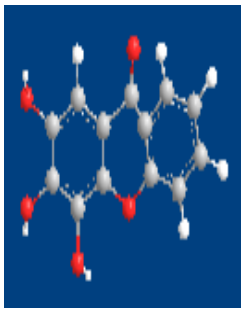

Fig 7. Compound 6

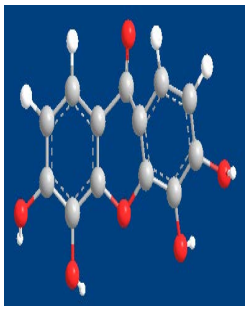

Fig 8.Compound 7

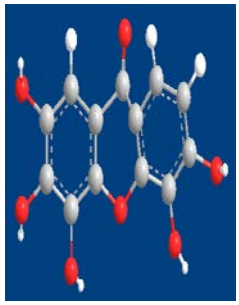

Fig 9.Compound 8

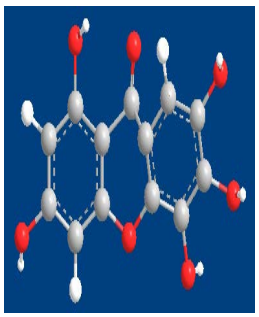

Fig10Compound 9

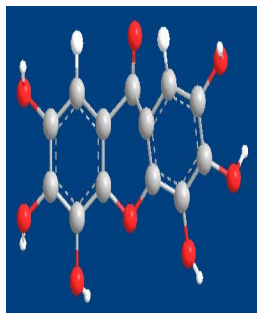

Fig11Compound 10

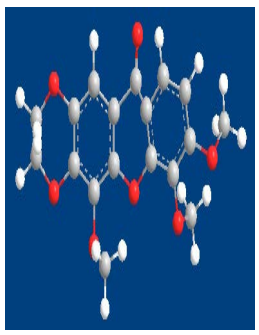

Fig12 Compound 11

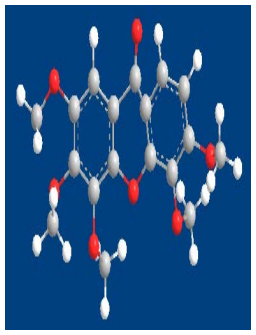

Fig 13 Compound 12

Fig14 Compound 13

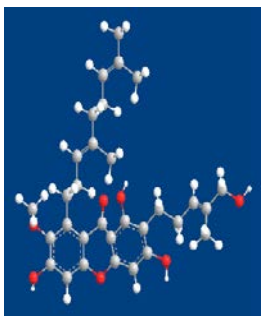

Fig 15Compound 14

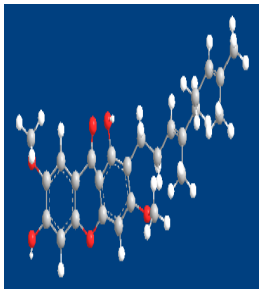

Fig 16. Compound 15

Fig 17Compound 16

Table 2.Value atomic net charges, dipole moment, Log P and polarizability of *xanthone* derivatives used in models

qC1	qC2	qC3	qC4	qC5	qC6	qO7
0.06	-0.08	-0.11	0.08	-0.18	-0.11	-0.10
-0.19	0.16	-0.26	0.16	-0.26	0.03	-0.10
-0.26	0.21	-0.31	0.21	-0.37	0.26	-0.10
-0.19	0.16	-0.25	0.16	-0.26	0.03	-0.10
-0.11	-0.10	0.07	0.03	-0.18	-0.05	-0.09
0.05	0.10	-0.03	0.06	-0.19	-0.11	-0.11
-0.17	0.13	-0.05	0.09	-0.23	0.00	-0.09
0.05	0.10	-0.02	0.05	-0.19	-0.11	-0.09
-0.26	0.21	-0.30	0.21	-0.38	0.26	-0.07
0.05	0.10	-0.02	0.06	-0.19	-0.11	-0.08
0.01	0.09	0.00	0.10	-0.21	-0.04	-0.07
0.04	0.12	0.04	0.12	-0.20	-0.01	-0.08
-0.03	0.15	-0.21	0.15	-0.24	0.04	-0.11
-0.03	0.14	-0.25	0.14	-0.24	0.06	-0.11
-0.03	0.15	-0.25	0.14	-0.24	0.05	-0.11
-0.03	0.15	-0.25	0.15	-0.24	0.05	-0.11

qC8	qC9	qC10	qC11	qC12	qC13	qC14	qO15
0.12	-0.22	0.39	-0.15	-0.04	-0.15	-0.01	-0.33
0.11	-0.22	0.40	-0.15	-0.04	-0.15	-0.01	-0.33
0.12	-0.22	0.43	-0.15	-0.04	-0.15	0.00	-0.38
0.15	-0.26	0.40	-0.20	0.16	-0.24	0.04	-0.34
0.09	-0.19	0.39	0.06	-0.14	-0.10	-0.05	-0.32
0.12	-0.22	0.40	-0.15	-0.04	-0.15	-0.01	-0.33
0.11	-0.22	0.40	0.02	0.06	-0.19	0.00	-0.33
0.12	-0.22	0.40	0.02	0.06	-0.20	0.00	-0.33
0.08	-0.18	0.43	0.06	0.03	0.02	-0.10	-0.38
0.08	-0.18	0.40	0.05	0.03	0.02	-0.10	-0.33
0.13	-0.25	0.40	-0.03	0.13	-0.22	0.03	-0.33
0.12	-0.21	0.39	0.03	0.13	-0.14	0.01	-0.32
0.18	-0.30	0.42	-0.24	0.20	-0.31	0.24	-0.03
0.18	-0.30	0.42	-0.24	0.20	-0.31	0.24	-0.03
0.18	-0.30	0.42	-0.24	0.20	-0.32	0.24	-0.03
0.16	-0.27	0.41	-0.21	0.16	-0.23	0.21	-0.03

moment	LogP	polarz	massa	volume	$LogIC_{50}$
1.54	-0.45	22.51	212.20	601.56	1.70
3.24	-0.45	22.51	212.51	602.82	2.00
3.96	-1.47	23.15	228.20	614.29	1.88
2.53	-1.47	23.15	228.20	622.66	2.00
2.99	-1.47	23.15	229.20	619.81	1.20
3.03	-2.50	23.79	244.20	640.11	-0.60
3.75	-3.52	2.52	260.20	659.74	0.70
4.08	-4.53	25.06	276.20	679.77	-0.40
3.46	-4.55	25.06	276.20	672.94	0.00
3.37	-3.57	25.70	292.20	699.08	-1.00
2.80	-4.39	34.24	346.34	946.99	2.00
5.22	-5.63	43.84	486.39	1,238.20	-1.10
5.45	1.41	58.72	520.67	1,329.36	0.40
5.49	1.25	56.88	506.64	1,489.98	0.48
2.90	0.25	57.52	522.69	1,326.67	0.18
3.68	-0.19	49.73	452.55	1,313.75	0.48

Table 3. Value R, F, Feval/Ftable

Model	R	Feval	Feval/Ftable
I	0.97	18.871	0.001
II	0.635	1.183	0.396
III	0.843	4.315	0.045
IV	0.711	1.224	0.4
V	0.786	1.346	0.381
VI	0.757	1.122	0.46
VII	0.854	2.248	0.196
VIII	0.911	2.627	0.136
IX	0.635	1.8	0.225
X	0.812	2.318	0.168
XI	0.921	4.689	0.056
XII	0.834	2.746	0.126

Table 4. Standard Deviation (SD) model 1 and model 3

No	Model	Standard Deviation (SD)
1	Model 1	SD= 24.490
2	Model 3	SD=0.12878

Table 5. Model 1

No	Compound	qC_1	qC_{12}	qC_{13}	Mom dipol	Log P	Log IC_{50eval}	Log IC_{50exp}
1	13	-0.3	0.20	-0.31	5.45	1.41	8.71508	0.40
2	14	-0.3	0.20	-0.31	5.49	1.25	8.55082	0.48
3	15	-0.3	0.20	-0.32	2.90	0.25	4.6459	0.15
4	16	-0.3	0.16	-0.23	3.68	-0.19	5.18288	0.48

Table. 6 Model 3

No	Compound	qO7	qC12	qC13	Mom dipol	Log IC_{50eval}	Log IC_{50exp}
1	1	-0.10	-0.04	-0.15	1.54	3.07318	1.7
2	2	-0.10	-0.04	-0.15	3.24	1.98008	2.0
3	15	-0.11	0.20	-0.32	2.90	1.9078	0.18
4	16	-	0.16	-	3.68	0.80398	0.48
		0.11		0.23			

Table. 7. Log IC_{50}eval and Log IC_{50}exp Model 1

No	Log IC_{50eval}	Log $IC_{50\ exp}$	Δ	Δ^2
1	8.71508	0.40	8.31506	69.1402228036
2	8.55082	0.48	8.07082	65.1381354724
3	4.6459	0.15	4.4959	20.21311681
4	5.18288	0.48	5.04488	25.4508142144

Table 8. Log IC_{50}eval and Log IC_{50}exp Model 3

No	Log IC_{50eval}	Log $IC_{50\ exp}$	Δ	Δ^2
1	3.07318	1.7	1.37318	1.88562
2	1.98008	2.0	-0.01992	0.00039
3	1.9078	0.18	1.7278	2.98528
4	0.80398	0.48	0.32398	0.10496

Table9. Value Y

No.	Model	Value (Y)
1	Model $_1$	Y_1 = 4.72408
2	Model $_3$	Y_3 = 0.965178

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Objectivity and Ethics in Empirical Research

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Abstract- Objectivity (value-free) and ethics (rules of conduct) in empirical research are very essential for generating knowledge. However, intrusion of personal, participants and funders' values (i.e. bias, belief, presuppositions) in research is unavoidable during empirical research process. This article aims to determine the positions of values and ethics in empirical research to achieve reliability, validity and generalizability, and the possibilities to accommodate objectivity and ethical rationally in research. Through content analysis of available literature, this article presents that values of the stakeholders intrude in empirical research both consciously and unconsciously. It is also sometimes problematic to maintain research ethics. This study established that there are opportunities to promote objective research (value-free research) within the premise of value relevance to an expected level. This article claims that appropriate research planning, effective sample design, carefully data collection and interpretation can promote and enhance objectivity of empirical research and achieve research ethics.

Index Terms- Empirical research, ethics, objectivity, values.

I. INTRODUCTION

Empirical research is based on observed phenomena and derives knowledge from actual experience rather than theoretical discussions for any type of discipline of research. This is directed to improve the knowledge and understanding the world through searching facts-answers to questions and solutions to problems through utilizing practical methods such as survey. It investigates to develop new insights, verification or testing new facts, analysis of interrelationships and casual explanations, and development of new tools through observations and practical experiences. The outcome of the research can help to change the way things are. However, merely systematic and organized enquiry of research is not sufficient to generate new and impactful knowledge. The researchers need to adopt 'value-free' (i.e. bias less) position rightly for choosing the most potential among the possible options due to welfare of the humanity as well as to develop new theory, concepts and tools. Moreover, 'ethics' (morals) are also worth in the research regardless research is related to humanities, social sciences or business. Whether empirical or theoretical research techniques, it requires improved approach that might create high impacts in different fields of research. This research focus on the position of values and ethics in empirical research.

Empirical research is mostly applied research to provide implications for policy practice, decision making relevant to various fields of social science and physical science research. The research outcome need to be reliable, validate and generalizable. However, can empirical research ever be 'value free'; or whether a 'value-free' empirical research is possible and desirable, or not? The claim about value-neutrality of research is quite common among researchers, but is challenged to attain. Over the years, researchers are moved by the challenge whether the research would be value-oriented or value-neutral. Empirical research is not free from this debate.

This article aims to clarify about the status of values and ethics in empirical research of any discipline, and to determine how to accommodate the value and ethical rationally in the research. Through content analysis of the available literature, this articles presents how 'values' and 'ethics' intrude in empirical research and what are the importance of value free (objective) empirical research. This paper also presents how to promote objectivities in the empirical research and achieve research ethics.

II. OBJECTIVITY (VALUE FREE) AND ETHICS (MORALS) IN RESEARCH

'Value' is belief, preference or position. Values are influenced by several factors such as society, culture, history of a person. Values vary within individuals, groups and societies. Society is characterized by 'value consensus' or agreement over social practices (May, 2001). An empirical researcher is not outside of the society. Therefore, there is possibility of intruding values in the research. He could judge the facts and evident in empirical research depending on his own predetermined views which could be biased by personal values. Ahmed (2010) developed an inventory of various influences (values) that might distort research, i.e. personal prejudices and bias, personal emotions, personal motives, customs and superstitions, self-interest, complexity of subject matters, lack of uniformity, misunderstanding due to lack of knowledge, moral values, ethnocentrism, external pressure, and ignorance.

'Objectivity' means the willingness and ability to examine evidence dispassionately. 'Objective research' is value-free research. It is a major condition of good research. Objective research is opposite to value judgment (subjectivity/ value relevance). According to May (2001) value judgment is to rate one thing against another that is a fundamental part of human. He also mentioned that value judgments are dependent on belief and experiences of everyday life that are expressed by approval or disapproval of some moral of social ideals. He also claims that the possibility of a value free empirical research in terms of 'apprising judgment' is a technical matter, not theoretical impossibility.

'Value neutrality' (value-free) is a term used by Weber to indicate necessity of objective research. Weber concerned against making value judgments which coincide with the orientation or motives of the researchers. Although, Weber believed that value neutrality is the aim of research, his view is that no science is fundamentally neutral, and dependent on the way individuals see a phenomena and the perception they hold from that (in Morrison, 1995). Scientific research is nature driven and development of the scientific knowledge is a kind of natural process dictated by nature itself, not by society. Therefore, it is easier to be objective. However, the research on the matter of humanity and society, the research process and outcome is subject to value-judgment as perception of a fact vary depending on the researcher's personal knowledge, idea or the group or society he belongs as well as the subjects (focus groups) who are studied.

'Ethics' refers to the norms and 'rules of conduct' in the research process that guide moral choices. Ethics and morality often go together and used interchangeably. Ethics are social and cultural constructs, and grounded in the values of time and place. The goal of ethics in research is to ensure that no one is harmed and suffer from adverse consequences from research activities. There is no absolute ethics, because *"Ethical standards are expressed as absolutes but must operate relatively"* (Becker and Bryman, 2004: 155). The accepted ethics on a specific period and location can change relatively to change of period and location.

'Research ethics' is the way to conduct a research with integrity and morally. Ethical research is the logical inquiry

that is conducted with honesty and integrity. Honesty related to avoiding anything taken from any other's work without acknowledgement. Integrity refers to resisting the research from temptation of any actual findings, or falsifying data to suit with predetermined positions or values. Research ethics involved gaining informed consent from the participants after informing them about the purposes, methods and uses, and any risks involved to the research. This might ensure the dignity, rights, safety and well-being of the research participants, clients (users) as well as of the researchers.

III. DESIRABILITY OF OBJECTIVITY AND ETHICS IN RESEARCH

According to Berger (1991) the researchers have to be objective, to control his personal preferences and prejudices, to perceive clearly from the evidence rather than to judge normatively**.** It is desirable to interpret and present authentic and real facts of the observations of any research. Intrusion of values in research is inevitable rather the researcher's deliberation to avoid this. Objectivity need to be upheld in the research process. This means that once the research begins, researchers should not let their personal values influence the collection and analysis of data, and they should not hide or alter research findings for their own beliefs or expectations. At this point, the question is no longer confined to the issue of objectivity, but involves professionalism and academic morality as well. This will open the door for contributing by authentic knowledge in the specific field of research. It can be substantial successes of an academic work through inducing social change. The researcher needs to be aware about the value-neutrality of the research to represent the authentic knowledge that could be applicable to the society for betterment of life of the people as like scientific research.

The researcher's conduct of enquires need to be a fair and balanced in which personal and political values plays no part, in both the research method and in the publishing of the findings (McNeill, 1990). Authentic findings of an empirical research can provide implications for welfare of the society and nature through optimal utilization of resources. Value oriented and/or unethical empirical research finding can distort the policy planning and decision making. One major advantage of value freedom is that it enables a researcher to make better judgments (as much as possible) on the research field. It enables him/her to see from different standpoints to explore the reality which can produce high impact theoretical base for further research to generate new insights.

IV. POSSIBILITY OF OBJECTIVITY AND ETHICS IN EMPERICAL RESEARCH

Truth itself is a value. According to the view of Hammersley (1995), the primary goal of research should involve the attempts to realize the truth. The question 'whether empirical research can be value free' is raised mainly from the researcher's conceptualization stances and the methods adopted to administrate the research. The place of values in empirical research is mostly unavoidable. Empirical research might be influenced by social interest, economic and organizational forces. Therefore, the research becomes social, economical or organizational value dependent.

The researchers are implicated themselves by the society upon which they study. Therefore, total freedom from values would be impossible without the total removal of the researcher from society himself. Society changes quickly and thus social organizations, network changes. It is not possible for a researcher to be personally value-free, since values are eternal of human. However, methodologically, value-freedom could be possible if a researcher clearly states the assumptions under which he/she is interpreting their data. Bruun (1972) mentioned the concept of 'objectivity' that there is less possibility of rational choice among ultimate values, because in the modern world ultimate values are in conflict as they imply different ways of life.

Hammersley (1995) pointed out several ways through which value judgments have an impact on research. Firstly, research presupposes some goals that might be associated with values and it can not be value free or politically neutral. Secondly, research requires resources, and a value judgment is involved of the desirability of the suppliers of those resources such as donor, university. Thirdly, research is founded on some presuppositions which reflect the cultural value arising from the socio-historical locations of researchers including their gender and ethnicity. Fourthly, research has material effects.

Weber (1949) claims that the knowledge of cultural reality is always from particular points of view and there can be no absolute 'objective' scientific analysis of 'social phenomena'. Social research could not be value free, but it is argued that the deliberate dissemination of personal values can be avoided in lectures and publications (Parkin, 1986). Empirical research cannot deny the social phenomena while doing research. Social phenomena are mostly motivated by the social norms, values, culture, views of the specific society where it belongs. These societal values stimulate individual values of the researchers. Empirical research holds some commitments for creating convenience in practical life for human being such as equal right, provision of basic needs with which several socio-cultural value driven matters are associated. For example, low income housing provisions, transportation facilities for the physical disable people, gender equality in job market, supporting small entrepreneurs.

Political circumstances can conquest over value freedom of the researcher while conducting the research. The research results might be used for purposes for which the researcher has not anticipated which is called as 'unintended consequences of social actions' (May, 2001). Thus, the researcher face insurmountable problems in defending his position, even though he adhere to 'value neutrality' throughout the research process. Mills (1970) criticized the impact of functionalist and power elites in research, and suspected against generation of empirical and value-free information in the research. Research cannot be value-free that are in favor with the powers.

Peel (2009) argued for supporting the need for a more explicit articulation of values in the research (mainly focusing built environment research) as the efforts tend to be problem and policy-oriented; that is, mostly 'applied' in nature rather than 'pure'. He mentioned regarding methodological stance that as research cannot be completely value free as the research includes the views from diverse initiators of different believers who might have some values. For example, the team members in a research project might have different values. When a researcher accepts some assumptions or preconceptions (for doing a value free research), he might face debates stirred by various values of team members. Moreover, whenever a researcher attempts to admit the concepts, ideas or strategies of the earlier research, values of earlier researchers might intrude in the research consciously or unconsciously.

Empirical research often involves ethical dilemmas because of involvement of people. This research can be intrusive through getting the time of the participants, accessing to their home or work place to get data, asking them questions about their personal and family life, preference and so on. Ethical research involves having 'informed consent' that is impossible sometimes. For example, ethnographic observation method of a research requires observing the activities of people. In this method, informed consent of the target people might change their behavior and activities. Most research requires having written consent from the participants. However, it is problematic when the empirical research involves determination of any forms of informality, illegality (i.e. corruption, crime, food manipulation) or some matters on which people are reluctant to share (i.e. sexual behavior).

Research ethics is subject to voluntary participation of the participants and free from coercion. There is risk of contamination of the evidences provided by the participants while they are given money or gifts for participating. However, it is unusual to persuade a day laborer, construction worker or

rickshaw puller (for example) to give time for participating in a research (during the time they can earn money if they work).

V. POSITION OF VALUES AND ETHICS IN EMPERICAL RESEARCH METHODOLOGY

The process of conducting an empirical research on a fundamental research problem, needs to design in order to provide policy makers pragmatic, action oriented implications for alleviating the problem (Majchrzak, 1984). Values could take a position into research in a number of ways during the stages while conducting research. Here is an attempt to clarify about the processes through which values can enter inter into different stages of empirical research.

A. Values and ethics during selection of a subject-matter to research

Values enters into the empirical research at the outset, when it is decided what to study. The researcher has to make some kind of initial judgments about his/her preferred subject area. The process of selecting a research topic is influenced by researchers' personal backgrounds, interests, and experiences. Therefore, selection of research topic is influenced by personal values; the values of the community that constitute a 'worthwhile' project; the values of society that constitutes a 'social problem'; the values of the funding agencies. The researchers cannot be value free in selection of research problems, i.e. the preference for certain hypotheses or conceptual schemes and disapproving others. Multidisciplinary empirical research is insisted by the individual expertise of the researcher. So, it is evident that choice of research subject matter is motivated by individual values of the researchers, community or funder.

Contemporary research has moved away from ‘research-led model’ to ‘customer-contracted model’ where the research are conducted through projects commissioned by the funders. In the customer-contracted model the customer/ client/ funder reserve the right about what to be investigated that reduces the control of the researcher over choosing the research agenda. It means that sometimes, institutions with economic power have the control over the production of knowledge.

B. Values and ethics while choosing research methods

During selection of research method, the researcher could face the challenge of selectivity. Nevertheless, this is not to say that researchers falsify their data and conclusions become selective. In the real world of research, grants and jobs of the researchers bring the pressure to follow particular ways of research, adopt particular methods and so forth, if they want their work published and applied. The customer-contracted model mostly reserves the right to select the methods based on their expertise and resources. Moreover, research methods can be faulty in which research objectivity become impeded that can also effect reliability of research.

C. Values and Ethics during rata collection

It is evident that authenticity of data collection is undeniable to get a valid and reliable result through research. Much empirical research select convenience and purposive (for example) sampling techniques for convenient and cost effective research. Lack of representativeness of the sample, sampling biasness, sampling error could generate faulty findings and eventually misguide conclusions. May (2001) expressed that whenever researchers wish to concentrate on one group of people rather than another, it reflects their own bias towards that group. Questionnaires surveys, interviews, focus group discussions and participant observation are some common methods employed to amass primary data in empirical research. The drawbacks of data collection through these earlier methods include the need to be very specific about the types of questions asked. People have personal bias, prejudices and can misinterpret the questions. People also tend to say what they think the interviewer wants them to say. Observation requires a human observer where the issue of value neutrality comes to the fore.

D. Values and ethics while interpretations about the collected data

Interpretation of the observed data consists of very important part of any research. It is not possible for researcher (as human beings) not to have some preconceived expectations about the collected empirical data. Therefore, the questions about how to interpret data, does not fit into the expectations already formulated. The difficulty also involves preconceived notions about what kind of data will or will not be significant. May (2001) pointed out that during data reduction and analysis the researchers face the problem of selectivity. While being selective, a number of interesting findings can be missing which could aid understanding and explanation of the research. Generalization of findings could be subjective (value relevant) due to personal bias on selectivity of data used and interpretation.

E. Values and ethics while publication and using the research finding

Publication could involve value judgments. Objectivity in research publication is questioned whenever use of logical arguments and presentation of evidence is influenced by personal and/or social value judgments. When the research funder reserves the right over an empirical research, or the political power holds the control for decision making, the research findings might be value oriented through misinterpretation of the data to use for their own favor.

VI. OPPORTUNITY TO PROMOTE OBJECTIVE AND ETHICAL EMPERICAL RESEARCH

Research need to achieve the criteria of validity, reliability and generalizability. McNeill (1990) suggested the researcher needs to search for objective or value free knowledge. However, if values intrude into empirical research, it does not mean that the research outcome is completely biased. Berger (1991**)** mentioned the researcher needs to be concerned with the practical applicability and consequences of his/her findings, and moves out from realms of values and ideas that he shares with other researchers. Regardless social or natural, empirical research cannot avoid value relevance in the research. However, there is still opportunity to promote objectivity in research to an expected extent to achieve valid, reliable and generalizable findings.

Mixed methods can provide stronger evidence for a conclusion through convergence and corroboration of findings through triangulation. A great challenge of a researcher is to be moved by the conflict between faith and truth. Academic and professional knowledge is important for a researcher to trace multidisciplinary notion from theoretical and practical stance while doing research. Integrity and effective analytical ability to put the theoretical debates in practice of the researcher assists to reserve the place of objectivity, so that the research outcome could not be contaminated by individual biasness. Critical analysis of literature has the potentials to enhance value free research concepts. Researcher needs to be aware about the changing conditions of ideas, beliefs as well as the knowledge to define social problems.

McNeill (1990) asserted about the concept of 'value-relevance' that the choice of research topic may well be influenced by values of a personal context, but these 'value-commitments' should not leak into the methods of research. The researcher needs to be aware about selecting the research methods. Comprehensible and standardized concepts and definition development of the research problem can guide the research well to be focused to the research objectives. Secondary sources need to be used with care. It is important to be aware of where the information comes from and to remember that some sources are more valid than others. Ahmed (2010) pointed out that utilization of quantitative research approach (i.e. quantitative data management,

statistical analysis) have more potentials of becoming value free compared to qualitative though the methods need to be rationale to the data required for a research. He also mentioned, the researcher needs to be conscious about representativeness of the sample of the study. In the case of availability of resource (i.e. time, man power), random sampling is more reliable compared to non-probabilistic sampling methods (i.e. convenience, purposive methods) to produce value free responses. He suggested, patience, self-control and open mind of the researcher are important to minimize intrusion of personal values in research.

Assurance of confidentiality and anonymity of the participants in the research can persuade the participants to provide authentic information. For avoiding the risk of contamination of evidence provided by the participants, any gifts can be provided to them after participation (possibly without pre-announcement). While informed consent might distort the internal behavior, the information regarding the target groups can be obtained from the person who knows very well about the behavior of the target people. For example, a traffic police can be interviewed about pedestrian behavior. However, there is matter of ethical acceptance about collecting second hand evidence in this way. The researcher might clarify the significance of the type of approach.

The questions in the 'interview schedule' (the questionnaire/ the inventory of the questions to ask, or topics to discuss with the participants) for interviews, discussions need to be very carefully structured. Pilot testing of the interview schedule might increase the acceptability to all stakeholders (the researcher, participants and the funders) to extract the authentic information from the participants. Moreover, participant observation technique requires that the researcher live among the group under study. Sharing information among other researchers and the participants increases the possibility of value neutrality.

Interpretation from the analyzed data is the most critical stage, where values intrude in research. The research findings need to have validity that the findings/ outcome are presented truly. Providing explicit evidences for generating the findings can promote objectivity of research. It is needed to enhance reliability by clarifying the methods of the research in the publication, and consistency testing of the data based on which conclusion is generated. It is needed to attempt determining generalizability (wider claims about the general occurrence of the findings) by comparing the research with others. Finally, academic and professional ethics stir the opportunity of value free research. Finally, integrity, truthfulness, responsibility, commitment and comprehensive contextual knowledge of the researchers are important for value free research to generate high impact empirical knowledge.

VII. CONCLUSIONS

It is evident that objectivity and ethics are very crucial in empirical research for improving knowledge and contributing to decision making related to society and nature. However, intrusion of personal, participants and funders' values (i.e. bias, belief, presupposition about the research findings) in research is unavoidable during all of the stages of empirical research process. This research theoretically explains whether logical value-relevance and/or disregarding ethics to some extent ruin the reliability, validity and generalizability of research for generating new empirical knowledge or not. This article presents that the values and beliefs of the stakeholders intrude in empirical research both consciously and unconsciously. It is also recognized that sometimes, research process prevents maintaining research ethics. During every stages of empirical research, there is possibility of intrusion of personal, participants and funders' values. However, it does not mean that value relevance and/or contravening ethics completely ruin the reliability, validity and generalizability of research.

There are possibilities to attain objectivity in research through mitigating the impacts of the values and maintaining the ethics. The researcher needs to be conscious, honest about personal values and beliefs, and recognize the position of these values during research development, data collection and generating outcome. Appropriate research design, effective sample design, carefully data collection, and data interpretation might enhance objectivity of empirical research. And thus, knowledge obtained through objective and ethical empirical research can play important role for benefit of the society and nature. This article claims though absolute value free empirical research is not possible, relative value free empirical research is possible through effective tactics during all of the stages of research that can produce reliable, valid and generalizable knowledge.

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The Effect of Parental Mediation and Television Co-Viewing on Adolescents Sexual Initiation in Kenya

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Abstract- This paper examines the effects of parental mediation and television co-viewing on adolescents' sexual initiation. Television plays an important role in the sexual socialization of adolescents. In Kenya, it has been established that sexual activity starts early, that 42 per cent of girls aged15-19 years have had sexual intercourse and 17 per cent are sexually active. Early sexual initiation (before age 16) is likely to involve sexual risk-taking and expose young people to unwanted sex, sexually transmitted infections, and teenage pregnancy. Research has revealed that in Kenya early sexual behaviour is manifested in the youth's high incidence of pregnancies, abortions, stress and sexually transmitted diseases, including HIV/AIDS. The paper sought to investigate the effects of parental mediation and TV co-viewing on adolescents sexual initiation by addressing the following three fundamental concerns, (1) how television influences early sexual initiation of adolescents, (2) the extent to which parental mediation and television co-viewing may influence adolescents sexual initiation, (3) whether television can play a major positive role in promoting adolescents sexual awareness. The paper revealed that Watching TV shows with sexual content apparently hastens the initiation of adolescents' sexual activity.TV shows with content about contraception and pregnancy can help to educate teens about the risks and consequences of sex and can also foster beneficial dialogue between teens and parents. The paper also revealed that parental TV co-viewing of sexual content serves as an endorsement of the material for adolescents, restrictive mediation is best in moderate amounts, and that active mediation is most effective when it is paired with an open, conversational delivery style. Overall this paper concluded that there exists a relationship between parental TV co-viewing of sexual content and the sexual initiation of the youth. The study therefore recommends that media literacy as a skill needs to be improved to enable the youth to interpret TV media content correctly in order to avoid the possible effects that are sometimes not intended by the media practitioners.

Index Terms- parental mediation, parental TV co-viewing, sexual initiation, adolescents

I. INTRODUCTION

1.1 BACKGROUND

Television plays an important role in the sexual socialization of adolescents (Buerkel- Rothfuss & Strouse, 1993; Pinkleton, Austin, Cohen, Chen, & Fitzgerald, 2008; Ward, 2003;Ward & Rivadeneyra, 1999). Adolescents who watch more sexual content are more likely to perceive less serious consequences of sex (Farrar, 2006), become sexually active (Brown et al., 2006), and experience greater risk of pregnancy (Chandra et al., 2008). Little research has examined parents' role in mitigating these effects. And yet, the work on parental mediation of television has shown that parents can play a significant role in reducing youngsters' susceptibility to other undesirable outcomes, like aggression and stereotype formation (Huesmann, Eron, Klein, Brice, & Fischer, 1983; Nathanson, 1999).

In Kenya, it has been established that sexual activity starts early, that 42 per cent of girls aged 15-19 years have had sexual intercourse and 17 per cent are sexually active (CBS, 2004). The median age in Kenya for first sexual intercourse rose from 16.8 years in 1998 to 17.8 years in 2003 (CBS, 2004).A study conducted by the African Medical and Research Foundation (AMREF) (1993) among female adolescents in various schools in Kenya found out that majority of the school going female adolescents are sexually active and some of them had multiple sexual partners. A study by Kamaara (1996/1997) conducted in Uasin Gishu County in Kenya had similar findings with the other studies. According to the study, 51 per cent of the youth interviewed were sexually initiated before the age of twenty and about 65 per cent indicated that they were currently having sexual relationships with more than one partner.

Research done in the Department of Obstetrics and Gynaecology of the University of Nairobi, Centre for the Study of Adolescence (CSA) and the Family Planning private sector (FPPS) concurs that about 80 per cent of the youth between ages 15-25, are sexually active (CSA, 1994). Out of these, 4 per cent engage in sexual relations before the age of 10; about 55 per cent become pregnant by the age of 20 and 60 per cent of them have multiple sexual partners (Aggarwal & Mati, 1982).

The high incidence of premarital sexual behaviour is further manifested in the high number of youth being affected by HIV/AIDS. The Kenya National AIDS control council and the ministry of health in Kenya (NACC, 2010; Ministry of Health, 2001). They have established further that more than 75 per cent of the AIDS cases occur between ages of 15 and 45 years, with the peak for AIDS being 25-29 for females and 15-25 for males. The implication of this is that HIV infection is prevalent at the age group between 15-25 meaning that majority of the youth contract the virus when they are still in their adolescence. It is against this background that this paper sought to examine the role of parental mediation and television co-viewing on adolescents' sexual outcomes.

1.1 STATEMENT OF THE PROBLEM

Sex is common on television and becoming more prevalent over time (Kunkel, Eyal, & Finnerty, 2005). Programs often

depict women as sexual objects, including presenting them in provocative clothing (Andsager & Roe, 1999) and as objects of sexual harassment (Grauerholz & King, 1997). Sexual content often lacks depiction of sexual planning, with few references to sexually transmitted diseases (STDs), contraception, and abortion (Kunkel et al., 2001; Lowry & Towles, 1989; Sapolsky & Tabarlet, 1991). Sex is usually depicted as glamorous, with the bulk of sexual activity occurring outside of marriages (Cope-Farrar & Kunkel, 2002). The depiction of sex varies across genres (Franzblau, Sprafkin, & Rubinstein, 1977; Greenberg & Busselle, 1996; Greenberg & D'Alessio, 1985).

Ward (1995) found that more than one quarter of prime time programs popular among adolescents involved sex, and many promoted a recreational attitude about sex and stereotypes about sexual roles. Other work shows that exposure to sexual television contributes to earlier sex initiation (Collins et al., 2004; Martino et al., 2006), more sexual experiences and partners (Bleakly, Hennessy, Fishbein, & Jordan, 2008; Brown & Newcomer, 1991; Brown et al., 2006), more negative attitudes toward the use of contraceptives (Escobar- Chaves et al., 2005), and higher rates of teen pregnancy (Chandra et al., 2008).

Kenyan domestic TV is dominated by foreign material such as soap operas, music and movies. (African Media Development Initiative: Kenya Context, 2007). Kenyan television music is laden with staggering sexual graphics. (Gakuha, 2010). Most songs include innuendo, partial nudity and sexual situations and behavior. The television media channels depict half-dressed women in sexually suggestive body movements and often play lyrics intended to inflame sexual feelings, (O'Toole, 1997).

According to Johnson, Cohen, Smailes, Kasen and brook (1999), the average adolescent spends more time watching television than in the classroom. According to Donnerstein and Smith (2001), parents who openly communicate and actively co-view television may protect adolescents from potentially detrimental effects of exposure. Frequency of viewing (Malamuth & Impett, 2001) appears to be important as well. Although we might hope that parents would be the primary source of sexual guidance for their children, they often find it difficult to present timely and clearly expectations, or even accurate information. (Brown, Steele & Walsh-Childers, 2002). It is against this background that this paper examines the effects of parental mediation and television co-viewing on adolescents' sexual initiation.

1.2 Objectives

Generally the purpose of this paper was to examine *the effects of parental mediation and television co-viewing on adolescents' sexual initiation.* The paper specifically discusses how television influences early sexual initiation of adolescents, the extent to which parental mediation and television co-viewing may influence adolescents sexual initiation and finally the paper examines whether television can play a major positive role in promoting adolescents sexual awareness.

II. THEORETICAL BACKGROUND (LITERATURE RIVIEW)

2.1 Exposure to TV Sex May Hasten the Initiation of Sexual Activity Among Adolescents

In social learning theory (Bandura, 1971), young people can learn about sexuality from others depicted in the media. According to Albert Bandura's cross-species and cultural studies, human sexuality is governed primarily by social conditioning, rather than endocrinal stimulation (Chapin, 2000). The cultivation theorists say that television's consistent images and portrayals construct a specific portrait of reality. Gradually, viewers come to cultivate or adopt attitudes and expectations about the world that coincides with this portrait. Garner et al. (1998) underscores this observation by stressing that young people are most dependent on the media as a source of information when they lack personal experience and interpersonal advice in the area they are seeking knowledge.

The sexual content in television can affect any age group, adolescents may be particularly vulnerable (Ward, 2003) since they are still in the impressionable developmental stages and are attempting to establish their own identity. Adolescents may be exposed to sexual contents in the media because they are still at their developmental stages and hence cannot decipher good from bad media programming. Analysis of television media content in America indicate that, on average, adolescent viewers see 143 (Ward & Friedman, 2006) incidents of sexual behaviour on network television at the most important times each week, with portrayals of three to four times as many sexual activities occurring between unmarried partners as between spouses. As much as 80% of all movies shown on television stations have sexual content (Chunovic, 2000). Therefore, an analysis of television media content also shows that sexual messages on television are almost universally presented in a positive light, with little discussion of the potential risks of unprotected sexual intercourse and few portrayals of adverse consequences (Anderson, 2004).

Sexual television content affects attitudes and beliefs conducive to early sexual initiation, including more permissive sexual norms, more positive expectations regarding sex and greater safe-sex self-efficacy (Bleakley, Hennessy, Fishbein, & Jordan, 2011; Braun-Courville & Rojas, 2009; Martino, Collins, Elliott, Kanouse, & Berry, 2009; Peter & Valkenburg, 2009). Several US longitudinal studies have found that exposure to sexual content in TV programmes predicts earlier timing of sexual behaviour (Bleakley, Hennessy, Fishbein, & Jordan, 2008; Brown & L'Engle, 2009; Brown et al., 2006; Collins et al., 2004; Martino et al., 2006; O'Hara, Gibbons, Gerrard, Li, & Sargent, 2012).

Television may create the illusion that sex is more central to daily life than it truly is and may promote sexual initiation as a result, a process known as media cultivation. (Gerbner, Gross, Morgan, & Signorelli, 1994). Early sexual initiation (before age 16) is likely to involve sexual risk-taking and expose young people to unwanted sex and teenage pregnancy (Martinez, Copen, & Abma, 2011). Most sexually experienced teens wish they had waited longer to have intercourse and unplanned pregnancies are more common among those who begin sexual intercourse earlier. (Collins et al., 2004).

Adolescents with a high level of exposure to television shows with sexual content are twice as likely to get pregnant or impregnate someone as those who saw fewer programs of this kind over a period of three years. (Parkes et al., 2013).According to Martino et al. (2005), television brings about early sexual

intercourse. Brown et al. (2005) indicates that the early initiation of sexual intercourse is a risk factor for teenage pregnancy and sexually transmitted infections (STIs) among adolescents.

2.2 Parent–Child Communication about Sex

Parents can be key agents in shaping adolescents' sexual outcomes (Handelsman, Cabral, & Weisfeld, 1987; Holtzman & Robinson, 1995; Jaccard & Dittus, 1991; Karofsky, Zeng, & Kosorok, 2000; O'Sullivan, Jaramillo, Moreau, & Meyer-Bahlburg, 1999; Rodgers, 1999). Parental discussion is related to later onset of sex (Fisher, 1987; Pick & Palos, 1995), fewer sexual partners (Leland & Barth, 1993), more effective contraceptive use (Fisher, 1987; Miller, Levin, Whitaker, & Xu, 1998; Thompson & Spanier, 1978), and reduced incidence of pregnancy and AIDS (Jaccard & Dittus, 1993).

Parent-child discussion conveys parental attitudes about sex (Dittus, Jaccard, & Gordon, 1999; Fisher, 1985, 1987; Meschke, Bartholomae,&Zentall, 2000). These types of conversations typically occur after "the big talk" about menstruation and reproduction, and may reveal parents' attitudes indirectly by discussing others rather than the teenager (Hepburn, 1983). Fisher (1986) found that the correlation between parents' and adolescents' sexual attitudes in high-communication families was stronger than that in low-communication families.

Similarly, Lewis (1973) reported that by discussing sex, parents can transmit sexual values to adolescents. Likewise, the absence of parent–child communication can send messages about parents' attitudes about sex (Darling & Hicks, 1982). However, Moore, Peterson, and Furstenberg (1986) found little evidence that parental communication and monitoring discouraged sexual activity, while Furstenberg, Herceg-Baron, Shea, and Webb (2001) found no relationship between parent–child communication and contraception use. Others (e.g., Jaccard, Dittus, & Gordon, 1996; Widmer, 1997) have observed positive relationships between parent–child communication and sexual activity. The contradictory evidence suggests that researchers may be overlooking an important component of parent–teen conversations about sex.

2.3 Communication Styles

The style that parents use when communicating with their teens may be an important predictor of the success of these conversations. Although early studies have focused on frequency and content of conversations (Rosenthal, Senserrick, & Feldman, 2001), recent work has revealed that communication styles are important predictors of adolescents' sexual outcomes (Boone & Lefkowitz, 2007). Research on parenting styles makes the distinction between an open, warm communication style and one that is focused on asserting power (Baumrind, 1968), with the former being more effective than the latter (Baumrind, 1997; Hoffman, 1970). This distinction has also been made by scholars studying Family Communication Patterns (FCPs);(Fujioka & Austin, 2002; McLeod & Chaffee, 1972), with concept-oriented parents encouraging more openness and discussion and socio-oriented parents favoring family harmony by avoiding controversy and deferring to authority.

Parents who use an open style tend to have adolescents who experience positive outcomes. Open styles have been related to less sexual risk taking (Kotchick, Dorsey, Miller, & Forehand, 1999) and safe sex practices among adolescents (Mueller & Powers, 1990). Whalen, Henker, Hollingshead, and Burgess (1996) also found that parents who were less directive had children who knew more about AIDS. Finally, Lefkowitz, Sigman, and Au (2000) found that adolescent girls were able to learn more about AIDs from mothers who had been trained to communicate more effectively.

However, adolescents are often dissatisfied with how parents communicate about sex. Adolescents often feel that their parents are controlling and to use a lecturing style when discussing sex (Rosenthal et al., 2001). In fact, Pistella and Bonati (1999) found that more than half of teenaged girls wished their parents would listen more and talk with them on an adult level.

2.4 TV Can Also Inform Teens About Risks and Foster Communication with Parents

Researchers (Collins et al.,2004) concluded that entertainment shows that include portrayals of sexual risks and consequences can potentially have two beneficial effects on teen sexual awareness: They can teach accurate messages about sexual risks, and they can stimulate a conversation with adults that can reinforce those messages. Reducing the amount of sexual talk and behavior on television, or the amount of time that adolescents are exposed to them, could appreciably delay the onset of sexual activity.

According to Collins et al., (2004), increasing the percentage of portrayals of sexual risk and safety relative to other sexual content might also inhibit early sexual activity as well as increasing knowledge of sexual risks and how to be safe, and stimulating dialogue with parents. (Martino et al., 2005) The first RAND study, found out that reducing teens' exposure to portrayals of sex on television poses challenges, however, having parents view programs with their children and discuss their own beliefs regarding the behavior depicted can reinforce the benefits of accurate risk information and positive messages and may help to limit the negative effects of sexual portrayals that do not contain risk information.

2.4 Parental Mediation of Sexual Television:

Television may provide opportunities for parents to initiate discussions of sex in a less threatening setting. Because the focus is on characters' behaviors, parents may feel more comfortable and adolescents may feel less embarrassed or defensive. There are many possible types of parent–child discussion of television. Messaris (1982) studied three forms of communication: categorization (discussing how TV reflects the world), validation (endorsing or condemning television), and supplementing (supplying additional information).

Contradiction is often linked with positive outcomes (Austin, Pinkleton, & Fujioka, 2000; Nathanson, 1999), while validation of problematic content is often related to negative effects (Austin & Chen, 2003; Hicks, 1968). Supplemental mediation often produces more learning from TV (Collins, Sobol, & Westby, 1981; Corder-Bolz, 1980).

2.5 Co-viewing and Restrictive Mediation of Sexual Content

Co-viewing refers to parents and children watching television together (Valkenburg, Krcmar, Peeters, & Marseille, 1999). Co-viewing could communicate that parents hold positive

attitudes toward the material, leading children to pay closer attention to and learn from programs that are co-viewed. Depending on the content, we can expect either positive or negative effects of co-viewing.

Positive effects include enhanced learning from educational television (Salomon, 1977), and negative effects include increased aggression after co-viewing violent TV (Nathanson, 1999), endorsement of stereotyped sex roles due to co-viewing gender stereotyped TV (Rothschild & Morgan, 1987), and perceived realism of TV characters (Messaris & Kerr, 1984). It is likely that co-viewing sexual content with adolescents would strengthen adolescents' perceived importance of the content.

This may lead adolescents to pay more attention to the material and learn from it, resulting in less accurate sexual knowledge and positive attitudes toward sex. In addition, adolescents may infer that co-viewing parents have favorable attitudes toward sex, which could lead to risky sexual behaviors. Restrictive mediation occurs when parents set rules about children's television viewing (Weaver & Barbour, 1992). The existence of viewing rules can decrease the importance of television for children (Nathanson, 1999). However, Nathanson (2002) found that adolescents were more likely to seek out restricted content elsewhere. Moreover, Nathanson (1999) found that the relationship between restrictive mediation of violent television and children's aggression was curvilinear, with very low and very high levels of restrictions triggering more aggression and moderate amounts of restrictions producing optimal effects.

Restrictive mediation of sexual content may generate unintended effects among adolescence, especially with regards to the "forbidden fruit" response, in which the restricted behavior becomes more tantalizing and pursued because it is restricted (Bijvank, Konjin, Bushman, & Roelofsma, 2009; Bushman & Stack, 1996). As a result, restricting sexual content can increase its attractiveness among adolescents (Cantor, Harrison, & Nathanson, 1997). This could lead them to watch more sexual content when parents are absent (Nathanson, 2002), which could increase acceptance of the stereotyped and recreational views of sex portrayed on television.

III. METHODOLOGY

This paper was based on literature review related to the following specific objectives: To find out if television influences early sexual initiation of adolescents, the extent to which parental mediation and television co-viewing may influence adolescents sexual initiation and whether television can play a major positive role in promoting adolescents sexual awareness. Literature of journals were reviewed. Some of the journals include: International Journal of Scientific and Research Publications, Volume 4, Issue 5, May 2014 1 ISSN 2250-3153 ; New Media and Mass Communication ISSN 2224-3267 (Paper) ISSN 2224-3275 (Online) Vol.27, 2014; The Journal of Education and Practice ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol 3, No 7, 2012; Journal Media and Communication Studies. Vol. 2(7), pp. 154-158, ISSN 2141 – 2545 August 2010; Nigerian Journal of Social Studies and Civic Education Vol. 4, Issue 1, pp 135-ISSN: 2315-6813 147, June, 2013.

IV. CONCLUSION

The paper has made the following conclusions based on the reviewed literature:

Adolescents are the wheels of change than other segments of the population. Hence, the future fate of the society depends on the demographic and reproductive health of this segment of the population; hence they have to be free of risky sexual behaviour. Television viewing does have an impact on adolescents' sexual initiation for example watching sex on TV may predict and/or hasten adolescent sexual initiation. Alternatively, parents may be able to reduce the effects of sexual content by watching TV with their teenage children and discussing their own beliefs about sexual issues.

Parental behaviors surrounding sexual television do play an important role, with some behaviors exacerbating the negative effect and others mitigating it. Parent–adolescent co-viewing of sexual television content was related to engaging in sex at a younger age and having more sexual partners. This effect was found even when the adolescents' exposure to sexual media content was controlled. It is likely that parents who co-view sexual television unintentionally endorse the content and characters, thereby making the behaviors more acceptable to the adolescents.

This paper reveals that there is strong evidence that co-viewing of objectionable television content is related to undesirable sexual outcomes among adolescents. There is need for the education of students, parents, media organisations, government and the entire society on the negative effects TV has on adolescents sexual behaviour. This awareness will help in understanding of the problems as it affects the adolescents and may help delay sexual initiation among the youth.

V. RECOMMENDATION

- Parents should use restrictive mediation with caution, especially with adolescents. Setting limits on viewing is effective in moderate doses; however, very low or very high levels of restrictions are related to undesirable outcomes. This finding underscores the importance of examining the ways in which parents communicate rules and expectations. It is likely that moderate amounts of rules are tolerable to adolescents and leave open the possibility of negotiation and discussion of restrictions. However, too few rules or too many rules leave adolescents more vulnerable to television.
- Parents should assist their children to become 'media literate' by discussing Television Content so that they can differentiate reality and fiction. This will go a long way to prevent the adolescents from becoming passive victims of TV content.
- Further research on Television viewing influence is necessary in order to enhance our understanding of communication systems in society.
- Parents have irreplaceable role in paving the way on how to help their children by teaching them the necessary skills and responsibility for maintaining and protecting their sexual health; to do this, parents should assess their level of knowledge related to reproductive

health and acquire the necessary knowledge to provide accurate and current information.

- Adolescents should be equipped with the necessary communication skills about sexuality issues in particular; concerned bodies especially those working on adolescents, should help both parents and adolescents in providing the necessary knowledge and skills.

Other important steps you can take to curb or mitigate adolescents exposure to sexual content on television include:

- Parents Watching TV with their adolescent children and discussing their beliefs about sex and about the sexual behaviors portrayed on TV.
- Developing TV-watching guidelines for adolescents and enforcing them.
- Limiting the amount of time children watch TV. Instead, one can use family movie reviews to rent movies with appropriate content.
- Encourage and reward adolescents for reading instead of watching TV.
- Encouraging adolescents to find and develop non-television related hobbies and interests.

In summary, research on parental mediation of sexual content can help us understand how parents can maintain their influence over adolescents in the face of undesirable sexual messages on television. In addition, it could help us understand how to increase the frequency and effectiveness of parent-adolescent conversations about sex. Although we are unlikely to change adolescents' desire to learn from sexual media, we could possibly inform parents about how to best mediate adolescents' exposure to this content so they can become socialized into a set of healthy and responsible attitudes, beliefs, and behaviors.

By taking these simple steps, one can help to ensure that adolescents' attitudes and beliefs about sex are more closely monitored and that their sexual initiation is delayed.

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Pathogenicity of *Aeromonas hydrophila* to blunt snout bream *Megalobrama amblycephala*

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Abstract- This study was carried out to confirm whether *Aeromonas hydrophila* is a main haemorrhagic pathogen in blunt snout bream *Megalobrama amblycephala* (BSB). The fish was challenged with bacterial concentrations of 1.7×10^4, 1.7×10^5, 1.7×10^6 and 1.7×10^7 cfu/fish for 7 days post infection. The results showed that mortality was bacterial-dose dependent, with 100% mortality observed at 1 day at the highest dose level (1.7×10^7 cfu/fish). For comparison, control fish exhibited cumulative mortalities of 0%. The median lethal dose (LD_{50}) was 5×10^5 cfu/fish. A total of 15 bacterial strains of *Aeromonas* were re-isolated from challenged fish and re-identified based on morphological characteristics, biochemical tests and genomic DNA gene sequencing. No bacteria were isolated from the control group. This study results indicated that *A. hydrophila* is capable of causing haemorrhagic septicaemia in BSB. Antibiotic susceptibility test with two strains D4 and HU201301 was investigated; both strains showed sensitive to most of the tested drugs.

I. INTRODUCTION

Blunt snout bream *Megalobrama amblycephala* (BSB) or Wuchang fish is an herbivorous fish species and commonly distributes in the middle portion of Yangtze River (Fishbase 2012). BSB has become a favourable freshwater aquaculture species in China (Tsao 1960; Zhou et al. 2008). During the past culture time, BSB culture industry has suffered problems related to degrading pond environments due to development of intensification which resulted in the odd of stress-induced disease (Nielsen et al. 2001). Many fish farms have been particularly infected by epidemics of *Aeromonas hydrophila* which has been reported causing haemorrhagic septicaemia clinical signs and histopathological changes, and causing a great loss in cultured BSB (Neilsen et al. 2001; He et al. 2006).

It has been known for decades that *Aeromonas* plays a causative agent role in fish diseases. The wide-spread distribution in aquatic ecology systems indicates that interactions of *Aeromonas* species with fish are continuous and unavoidable, facilitating their opportunistic pathogenicity (Ottaviani et al. 2011; Hu et al. 2012). *A. hydrophila* were recorded widely infecting freshwater fish and marine fish species associated with skin lesions, tail and fin rot, haemorrhagic septicaemia over the body and tissue destruction, epizootic ulceration and necrosis in the liver and kidney of fish (Austin and Adams 1996; Doukas et al. 1998; Janda and Abbott 2010). It was considered as a significant economic problem, particularly in China and India over the past decade (Citarasu et al. 2011). The existence and pathogenicity of *A. hydrophila* have been reported in a variety of freshwater species, comprising *Salmo gairdneri* (Peters et al. 1988), *Clarias batrachus* (Angka 1990), tilapia (Liu et al. 1999), *Carassius auratus* (Iqbal et al. 1999; Citarasu et al. 2011), *Cyprinus carpio* (Chirila et al. 2008; Citarasu et al. 2011), *Oreochromis niloticus* (Ibrahem et al. 2008), and *Channa striata* (Duc et al. 2013). Nevertheless, to date the infection information of BSB in China is still limited. In present study, the efforts were conducted by a challenge test to confirm whether *A. hydrophila* is a main haemorrhagic pathogen in BSB.

II. MATERIALS AND METHODS

A. Bacterial strain and bacterial suspension preparation

A. hydrophila D4 used in this experiment was isolated from BSB with clinical signs of haemorrhagic septicaemia cultured in Dongxihu, Hubei, China in 2012 and maintained in the College of Fisheries, Huazhong Agricultural University. The bacterium was cultured on the agar medium (including 3 g beef extract, 10 g peptone, 5 g NaCl, and 15 g agar in 1,000 mL distilled water) and incubated at 28 ^oC for 24 hours. In order to harvest bacterial cells, sterile physiological saline (0.85% NaCl) was added into the bacterial incubated test tubes, and the surface colonies were crushed by using a sterile loop to dilute bacterial suspension. The desired densities of bacteria (1.7×10^5, 1.7×10^6, 1.7×10^7 and 1.7×10^8 cfu/mL) were determined by counting on a neubauer haemocytometer and prepared by ten-fold dilution method. To confirm the inocula density of bacterial suspension, a method for plate count by serial dilution was conducted.

B. Fish for experiment

For pathogenicity test, healthy BSB weighing 27.1±8.3 g were collected in the fish farm in Huanggang, Hubei, China and transferred to the laboratory of the College of Fisheries, Huazhong Agricultural University. All tested fish were acclimatized in $4m^3$-glass tanks (maintained at 28 ^oC and pH of 7.5) for 2 week before the artificial injection experiment. During the acclimatization period, fish were fed to satiation twice a day (08:00 and 16:00) with commercial pelleted feed.

C. Pathogenicity test

Fifty fish without clinical signs by naked eye observation were used for intraperitoneal injection experiment. The experiment included 5 groups (n=10 for each), comprising the negative control (physiological saline injection) and four concentrations of bacterial suspension. Before infection experiment, tested animals

were slightly anesthetized by MS-222 (Sigma, USA). Inocula were set up as intraperitoneal injections at 0.1 mL/fish of physiological saline or desirable densities of bacterial suspension. The experiment was conducted in 50 L aquarium with aeration at 28 ^{o}C for 7 days. No feed was fed during the experiment.

The fish were monitored daily and mortality was recorded. The cumulative mortality was calculated after challenge test. Moribund fish was observed for the external and internal clinical signs. Bacteria were re-isolated and identified by biochemical tests and sequencing on genomic DNA gene. The median lethal dose (LD_{50}) was finally determined (Reed and Munch 1938).

D. Biochemical tests

Biochemical characteristics of bacterial strains (D4, HU201301, HU201302 and HU201304) were performed at 37 ^{o}C unless otherwise specified. Gram staining, motility, catalase activity, oxidase activity, carbohydrate fermentation (glucose, sucrose, lactose, arabinose, mannitol and salicine), Methyl Red/Voges-Proskauer (MR/VP), citrate utilization, esculine and starch hydrolysis, indole and hydrogen sulphide (H_2S) production and growth on *A. hydrophila* specific-medium (AHM) were investigated. Arabinose, aesculin, mannitol, salicin were carried out by microbial biochemical identification tubes (Hangzhou Microbial Reagent Co., Ltd) following to manufacture's instruction. Two strains (D4 and HU201301) were used in tolerance of to salt environment at 28 ^{o}C for 24 hours.

E. Antibiotic susceptibility test

The antibiotic susceptibility test was performed by the disk diffusion method described previously (Bauer et al. 1966). A total 20 antimicrobial agents (Hangzhou Microbial Reagent Co., Ltd) including amoxicillin (10 μg/disc), florfenicol (75 μg/disc), levofloxacin (5 μg/disc), tetracycline (30 μg/disc), neomycin (30 μg/disc), novobiocin (30 μg/disc), doxycycline (30 μg/disc), gentamicin (10 μg/disc), norfloxacin (10 μg/disc), aztreonan (30 μg/disc), fortum (30 μg/disc), kanamycin (30 μg/disc), ceftriaxone sodium (30 μg/disc), ofloxacin (5 μg/disc), piperacillin (100 μg/disc), clindamycin (2 μg/disc), rifampicin (5 μg/disc), imipenem (10 μg/disc), erythromycin (15 μg/disc) and chloramphenicol (30 μg/disc) were used for investigation. Two strains of bacteria, D4 and HU201301, were used in antibiotic susceptibility test. A bacterial suspension (100 μL) was spread onto nutrient agar plates and then chemotherapeutic agent discs were placed on. The plates were incubated at 28 ^{o}C for 24 h. The diameter of each inhibition zone (including the diameter of the disc) was measured and recorded in mm. The responses were illustrated, which is resistant (R), intermediate (I) or sensitive (S) according to manufacturer's recommendation.

F. Molecular analysis

Bacteria were incubated on the agar medium at 28 ^{o}C for 24 hours. The bacterial suspension was prepared by being diluted in sterile double-distilled water and centrifuged at 12,000 rpm in 5 min at 4 °C. Genomic DNA was extracted using ammonium acetate precipitation technique as described previously (Bruford et al. 1998) with slight modification. The quality of genomic DNA was evaluated using electrophoresis in 1% agarose gels. The quantity of genomic DNA samples was measured by using a Nanodrop 2000 (Thermo Scientific, USA). DNA was stored at -20^{o}C until use. Polymerase Chain Reaction (PCR) was performed on all strains. Two universal primers, forward primer 27F: 5'-agagtttgatcctggctcag-3' and reverse primer 1492R: 5'-tacggctaccttgttacgactt-3' (Sangon Biotech (Shanghai) Co., Ltd.), were used to amplify 16S genomic DNA gene. The PCR amplifications were performed in a final volume of 10 μL containing 5 U Taq DNA polymerase, 1.0 μL 10× buffer (with Mg^{2+}) for Taq DNA polymerase, 0.25 μL dNTP, 0.25 μL each primer and 50 ng genomic DNA. A negative control (without template DNA) was also carried out. The PCR amplification program was set with initial denaturation at 94 °C for 5 min, 30 cycles at 94 °C for 30 s, 58 °C for 45 s, 72 °C for 1.5 min, and followed by final extension step at 72 °C for 10 min. The PCR products were analysed by using electrophoresis in 1% agarose gels. The PCR products were sequenced in Sangon Biotech (Shanghai) Co. Ltd. by the Sanger's sequencing method using ABI 3730. The identity of 16S genomic DNA gene sequences was obtained based on BLAST search in GeneBank database (Altschul et al. 1990).

III. Results

Clinical signs

The first-observed mortality time was 8 h after infection. The external clinical signs were observed with impaired swimming, exophthalmia and anorexia, swollen eyes, and haemorrhage at the site of injection and ventral surface of moribund and dead fish. Internal clinical signs observation showed haemorrhage in the abdominal cavity, red odiferous fluid, swollen and colour-deep spleen, pale liver and sometimes swollen kidney recognized. The clinical signs of fish challenged to *A. hydrophila* were similar to those of the naturally infected fish recorded (Fig. 1).

The cumulative mortality

The cumulative mortality of BSB challenged with *A. hydrophila* at 7 days post-inoculation was showed in Fig. 2. The different mortalities were found in different bacterial suspension densities. The mortality was recorded as 10, 10, 70 and 100% after bacterial intraperitoneal injection with 1.7×10^4, 1.7×10^5, 1.7×10^6 and 1.7×10^7 cfu/fish, respectively. Non-died fish was recorded in negative control group during experiment carried out. The median lethal dose (LD_{50}) was 5×10^5 cfu/fish in intraperitoneal injection of *A. hydrophila* to BSB.

Re-isolation and re-identification

A total of 15 bacterial strains were re-isolated from spleen, liver and kidney of moribund artificially injected fish with clinical signs. No evident external lesions or died fish in control group were recorded and no bacteria were isolated from either the control experimental fish.

A similarity was found in biochemical characteristics between experimental original strain (D4) and re-isolated strains (HU201301, HU201302 and HU201303) shown in Table 1. For the morphological characteristics, these bacterial strains grew on nutrient agar at 28 ^{o}C for 24 hours with mucoid yellow colour colonies. All can growth on AHM medium at 28 ^{o}C. Microscopic observation exhibited a phonotypical homogenization of short rod-shaped. All were gram-negative, motile, oxidase-positive and catalase-negative. Biochemical testing resulted in positive

reaction of all tested bacterial strains for production of indole and H_2S, utilization of citrate, hydrolysis of starch and esculin, fermentation of glucose, lactose, arabinose and mannitol and Methyl Red/Voges-Proskauer. Nevertheless, negative reaction was shown for fermentation of sucrose and salicine in all tested strains.

Genomic DNA sequence analysis

The identification of *A. hydrophila* based on morphological and biochemical characteristics were carried out. Subsequently, a number of colonies of strains incubated for 24 hours were chosen for PCR amplification. PCR products of 16S genomic DNA gene of D4 and HU201301 were sequenced to validate for *A. hydrophila* identification. A similarity of identity percentage (98%) with the nucleotide sequences of genomic DNA gene of two strains was showed; and a high similarity (99% identity) to other available *A. hydrophila* sequences in the GenBank database by using BLAST network search.

Antimicrobial susceptibility test

The pattern of antibiotic susceptibility of two strains of *A. hydrophila* (D4 and HU201301) is shown in Table 2. This present study found the relevant similarities between the original bacterial strain (D4) used in conducting challenge experiment and the re-isolated strain (HU201301). Both strains showed resistance to amoxicillin, and clindamycin and sensitive to novobiocin, florfenicol, levofloxacin, tetracycline, neomycin, doxycycline, gentamicin, norfloxacin, aztreonan, fortum, kanamycin, ceftriaxone sodium, ofloxacin, piperacillin, rifampicin, and chloramphenicol. Interestingly, the D4 strain showed resistance to imipenem and sensitive to erythromycin, while HU201301 showed intermediate to those of antibiotic agents.

IV. DISCUSSION

In this study, a challenge test with *A. hydrophila* demonstrated similarities in the clinical signs recorded by artificially challenged and naturally infected BSB. The observed symptoms in the present study resembled those reported in other fish (Popovic et al. 2000; Nielsen et al. 2001; He et al. 2006; Duc et al. 2013). Three among fifteen strains re-isolated from tested fish were used to conduct experiment on biochemical tests. Based on biochemical characteristics, it was determined that the four strains (D4, HU201301, HU201302 and HU201303) of bacteria were homogenous, which is comparable to previous reports (Lee et al. 2000; Abbott et al. 2003). All four strains grew on the previously described AH medium (Kaper et al. 1979), used for species identification, confirming that these bacterial strains are *A. hydrophila*.

Molecular method for detecting of *A. hydrophila* was introduced and applied in numerous previous studies (Nielsen et al. 2001; Swaminathan et al. 2004; Yogananth et al. 2009). The genomic DNA was the coding region of ribosomal RNA, which was used for phylogenetic studies as it is highly conserved between different species of bacteria and archaea and as important taxonomic tools (Weisburg et al. 1991; Coenye and Vandamme 2003) such as taxonomy of the genera *Aeromonas* (Lee et al. 2002; Chen et al. 2012; Liu and Li 2012; Sarkar et al. 2012). Two universal primers, 27F and 1492R, were developed in amplification of genomic DNA genes and had allowed discriminating of identification up to the species level and typing of other bacteria (Jiang et al. 2006; Sarkar et al. 2012). It has been indicated previously that levels of similarity between genomic DNA gene sequences higher than 97% suggest that the strains in question belong to the same species (Stackebrandt and Goebel 1994), so a 98% identity of sequences of the D4 and HU201301 strains implies that they belong to the same species. This challenge test experiment did fulfil Koch's postulates (Walker et al. 2006).

The high cumulative mortality (100%) of BSB (challenged with 1.7×10^7 cfu/fish by intraperitoneal injection method) in this study was comparable to the results previously reported (Mostafa et al. 2008). They have challenged *Heteropneustes fossilis* with *A. hydrophila* at a dose of 9.6×10^7 cfu/fish using intraperitoneal and intramuscular injection, which also resulted in 100% mortality of the tested fish within 1-9 days. Similarly, the reported mortality of some other fish species challenged by intraperitoneal injection with lower bacterial density, such as walking catfish *C. batrachus* with 10^6 cfu/fish (Angka 1990) and snakehead *C. striata* with 10^6 cfu/fish (Duc et al. 2013) was 100%. Also, several fish species (*Labeo rohita, Catla catla* and *Cirrhinus cirrhosis*) challenged by intramuscular method at a dose of 2×10^6 cfu/fish had 80 to 100% mortality, while *Hypophthalmichthys molitrix* (Valenciennes, 1844) and *C. carpio* at a dose of 2×10^5 cfu/fish had 60-80% mortality within 2-12 days (Sabur 2006) (cited by Sarkar and Rashid 2012). The LD_{50} value in this study was 5×10^5 cfu/fish, similar to the LD_{50} of *A. hydrophila* challenged to snakehead fingerling (Duc et al. 2013), and lower than for some other fish species, such as *Anguilla anguilla* ($10^{6.2}$ to $10^{7.4}$ cfu/fish) (Esteve et al. 2004), *Channa punctatus* (3.42×10^7 cfu/fish) (Yesmin et al., 2004) and *Brycon amazonicus* (6.66×10^{11} cfu/fish) (Oliveira et al. 2012), indicating that isolates used in challenge test were strongly virulent to BSB.

Chemotherapeutic agents were previously introduced to treat *A. hydrophila* infection in cultured fish (Saitanu and Chularak 1983). In this study, the antibiotic sensitivity patterns of two strains (D4 and HU201301) were evaluated and confirmed to be mostly similar. This test was conducted in order to confirm the resemblance of re-isolated strain (HU201301) and experimental inoculated bacterial strain (D4) in sensitive ability to antimicrobials, and also to determine the suitable therapeutical medicines for controlling *Aeromonas* infection in BSB. Both strains were sensitive to most tested drugs, except for amoxicillin and clindamycin. D4 was also resistant to imipenem, while HU201301 was only intermediately resistant to this drug. In previous studies, *A. hydrophila* was reported to be sensitive to chloramphenicol, erythromycin, kanamycin, neomycin (Boonyaratpalin 1989) and resistant to amoxicillin and clindamycin (Belem-Costa and Cyrino 2006; Adanir and Turutoglu 2007; Jayavignesh et al. 2011). The results from the present study were similar to these, but different from the results reported by Son et al. (1997, p. 480) and Vivekanandhan et al. (2002, p. 166), who found that *A. hydrophila* was resistant to chloramphenicol, erythromycin, kanamycin, tetracycline, rifampicin and novobiocin.

The susceptibility of the experimental bacterial strains (D4 and HU201301) to some beta-lactam antibiotics was also

investigated. In comparison to a previous report (Morita et al. 1994), the results showed the similarity in susceptibility to aztreonam and imipenem, and difference in resistance to piperacillin and ceftriaxone. These differences may be related to the source of bacterial isolates and the source of antibiotic agents used in the experiment. Moreover, it is known that the bacteria can receive and transmit antibiotic resistant genes from and to other gram-negative bacteria (Marchandin et al. 2003). Thus, aeromonad-infection in BSB may still be controlled by using correct drugs. Nevertheless, reduction of the use of chemicals in aquaculture is nowadays considered a good management practice. Certain types of chemicals, especially antibiotics, if used inappropriately, not only cause damages to animals and the environment, but also increase production costs and adverse consequences (Tonguthai 2000). Furthermore, the observation of disease odd usually correlates with anorexia (Duc et al. 2013); hence the utilization of antibiotics at the disease outbreak time may not be effective. Also, the extensive use of antibiotic and other chemotherapeutics to prevent and treat fish diseases may cause drug-resistance phenomenon in cultured fish (Son et al. 1997). Vaccination treatment was recommended for use in disease prevention in cultured fish (Bakopoulos et al. 1995; Sommerset et al. 2005) and herbal concoction was used in the therapy of *A. hydrophila* infection in goldfish (Harikrishnan et al. 2009).

V. CONCLUSION

This study demonstrated *A. hydrophila* as a potential pathogen, which can cause haemorrhagic septicaemia clinical signs in BSB. In the antimicrobial susceptibility test, both tested bacterial strains showed sensitivity to most used drugs.

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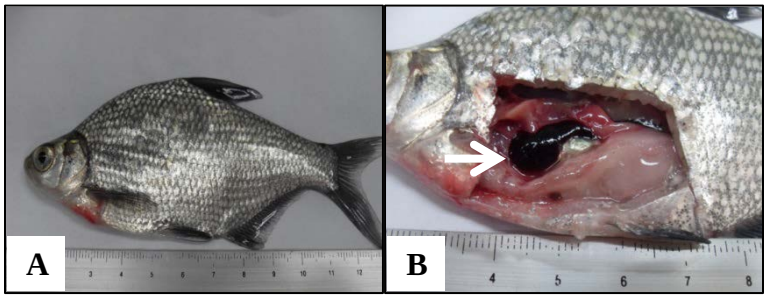

Fig. 1. Clinical signs of BSB (*M. amblycephala*) intraperitoneally challenged to *A. hydrophila* (1.7×10^7 cfu/fish). (A) Haemorrhage at the site of injection and ventral surface; (B) Red odiferous fluid, swollen and colour-deep spleen (arrow)

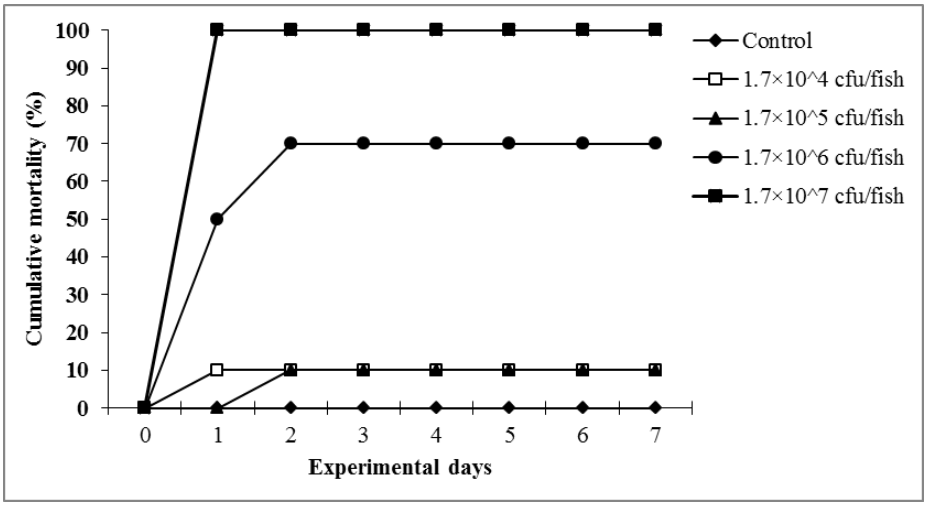

Fig. 2. Cumulative mortality of BSB (*M. amblycephala*) challenged with *A. hydrophila*

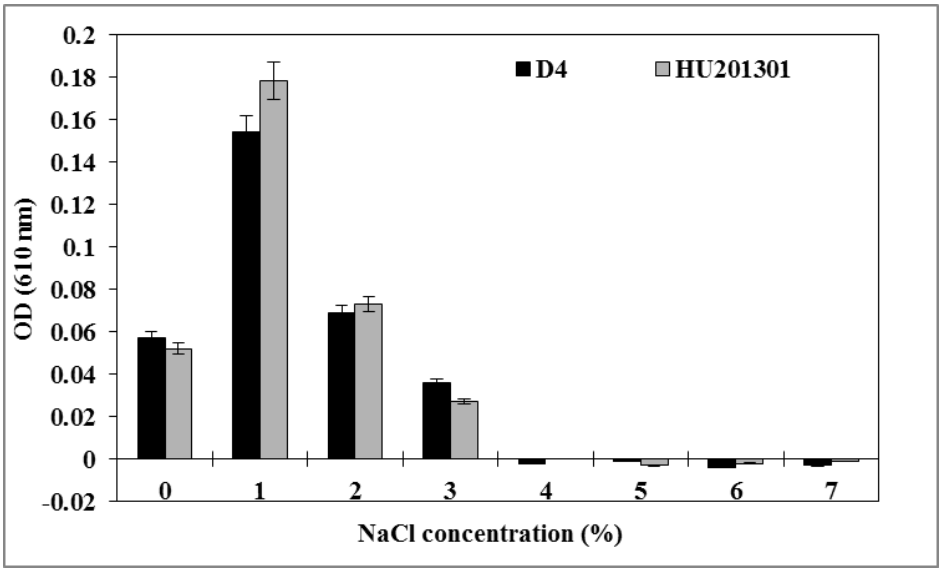

Fig. 3. Effect of NaCl concentrations (%) on growth of D4 and HU201301

Table 1. Biochemical profile of D4 and re-isolated strains of *A. hydrophila*

Biochemical test	D4	HU201301	HU201302	HU201303
Gram stain	-	-	-	-
Motility	+	+	+	+
Oxidase	+	+	+	+
Catalase	+	+	+	+

Glucose	+	+	+	+
Sucrose	-	-	-	-
Lactose	+	+	+	+
Arabinose	+	+	+	+
Mannitol	+	+	+	+
Salicine	-	-	-	-
MR	+	+	+	+
VP	+	+	+	+
Citrate utilization	+	+	+	+
Esculine hydrolysis	+	+	+	+
Starch hydrolysis	+	+	+	+
Indole production	+	+	+	+
H_2S production	+	+	+	+
AHM	+	+	+	+

(+) = positive reaction; (-) = negative reaction

Table 2. Antimicrobial susceptibility testing of experimental original strain (D4) and re-isolated strain of *A. hydrophila* HU201301

Antibiotic agents (µg/disc)	D4	HU201301
Amoxicillin (10)	R	R
Florfenicol (75)	S	S
Levofloxacin (5)	S	S
Tetracycline (30)	S	S
Neomycin (30)	S	S
Novobiocin (30)	S	S
Doxycycline (30)	S	S
Gentamicin (10)	S	S
Norfloxacin (10)	S	S
Aztreonam (30)	S	S
Fortum (30)	S	S
Kanamycin (30)	S	S
Ceftriaxone sodium (30)	S	S
Ofloxacin (5)	S	S
Piperacillin (100)	S	S
Clindamycin (2)	R	R
Rifampicin (5)	S	S
Imipenem (10)	R	I
Erythromycin (15)	S	I
Chloramphenicol (30)	S	S

R = resistance; I = Intermediate; S = sensitivity

Seismic Vibration Control of a MDOF Building Connected with Viscous and SAVFD Dampers

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***Abstract*- V**ibrations due to natural dynamic loads generated by earthquake. The reducing of structural vibrations occurs by adding a mechanical system that is installed in a structure called Dampers .In this paper, the vibration control of multi degree of freedom (MDOF) buildings connected with selected types of dampers due to earthquake effect is studied. The application of Viscous and Semi active variable friction (SAVFD) damper for response control of seismically excited building is evaluated. Both dampers effectiveness is investigated in terms of the reduction of structural responses (displacements and accelerations) of the connected to building. The optimum number and the location of dampers are decided by the optimization procedure. The numerical study is carried out, namely (a) A MDOF building connected with viscous dampers with optimum damping coefficient (b) A MDOF buildings connected by Semi active variable friction dampers with optimum gain multiplier. Results shows that using viscous and SAVFD to connect structures can effectively reduce earthquake-induced responses of either structure but when SAVFD is used to connect buildings and results shows that SAVFD can control only displacements of structures. Further, lesser damper at appropriate locations can significantly reduce the earthquake response of the coupled system. The reduction in responses when MDOF building connected with 50% of the total dampers at appropriate locations is almost as much as when they are connected at all floors, thereby the cost of the dampers can be minimized.

***IndexTerms*-** Dampers, Optimum gain multiplier, SAVFD, Vibrations, Optimum damping coefficient

I. INTRODUCTION

In recent years due to development of design technology and material qualities in civil engineering, the structures (high rise buildings, long span bridges) have become more light and slender. This will cause the structure to develop the initial vibrations. These vibrations may lead to serious structural damage and potential to structural failure. Civil structures also fail during large seismic events, often resulting in loss of human life and damage property.

Structural vibration control, as an advanced technology in engineering, consists of implementing energy dissipating devices into structures to reduce excessive structural vibrations(due to dynamic loads), to prevent catastrophic structural failure and enhance human comfort because of natural disturbances like strong earthquakes. In early 1990s, considerable attention has been paid to research and development of structural control devices, and medium and high rise structures have begun implementing energy dissipation devices or control systems to reduce excessive structural vibrations.

Structural control is a diverse field of study. Structural control is one area of current Research that looks promising in attaining reduce structural vibrations during loading such as earthquakes and strong winds. There are three primary classes of supplemental damping devices, categorized into three corresponding control strategies. The first class of supplemental damping devices is passive. Passive devices are non-controllable and require no power. The second class of supplemental damping devices is active. Active devices are controllable, but, require significant power to operate. The third class of supplemental damping devices is semi active. Semi active devices combine the positive aspects of passive and active control devices in that they are controllable (like the active devices) but require little power to operate. In this research, an active control strategy employing acceleration feedback, and, further, semi active "smart" dampers, are proposed to connect and control building responses.

II. PROBLEM FORMULATION

To control vibration responses of structures it is necessary to introduce additional damping to the structures. Damping can be increased in the structure by connecting dampers and making structures stable during earthquakes. Buildings with higher natural frequencies, and a short natural period, tend to suffer higher accelerations but smaller displacement. In the case of buildings with lower natural frequencies, and a long natural period, this is reversed: the buildings will experience lower accelerations but larger displacements.

A. Performance of Viscous Damper Connected to a MDOF Building

A typical viscous damper (patil, 2011) consists of viscous material in the form of either liquid (silicon gel) or solid (special rubbers or acrylics). One of the types of viscous dampers is fluid viscous damper and there are essentially two categories of it based on the functioning, such as those in which, (a) energy dissipation is achieved through the deformation of viscous fluid or special solid material (i.e. through fluid viscosity) and (b) energy dissipation is achieved by the principle of flow through orifice. In a fluid viscous damper the difference of the pressure on each side of the piston head results in the damping force, and the damping constant of the damper which can be determined by adjusting the configuration of the orifice of the piston head. When it comes to pure viscous behavior, damper force and the

velocity should remain in phase. When it comes to pure viscous behaviour, damper force and the velocity should remain in phase. However, for a damper setup shown in Figure 2.5, the volume for storing the fluid will change while the piston begins to move. Thus a restoring force, which is in phase with displacement rather the velocity, will be developed. Configuration of an accumulator is used to solve the problem. The ideal force out for a viscous damper is given by,

$$f_{di} = C_{md} \left| \dot{x}_{i2} - \dot{x}_{i1} \right|^{\varepsilon} \operatorname{sgn}(\dot{x}_{i2} - \dot{x}_{i1}) \ldots\ldots\ldots\ldots 1$$

Where C_{md} is coefficient of damper, x_{i2}-x_{i1} is relative velocity between the ends of i^{th} damper and ε is exponent having value between 0 and 1.The damper with ε =1 is called a LVD (Linear viscous damper). The damper with ε larger than 1 have not been seen often in practical applications. The damper with ε smaller than 1 is called a nonlinear viscous damper which is effective in minimizing high velocity shocks.

Assumptions and Limitations:

A MDOF building is having similar storey height with their symmetric planes in alignment. The problem is simplified as 2D because the excitation of ground is assumed to occur in one direction in symmetric plane of a structure. The seismic excitation is assumed to be not so severe and due to the enhanced energy absorbing capacity of the building because of the connected dampers, the building is assumed to be remain in linear elastic and hence, do not yield under the considered earthquake excitation. Structure is modelled as a linear MDOF flexible shear-type structure with lateral degree-of-freedom at their floor levels. The total plan dimensions in the direction of excitation are not large, so any effect due to spatial variations of the ground motion is neglected. Any effect due to soil–structure interaction is neglected; limit the applicability of the results to structures on stiff, firm ground and less restrictively to structures whose foundations are not massive (e.g. footing foundations). The lateral resistance of the structures is assumed to be so large that it does not have any effect on the performance of damper. The floors are rigid and the total mass is concentrated at the levels of the floors. There is no rotation of the horizontal section at the level of floors. The floors are subjected to horizontal ground acceleration, while the vertical component of the ground acceleration is neglected.

Equation of Motion:

Let structures having n stories, the mass, damping coefficient and shear stiffness values for the i^{th} storey are m_i, c_i, k_i. The system will then be having a total number of degrees of freedom equal to 2n. The equations of motion for this system are expressed as,

$$M\ddot{X}+(C + C_D)\dot{X} + KX = -MI\ddot{x}_g \ldots\ldots\ldots\ldots 2$$

Where M, C and K are the mass, damping and stiffness matrices of the structural system.C_D is the additional damping matrix due to the installation of the viscous dampers but we are not considering additional damping due to installation of dampers. X is the relative displacement vector with respect to the ground, I is a vector with all its elements to unity, and x_g is the ground acceleration at the foundations of the structures. The details of each matrix are given as,

$$m_{(n,n)} = \begin{bmatrix} m12 & & & \\ & m22 & & \\ & & \ldots & \\ & & & mn2 \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots 3$$

$$c_{(n,n)} = \begin{bmatrix} c12 + c22 & -c22 & & \\ -c22 & c22 + c32 & -c32 & \\ & \ldots & \ldots & \\ & & & cn2 \end{bmatrix} \ldots\ldots\ldots 4$$

$$k_{(n,n)} = \begin{bmatrix} k12 + k22 & -k22 & & \\ -k22 & k22 + k32 & -k32 & \\ & \ldots & \ldots & \\ & & & kn2 \end{bmatrix} \ldots\ldots 5$$

State Space Representation:

$$z[k+1] = A_d z[k] + B_d u[k] + E_d w[k], \ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where the vector z(k) represents the state of the structure, which contains the relative-to ground Velocity and displacement of each floor, [k + 1] denotes that the variable is evaluated at the $(k+1)^{th}$ time step, u(k) denotes the vector of the controllable Viscous forces provided by the viscous dampers, w(k) is the vector of ground accelerations. A_d represents the discrete-time system matrix with Δt being the time interval (sampling period), while the constant coefficient matrices B_d and E_d are the discrete-time counterparts of the matrices B and E that may be written explicitly as

$$\left.\begin{aligned} Bd &= A^{-1}(Ad - I)\,B \\ Ed &= A^{-1}(Ad - I)\,E \end{aligned}\right\} \ldots\ldots\ldots\ldots\ldots 7$$

Numerical Study:

The study, MDOF structure with ten stories is considered with floor mass and inter storey stiffness is assumed to be uniform for structure. The damping ratio of 5% is considered for structure. The mass and stiffness of each floor are chosen such that the fundamental time period of structure T_1 yields 0.3s for structure and for case. A thorough study is conducted to arrive building responses like displacements, and accelerations for MDOF structure connected with viscous damper under modified El Centro earthquake data.

Responses of MDOF Building

The building responses of the top floor displacements and accelerations when connected with viscous dampers at all the floors (TYPE II) are plotted as shown in Figures 3.4–3.5, respectively. These plots clearly indicate the effectiveness of viscous dampers in controlling the earthquake responses of both the structures. Viscous damper can reduce 70 to 75 % of earthquake responses when damper connecting arrangements as shown in Fig.1

Optimization of Number of Dampers:

To minimize the cost of dampers and number of dampers, the responses of the building are investigated by considering 50% of the total dampers and even less at different floors. As the force in viscous damper is proportional to the maximum relative velocity of the damper connected floors, to arrive at the variation of damping in the dampers, the maximum relative velocities between all dampers connecting floors, under earthquake considered are obtained. The variation of these maximum relative velocities of damper connecting floors is calculated, from which an average value for variation is obtained. The storey having maximum relative displacement and or velocity are selected to place the dampers.

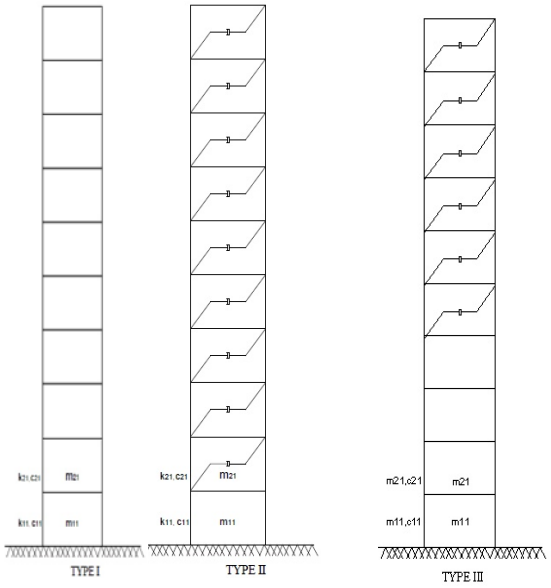
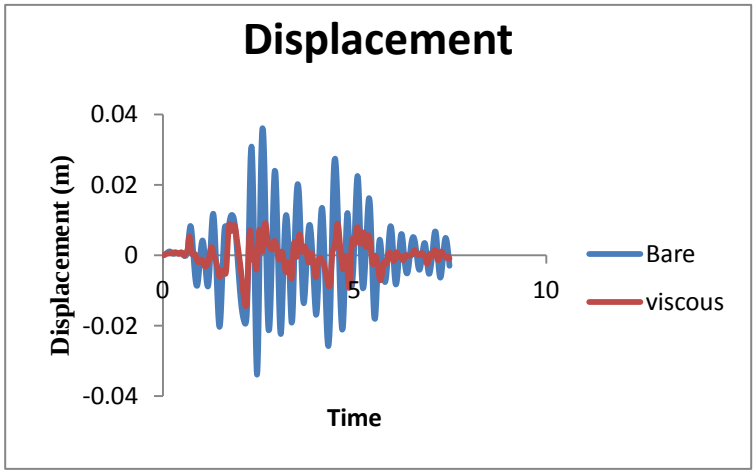


Fig1. buildings connected with viscous Dampers with Different arrangements.

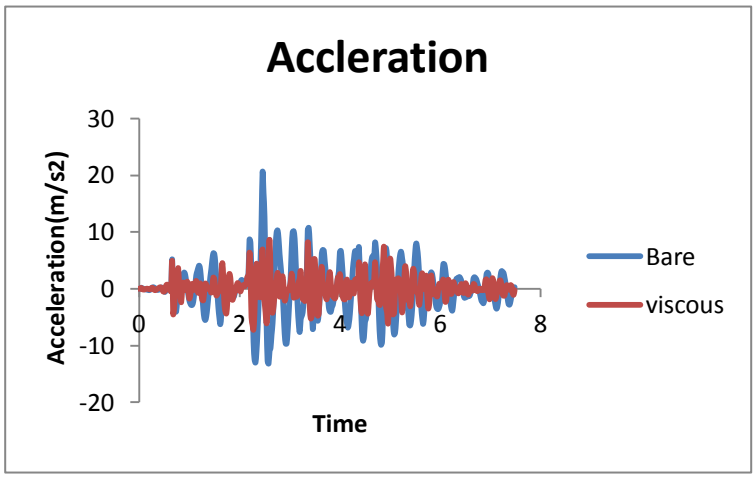
Table1. Seismic Response Of The Building Connected With Viscous Dampers (T_1=0.3s).

Earthquake	Str	Peak Top floor displacement (m)		
		TYPE I	TYPE II	TYPE III
Imperial Valley, 1940	1	0.035988	0.009115 (74.6%)*	0.019593 (45.5%)*
Earthquake	Str	Peak Top floor accelerations(m/s^2)		
		TYPE I	TYPE II	TYPE III
Imperial Valley, 1940	1	20.55093	8.657686 (57%)*	13.13196 (36%)*

Many trials are carried out to arrive at the optimal placement of the dampers, among which Figures shows the variation of the displacement and accelerations respectively, in all the floors for Five different cases, such as case (i) TYPE I arrangement case (ii) TYPE II arrangement (iii) TYPE III arrangement and It is found from the plots 1.1 and 1.2 that the dampers are more effective when building are connected with optimum dampers and responses in all the stories are reduced almost as much as when they are connected at all floors(TYPE II). The reduction in the peak top floor displacement, peak top floor acceleration and velocities of the structures, for without dampers, connected with dampers at all floors and connected with only 50% of total viscous damper are shown in Table 1. It is observed form the table that reduction in the responses when structures connected at all the floors are as much as when connected with 50% of total dampers Thus, it can be concluded that providing the dampers at all the floor need not be the optimum solution and even few dampers may results in the same performance.

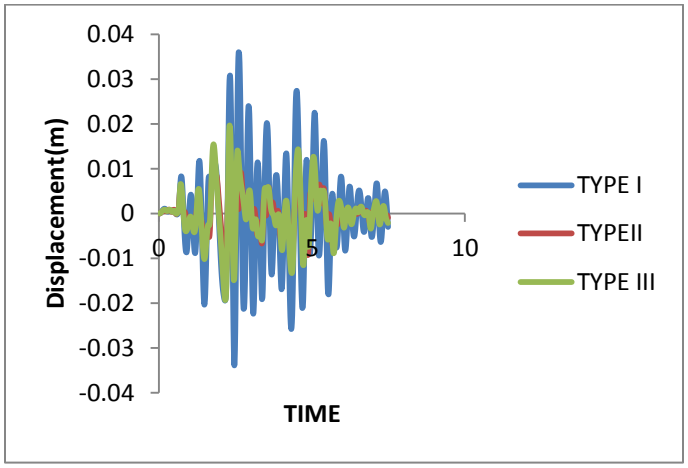


Plot 1.1(a)

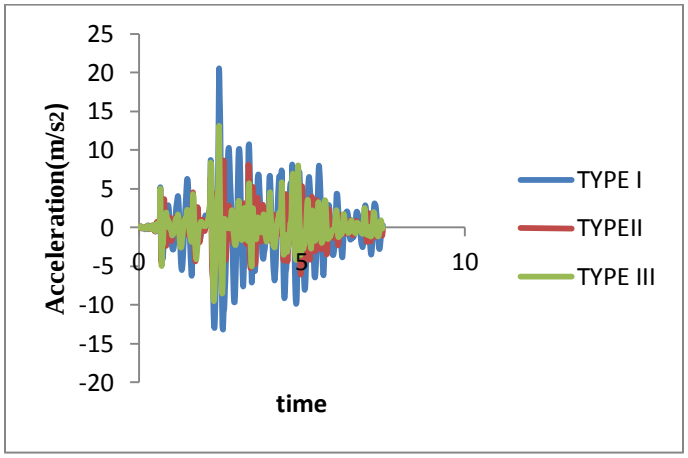


Plot 1.1(b)

Graph 1.1 Top Floor displacements for type I and type II building (a) Displacement (b) Acceleration with T=0.3 s

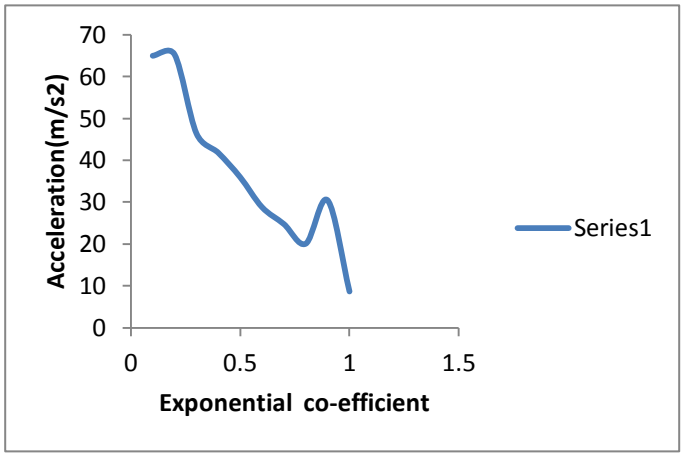


Plot 1.2(a)



Plot 1.2(b)

Plot1.2 Top Floor displacements for type I, II, III building (a) Displacement (b) Acceleration with T=0.3 s

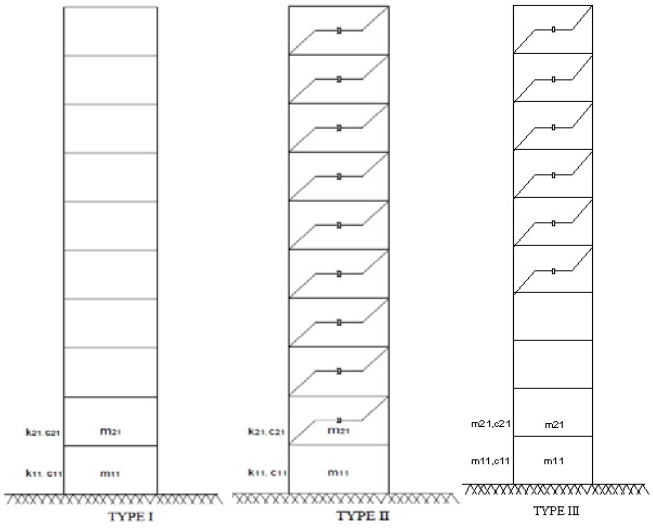


Plot 1.3 Responses of floor (a) Displacement (b) Accelerations with Exponential co-efficient

B. PERFORMANCE OF SEMI ACTIVE VARIABLE FRICTION DAMPER CONNECTED TO MDOF BUILDING

A semi–active system combines the features of active and passive systems. They utilize the response of a structure to develop control actions through the adjustment of damping or stiffness characteristics of the system. A variety of semi–active devices have been considered for seismic applications, including variable orifice dampers; variable friction devices; adjustable, tuned liquid dampers; controllable fluid dampers and variable stiffness dampers. Because of their relatively high performance and low energy requirement, a numbers of different devices have been proposed for the practical implementation of semi– active control systems, and more research has focused on improving semi–active control devices or control laws to enhance its performance. A friction damper is a displacement–dependent energy dissipation device, and the damper force is independent of the velocity and the frequency–content of excitation. The present study is aimed to investigate the effectiveness of semi active variable friction damper (SAVFD) in mitigating the seismic response of the structure under modified El Centro earthquake ground motions. The specific objectives of the study are

- To study the earthquake responses like displacements and accelerations of a MDOF building.
- To investigate the optimal placement of the dampers instead of providing them at all the floors for optimum the cost of the damper.
- To ascertain the optimum value of gain multiplier of the dampers.



TypeI (a) TypeII (a) TypeIII (a)

Fig.2 Structural Models of a MDOF Building Connected With SAVFD Dampers with Arrangements

Equation of Motion:

$$M\ddot{x} + C\dot{x} + Kx + \Delta F = -M I\ddot{x}_g \quad \ldots\ldots\ldots\ldots 7$$

Where M, C and K are the mass, damping, and stiffness matrices of the combined structure system, respectively; x is the relative–displacement vector with respect to the ground, $F = [f_{d1}, f_{d2} \ldots\ldots f_{dn}]^T$ is control–force vector, Δ is a matrix of zeros and 1s, where 1 will indicate where the damper force is being applied. I is a vector with all its element equal to unity; and $x_g^{\cdot\cdot}$ is the ground acceleration at the foundations of the structures.

Semi Active Variable Friction Damper Force:

By keeping the adjustable slip force of a semi-active friction damper slightly lower than the critical friction force, the method allows the damper to remain in its slip state throughout an earthquake of arbitrary intensity, so the energy dissipation capacity of the damper can be improved.

$$f[k] = \alpha (G_z z[k-1] + G_u u[k-1] + G_w w[k-1]) \ldots\ldots 8$$

Where Gz ,Gu and Gw are given in Equation (9). After being multiplied by the factor α, these matrices may also be treated as the control gains. It is obvious in Equation (8) that the parameter α plays an important role in the proposed control law. A larger value of α will lead to a higher control force, but this does not necessarily guarantee better energy dissipation capacity. [Lu, 2004]

$$\left.\begin{aligned} G_z &= K_b D(A_d - I) \\ G_u &= K_b D (B_d + I) \\ G_w &= K_b D E_d \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots 9$$

Numerical Study:

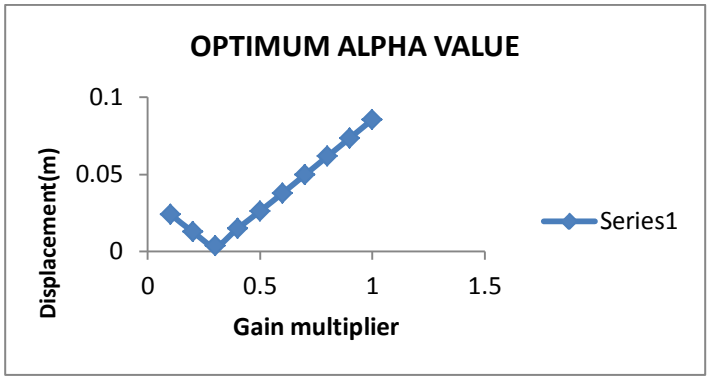
The study, MDOF structure with ten stories is considered with floor mass and inters storey stiffness is assumed to be uniform for structure. The damping ratio of 5% is considered for structure. The mass and stiffness of each floor are chosen such that the fundamental time period of structure T_1 yields 0.3s for structure and for case. A thorough study is conducted to arrive building responses like displacements, and accelerations for MDOF structure connected with SAVFD damper under modified El Centro earthquake data.

Optimum Gain Multiplier Of Semi Active Variable Friction Damper:

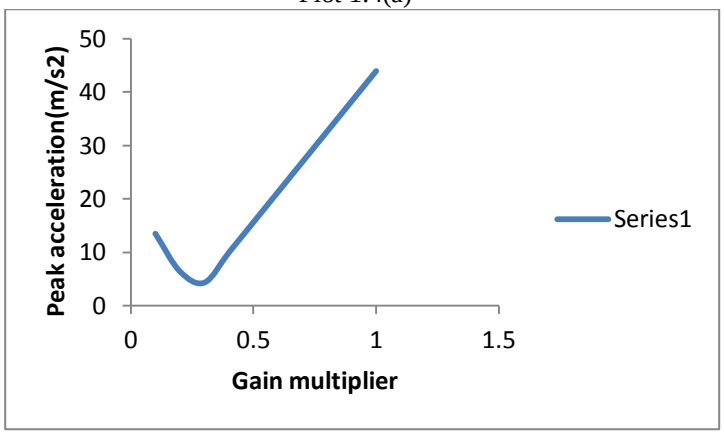
To arrive at the optimum gain multiplier of the SAVFD connected as shown in TYPE II structure .The variation of the top–floor displacements and accelerations of structure are shown in the Fig.4.3. It shows the influence of the gain multiplier on the peak responses under earthquake ground motions. It is observed that the responses of structures (displacements and accelerations) are reduced when value of gain multiplier will be in the range of 0.2 to 0.4 and after this there will be increase of responses with higher value of gain multiplier. Thus, it is concluded that the optimum gain–multiplier value exists to yield the lowest responses of building. For the gain multiplier of a different value, the performance of the dampers is significantly reduced.

Responses Of MDOF Structure:

The earthquake responses of the top floor displacements and accelerations connected with SAVFD at all the floors (TYPE II (a)) are plotted as shown in plot 1.5a–1.5b, respectively. These figures clearly indicate the effectiveness of Semi active variable friction dampers can reduce 70 to 80 % of earthquake responses when damper connecting arrangement is shown in Fig. 1(TYPE II (a)).

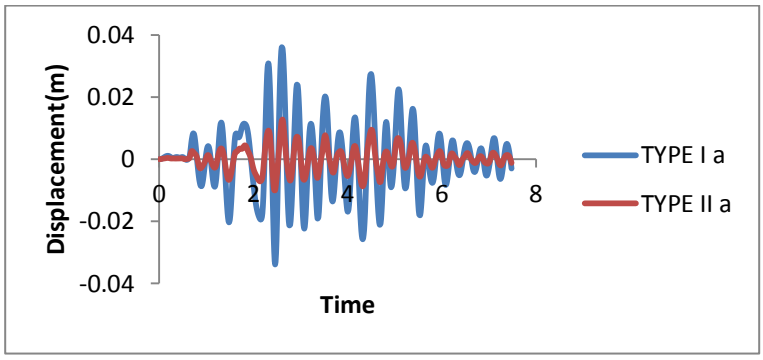


Plot 1.4(a)

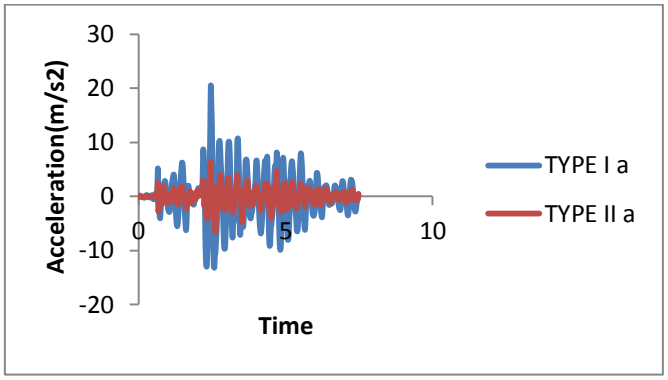


Plot 1.4(b)

Plot 1.4 Variations of Top Floor (a) Displacements (b) Accelerations with Gain Multiplier

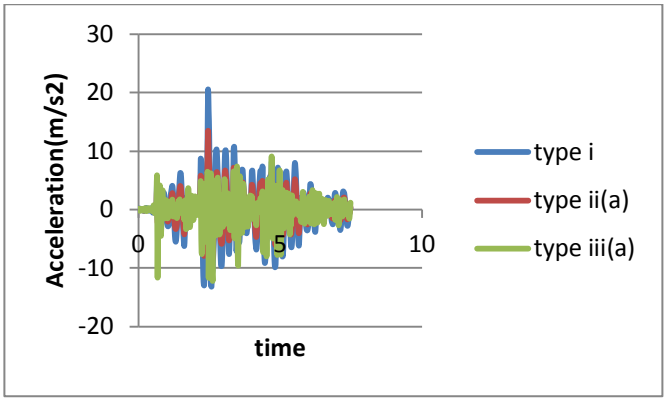


Plot 1.5(a)

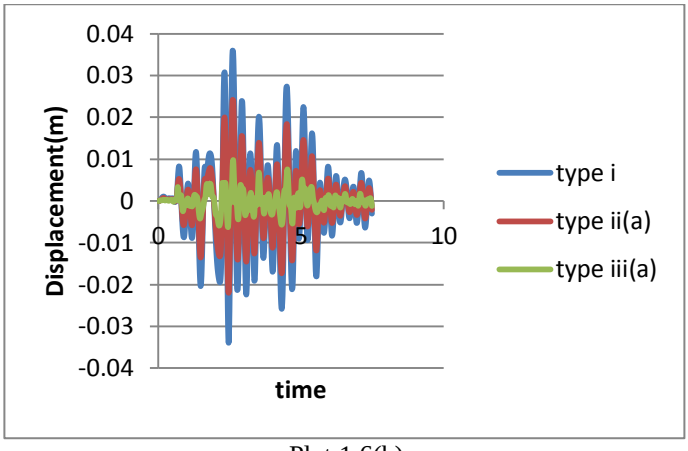


Plot 1.5(b)

Plot 1.5 Top Floor displacement and acceleration for type I (a) and type II(a) 1.5(a) Displacement 1.5(b) Acceleration



Plot 1.6(a)



Plot 1.6(b)

Plot 1.6 Top Floor displacements and acceleration for type I (a) and type II (a) type III (a) 1.6(a) Displacement 1.6(b) Acceleration

Table 2. Seismic Response Of The Building Connected With SAVFD (T_1=0.3s).
*Percentage of reduction compared to TYPE I structure

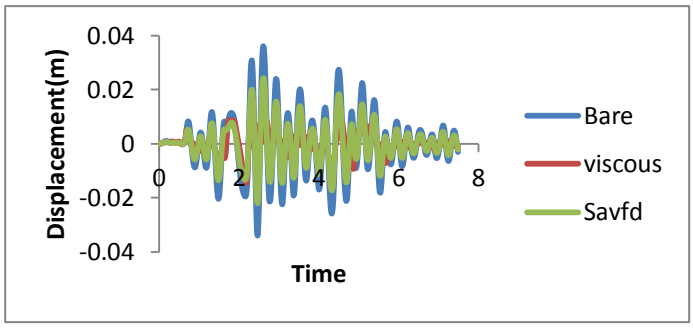
Earthquake	str	Peak Top floor displacement (m)		
		TYPE I	TYPE II(a)	TYPE III(a)
Imperial Valley, 1940	1	0.035988	0.012706(64.69%)*	0.0175616(51.20%)*
Earthquake	str	Peak Top floor accelerations(m/s^2)		
		TYPE I	TYPE II(a)	TYPE III(a)
Imperial Valley, 1940	1	20.55093	6.411074(68.8%)*	9.089983(55.75%)*

C. COMPARATIVE STUDY ON BUILDING WHEN CONNECTED WITH SAVFD AND VISCOUS DAMPER

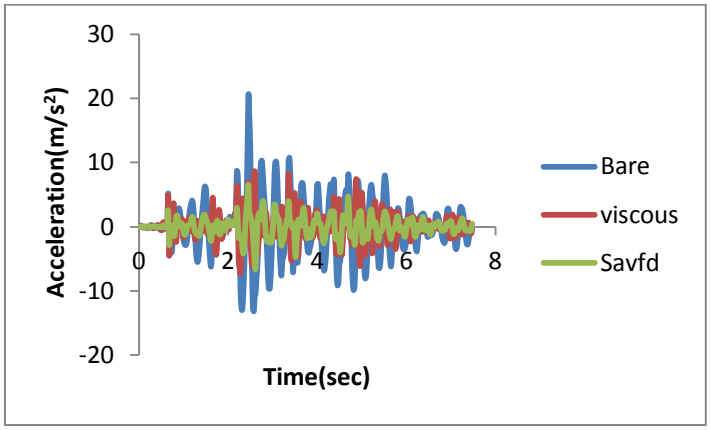
In this study, the comparative responses of MDOF building connected with semi–active variable friction dampers (SAVFD) and viscous fluid damper under El Centro earthquake excitations investigated. As we know from both dampers (SAVFD and VISCOUS FLUID DAMPER) mitigating the earthquake responses at some extent when we considering their optimum parameters but there will be some advantages and disadvantages in both damper performances hence we are giving comparison.

Responses Of a MDOF Building:

For the present study, building with 10 stories with uniform floor mass (i) the damping ratio in building was taken as 5 percent. For case (ii) The stiffness of each floor of the building was chosen so they would yield fundamental time periods of 0.3 sec for building and .(ii) for comparative study when building is connected with viscous damper we are considering maximum optimum damping coefficient and maximum optimum exponential coefficient. In the same way when building connected with SAVFD we are considering maximum optimum gain multiplier. Same damper locations are considered for both the dampers. Comparative responses of top floor displacements and accelerations are shown in Plot 1.7... Results are tabulated in Table 3



Plot 1.7(a)



Plot 1.7(b)

Plot 1.7 Top Floor Displacement and accelerations for type I, type II and type II(a) buildings With T_1=0.3s

Table.3 Seismic Response of the Building Connected With Viscous (TYPE II) and SAVFD (TYPE II (a))

Earthquake	Str	Peak Top floor displacement (m)		
		TYPE I	TYPE II	TYPE II(a)
Imperial Valley, 1940	1	0.035988	0.009115(74.6%)*	0.012706 (64.69%)*
Earthquake	Str	Peak Top floor accelerations(m/s^2)		
		TYPE I	TYPE II	TYPE II(a)
Imperial Valley, 1940	1	20.55093	8.657686(57%)*	6.411074(68.8%)*

III. CONCLUSION

Structural control by implementing energy dissipation devices or control systems into structures is more effective in reducing excessive structural vibrations because of natural disturbances. This study presents the vibration control of multi degree of freedom building connected with viscous and semi active variable friction damper types of dampers due to earthquake effect. The model is subjected to Modified El Centro earthquake data. Dampers are placed diagonally in-between stories. Viscous damper mainly depends on damper damping coefficient and exponential coefficient similarly semi-active damper also depends on stiffness of the damper and that can be preselected by the control designer. Some of important conclusions are mentioned below

- To control vibration responses of structures it is necessary to introduce additional damping to the structures. Damping can be increased in the structure by connecting dampers and making structures stable during earthquakes.
- The viscous damper is found to be very effective to control the earthquake responses of the connected structures for this building viscous damper reduces 74% of displacement and 57% of acceleration.
- There exists an optimum damper damping and optimum exponential coefficient of the viscous damper also there will be existing optimum gain multiplier of SAVFD for minimum earthquake response of the building.
- A larger value of a gain multiplier leads to higher control force, but higher efficiency and better energy dissipation is obtained through the optimum gain multiplier
- Lesser dampers at appropriate location can significantly reduce the earthquake responses of the connected structures and reduces the cost of the dampers by 50 percent.

The SAVFD is also found to be very effective to control the earthquake responses of the structures. For this building results shows that Semi active variable friction damper reduces 65% 0f displacement and 69% accelerations. Hence SAVFD is very effective for this building compared to viscous damper as it reduces both displacement and acceleration considerably.

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Conservation and Management of Bioresources of Chilika Lake, Odisha, India

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Abstract- The Chilika lake is one of The Asia's largest brackish water with rich biodiversity. It is the winter ground for the migratory Avifauna in the country. This lake is a highly productive ecosystem for several fishery resources more than 1.5 lakh fisher folks of 132 villages and 8 towns on the bank of Chilika directly depend upon the lagoon for their sustenance based on a unique biodiversity and socio-economic importance. The lagoon also supports a unique assemblage of marine, brakish water and fresh water biodiversity. The lagoon also enrich with avi flora and avi fauna , fishery fauna and special attraction for eco-tourism. The other major components of the restoration are based on the management of lagoon by local community participation for the sustainable of the ecosystem. A wise step is taken by CDA for conservation and management of lagoon is that the salt sustainable mechanism and integrated the terrestrials aquatic resource management.

Index Terms- Biodiversity, Chilika lake, CDA , Conservation & management, Lagoon, Eco-system, Avi-fauna.

I. INTRODUCTION

The Chilika lake is a brakish water lagoon, located between the Puri, Khurda & Ganjam districts of Odisha state, on the east coast of India at the mouth of Daya river, flowing into the Bay of Bengal. It is the largest coastal lagoon, in India and second largest lagoon in the world.

The lake is situated in between latitude $19^0$43'N and longitude $85^0$19'E,of the globe. 35 number of streams like Bhagravi, Daya, Malguni Nuna etc. inflows to Chilika and two number of outflows from Chilika to Bay of Bengal like old mouth at Arakhakuda and new mouth at Satapada. This lake having a catchment area of 3560 km^2 and is maximum length is 64.3 km^2, depth. The surface area of water varies winter season. Several islands are located in the lagoon covering an area of 223km^2 .the major islands are Kalijai, Barakuda, Ghantasila, Nalabana etc. Plant resources which include more than 546 angiospermic species 379 genera and 107 families, 100 phytoplankton genera, 20 seaweed species and 7 pteridophyte species were studied by Biswas (1932), Mooney(1950). Plankton diatoms and their periodicity in Chilika during 1950-51 was studied by Roy(1954). Patnaik (1973, 1980), Panda and Patnaik (1988) and Panigrahi(1988).

A pollen analysis study indicates that the oldest sediments in the lake are 13,500 years old. At that time, Chilika was a river mouth or a river delta with fresh water vegetation. With increase in the sea level, after 9,500 years, the area became an estuary with mangrove vegetation. The lagoon is divided into four sectors like Northern, Central, Southern and Outer channel

It is the largest winter ground for migration birds on the Indian sub-continent. The lake is home for several threatened species of plants and animals. The lake is also ecosystem with large fishery resources. It sustains more than 1.5 lakh fisher – folks living in 132 villages on the shore and islands. The lagoon hosts over 230 species of birds on the pick migratory season. Birds from as far as the Casparian sea, lake Baikal, remote part of Russia, Central and South Asia, Ladhak and Himalaya come here.

The Chilika lagoon is identified as one of the hotspot of biodiversity in India. Based on unique biodiversity and socio-economic importance, India designated Chilika lagoon as a wetland of International importance under the Ramsar convention in 1981. A study published by the Salim Ali Centre for Ornithology and Natural History, Coimbatore says that between 1991-2001, India lost 40% of its wetland. The National Wetland Conservation Programme was started in 1987. India's wetlands are extraordinarily diverse-ranging from lakes and ponds to marshes, mangroves, backwaters and lagoons, and play a vital role in maintaining water balance, flood prevention, biodiversity and support food security and livelihoods.

Fig. Satellite view of Chilika

II. MATERIALS AND METHODS

After several visit was undertaken to the site during the year 2013 and biodiversity of Chilika lake was noted various information and data were collected during interaction with local inhabitants as well as the Chilika Development Authority.

III. RESULT AND DISCUSSION

The following data were detected during the study period :

Eco-Tourism

At present Chilika has little by way of ecotourism several brochures published by the Odisha State Tourism Department (OSTD), highest the recreational, religious, historic and science beauty of Chilika lake, state of interest at Chilika include

(i) Rambha Bay : It is situated at the southern end of the lake. There are number of inviting islands with an excellent site for water sports, camping sites.

(ii) Becon Islands : It is an architectural marvel with a conical pillar and a small room constructed on a sub-merged mass of rocks.

(iii) Breakfast Islands : It is a pear shaped island. The Bungalow constructed by the king of Khallikote. The flora of the island is quite interesting.

(iv) Honeymoon Island : Britishers used this island for picnicking. The water around the island is very clear and dark blue in colour.

(v) Somoto & Dumkudi – Situated in the central and southern sectors of the lake, these islands are inundated remnants of the Eastern ghats through rocky, they are rich in Flora and Fauna.

(vi) Birds Islands : It is situated in the southern sector of Chilika lake. This is a hillock with huge exposed hanging rocks. The island is covered with herbs, shrubs, trees and creepers. The granite rocks are the remnants of Eastern Ghats.

(vi) Kalijai Temple : Kalijai Temple is situated on an island considered to be the above of the Goddesss Kalijai. She is venerated due to the folklore and the legend. An excellent destination.

(vii) Satapada : Located on the eastern shore of the lake. It is bounded by the lagoon on three sides and thus offers an excellent view of the lagoon. One main attraction Satapada is Irrawady Dolphins.

(viii) Sand bar and mouth of Chilika lagoon : A beautiful and endless unexplored stretch of empty beach exists across the sand bar which separates the lagoon from the sea.

A great expanse of water like Chilika lake holds considerable tourism potential. Almost all parts of Chilika are easily accessible and rare proximate to the so called Golden Triangle of Odisha Tourism which enjoys brisk tourist traffic for at least 3 to 5 months a year.

Avi-Fauna :

Over a millions of birds congregate in this waterbeds for feeding and roosting, migration commences in late September and the birds remain upto April. Birds belonging to over 230 species including 14 birds of prey (32% aquatic, 22% waders and 46% terrestrial birds). 95 species are inter continental and local migrants. Flocks of migratory , waterfowl arrive from as far as the casparion sea, lake Baikal, Remote parts of Russia, Central and South East Asia, Ladakh and Himalaya for feeding and roosting, 15 species of ducks and two species of geese, cover over 70% migratory birds which visit this lagoon annually, 15% waders, 12% pelicans, 1.5%grebes, 1% kites and eagles and 0.5% kingfishers.

Fig. 2 Birds in Chilika

Fishery Fauna of Chilika :

Different types of fishes are found in Chilika, they come from different inflow channels (rivers) and outflow channel (sea). The total number of fish species is reported to be 158. The great fishery diversity is due to different salinity condition in different season. So this fauna, is not a uniform habitat. Since from last few years, sudden reduction in quantum of catch of native varieties. For their conservation, CDA and fishery Department implemented various measures.

Fig. 3 Fishes in Chilika

Endangered species of Chilika

Most natable endangered species are available in the lagoon.

Barakudia insularis (Limbless lizard)
Irrawaddy dolphin (orcaella brevirostris)
Felis viverrina (fishing cat)
Haliaeetus leucogaster (white bellied sea eagle)
Platalea leucorodia (white spoon bill)
Pandion haliaetus osprery
Eurynorhynchus pygmeus (spoon billed sandpiper)

Arribada of olive ridley sea turtles :

The mass nesting beach along the Chilika coast is at Rushikulya which is located at the Southern Odisha coast. It spread over six km straight from coast like in front of village Purunabandha, Kantiagada of Ganjam district. The nesting beach is much wide more or less flat with sea and sand dunes of 1-2m high. The average beach width is about 100m from near the high tide line about 200000 turtles estimated to have nested.

Fig 4 Olive ridley at Chilika coast, Rushikulya

Dolphin in Chilika Lagoon :

Endangered dolphins have been recorded in Chilika Lake between east coast and sundarban delta. These are protected under Wild Life Act, 1972. Presence of this species indicates rich piscine population. At present 1561 Dolphins are scattered over different parts of the lake. For maintaining ecosystem and economy dolphin play a vital role. So the authority trying hard to conserve the species from unusual mortality.

Fig. 5 Dolphin in Chilika

Crabs of Chilika :

Chilika lake has a rich source of Brachyuran crabs with 45 number of species found in different eight families, like Grapsidae, heucosida, ocypodidae, potrunidae, Gecarcidae, Calappidae, parthenopidae and majidae

Threat :

Chilika lake is threatened by siltation, eutrophication , change in salinity, proliferation of fresh water weed, increased aquaculture activities, change in species composition, depletion of bioresources, decrease in fish population etc.

Conservation and management strategy :

The wetland is important for sustainable development of bioresources. It's degradation is so severe that the Chilika Development Authority was formed to restore and conserve the lake.

The state Environment Department and the CDA have taken several measures for conservation and management of this unique wetland and its rich biodiversity with the support of the Ministry of E&F, Govt. of India..

* Protection of migratory waterfowl and other species prone to poaching for meat.
* Catchment area treatment
* Weed control
* Restoration of feeding and roasting habitat of water fowl
* Pollution control
* Creation of awareness about the values and function of wet land
* Research and development activity
* Community participation
* Capacity building
* Building of database of lagoon
* Promotion of eco-tourism

The salient features of the policies adopted for conservation of Chilika fisheries under Marine Fisheries Act introduced in 1988 are i. Fishing by any method is prohibited in Palur canal throughout the year, ii. Capture of Khainga, Kabla, Bhekti below 150mm size and prawn like Bagda and Chapra varieties below 100mm size by any means is prohibited throughout the year. iii. Fishing is completely prohibited in the outer channel of Chilika lake during the months between December and January, iv. No fishing by means of net shall be allowed in the outer channel throughout the year. v. At Balugaon, Khordha fishery training centre has been established. Training programmes for fishery extension officers, officers of marine science department and fish cultivation are also imparted here.

IV. Conclusion

Asia's unique largest wetland is one of the hotspot of Biodiversity with ecology and bioresources. This lake have characteristic of fresh water, salt water and brakish water creating on extraordinary environment due to efficient nutrient cycle. The lagoon in view of it's biodiversity creates a number of sites for eco-tourism and excellent centre for research.

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Immediate Implant Placement Following Extraction in Maxillary Anterior Region – A Case Report

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Abstract- Replacement of missing anterior tooth is the most esthetic challenging situation. Following tooth loss, reduction in bone height is often accompanied by alteration in gingival architecture. Immediate implant placement in freshly extracted socket is said to decrease these. This case report describes the step by step procedure for the same. Implant placement was followed by early implant loading by cementing a zirconia crown. Review check up were done till 36 months and showed implant to be functional. In addition to reduced treatment time and fewer surgeries, good esthetics and patient satisfaction are obvious advantage of immediate implant placement.

Index Terms- Early loading, immediate implant placement, indications.

I. INTRODUCTION

Placement of dental implants for replacing missing teeth is a well-established treatment option [1]. According to the traditional protocol, as given by Branemark et al. and Adell et al. a 6- to 12-month healing period after tooth extraction and prior to implant placement was suggested [2,3]. This time frame and the additional 3 to 6 months required for osseointegration of the implants, along with the time necessary for loading and fabrication of the restoration, often resulted in a treatment time of 1 to 2 years before the patient received the final implant supported restoration [4]. Attempt to shorten the overall treatment time has focussed on approaches like early or immediate implant loading and immediate or early implant placement [5-7] .

Esposito MA et al, defined implant placed in a fresh extraction socket is as an immediate implant, an implant placed in an extraction socket within 8 weeks after tooth extraction was called immediate-delayed and later placed implants were called delayed implants [8]. Immediate placement of a dental implant in an extraction socket was initially described more than 33 years ago by Schulte and Heimke in 1976 [9] .

Apart from reducing the time period and the number of surgical interventions, other advantages of immediate or early (immediate-delayed) implant placement in the extraction socket has been suggested, such as better implant survival rates, better aesthetics, maintenance of the hard and soft tissues at the extraction site, and higher patient satisfaction compared with delayed (late) placed implants. On the other hand, because of the nature of this treatment method, a higher risk of complications and failures may be expected [1] . In this case report the harmony of hard and soft tissues was preserved by immediate implant placement with early loading.

II. CASE REPORT

A 23 year old male patient reported to the Department of Prosthodontics, Meenakshiammal Dental College with chief compliant of fractured upper front tooth due to trauma. On clinical and radiographic examination, it was found that the tooth was previously endodontically treated and was restored with post and core followed by crown (Fig – 1- 4). The patient was explained about unfavourable prognosis for the tooth and the need for extraction. The patient was explained about alternative treatment options and the proposed procedure of extraction followed by immediate implant placement. The patient being conscious about esthetics and early restoration opted for immediate implant placement option.

FIG 1: PRE-OPREATIVE INTRAORAL PICTURE- FRONTAL VIEW

FIG 2: OCCLUSAL VIEW

FIG 3: PREOPERATIVE IOPA

FIG 4: PREOPERATIVE OPG SHOWING SUFFICIENT BONE APICAL TO ROOT APEX

Presurgical radiographic evaluation were carried out with IOPA for appropriate treatment planning. With the help of radiographs the diameter of the fractured tooth at the most coronal portion was measured as 4mm and length of the root was measured as 12mm. After meticulous treatment planning, endoosseous implant (S1, Safe & Simple implant system) of size 4*12mm was selected.

Following an injection of 2% lignocaine (1: 80,000 conc.), the fractured tooth was atraumatically extracted (fig 5). The extraction socket was evaluated for any osseous defects and infection / granulomatous tissue. The four walls of socket were intact. The extracted tooth dimensions were measured with vernier calliper to ascertain about the size (6). The socket was thoroughly debrided with saline solution and after sequential drilling with copious irrigation, the implant was placed with insertion torque of 45Ncm (fig 7& 8). The implant platform was placed in level with crestal bone. Post operative radiograph was

taken. Abutment was placed and checked for clearance (fig 9) . The abutment was milled (fig 10 & 11) followed by abutment level impression made with polyvinyl siloxane material. Cast was poured and mounted on semi- adjustable articulator. The permanent restoration fabricated with Cercon zirconia crown (Dentsply Ceramco) was cemented within a week of implant placement (fig 12).

FIG 5: TOOTH EXTRACTED ATRAUMATICALLY

FIG 6: MEASURING DIMENSIONS OF EXTRACTED TOOTH

FIG 7 & 8: SHOWS IMPLANT PLACED IN THE EXTRACTION SOCKET

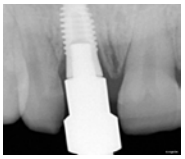

FIG 9: ABUTMENT TRIED- IN

FIG 10: MILLING OF ABUTMENT

FIG 11: MILLED ABUTMENT

FIG 12: FINAL RESTORATION IN PLACE

III. DISCUSSION

Immediate implant placement is indicated in cases of tooth extraction due to trauma, root fracture, root perforation, root resorption, unfavourable crown: root ratio and with no dehiscence or fenestration defect [10] .Contraindications include site with active infection, insufficient bone apical to tooth socket apex (<3mm) and wide or long gingival recession [11] .

A vast number of studies on immediate implant placement are present however, only a few randomized controlled trials (RCT) or long-term prospective trials exist. Review of the literature show that the survival rates of immediately, early, or delayed placed implants are comparable with those of implants placed in healed alveolar bone in short perspective [1] . In general, approximately 5% of implants are expected to be lost regardless the protocol being used. The success rate in maxilla has been stated as 66- 95.5% and in mandible is 90 – 100% [12] .

No statistically significant differences in mean crestal bone loss and mean probing pocket depth between the protocols was found. Immediate implant placement was initially said to preserve alveolar bone. However this is said to be controversial since morphologic changes of the post-extraction site may occur despite immediate ⁄ early implant placement. Buccal wall of socket being thin, slightly palatal ⁄ lingual placement of the implant in the extraction socket is recommended to avoid exposure of the implant surface. And also for preservation of bone, careful extraction is recommendable and it is advised to section multi-rooted teeth before removal [1] .

Controversies exist on whether local pathology has an adverse effect on the outcome. Chronic infection is not an absolute contraindication for immediately placed implants, however, thorough debridement of the alveolus should be made. The use of antibiotics prophylactically, is recommended in medically compromised patients. In the present study no local pathology was present [1] .

Small gaps between implant surface and socket wall have a potential for spontaneous healing. GBR and grafting perform successfully for augmentation of dehiscences and fenestrations; however, no evidence exists that one technique or material is superior to others. In the present study, no osseous defect had warrentied the use of any graft material [1] .

In the present case report, the patient's need for immediate replacement and good esthetics were addressed. Thus immediate implant placement may be a good treatment option for missing anterior tooth.

IV. CONCLUSION

Immediate implant placement though a technique sensitive procedure, has a good success rate when careful case selection and treatment planning are performed. In this case report, the immediate implant placement with early loading had resulted in acceptable esthetics and patient satisfaction.

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Heavy minerals assemblage of sediments in Almanaqil Ridge, Gezira State, Sudan

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Abstract- Heavy mineral assemblage of sediments in Almanaqil Ridge, Gezira State, Sudan has been studied, to identify, and if possible, to know their source and transporting agent. Four sediment samples were analyzed for determinations heavy mineral assemblage. The separation of these minerals was carried out using bromoform (specific gravity 2.85). These were followed by slide examination under the petrographic microscope. Heavy minerals grains of soil samples collected from outside the study area (sample 1 and 2) were compared with those inside the study area (sample 6 and 7). The heavy minerals assemblages of Zircon, Tourmaline, Rutile, Silimatate, Andalusite , Garnet, Epidote, and Quartz indicated its derivation from mixed sources of acid igneous rock to medium and high grade metamorphic rocks. The calculated % ZTR (Zircon, Tourmaline, Rutile) values varied between 47.99% to 26.08 % in in the samples from outside the study area compared with values of those inside study area which varied between 12.92% to 17.95 % and the mean ZTR percentage indices was 37.035 % of outside the study area and 15.5% of those inside study area. The three most abundant were Quartz, Garnet and Andalusite with values 50.33 %, 34.2 % and 24.52, respectively. Heavy minerals assemblages in the sediments of study area and that outside the area indicated low Zircon Tourmaline Rutile indices. This index is used as a clue for the identification of the source and as measure of the maturity of the sediments. The low ZTR index might indicate mineralogical immaturity and mineralogical composition. Heavy sand mineralogy revealed that the origin of the sand in the area was the Nubian sandstone.

Index Terms- heavy minerals, zircon, tourmaline and rutile

I. Introduction

The study of heavy minerals in sediments was established more than 100 years ago and in spite of the general skepticism towards its value during the middle of this century, the technique has not been neglected. The large variety of often distinctive heavy minerals which are found in sediments can provide valuable information for interpreting stratigraphy and determining the provenance of sediment. They can often be traced to a source in bedrock. Furthermore, the heavy mineral fraction can provide information on the nature of geochemical anomalies that would be otherwise difficult to obtain (Suzuki, 1975).

Heavy minerals are more provenance-specific than quartz and feldspar. They are a powerful tool for assessing the provenance and dispersion of modern and ancient sediments. They have been used successfully to correlate barren sandstones and reconstruct paleogeography (Pellant, *et al.*, 1996).

There are four potential important processes that can modify a heavy mineral assemblage: source area weathering, transport abrasion, hydraulic sorting and post-depositional digenesis. The latter two processes are the most significant. The effects of hydraulic sorting can be minimised by analysing the very fine sand fraction of a sample, and by discounting platy minerals such as mica and chlorite.

Progressive chemical dissolution of minerals occurs by near-surface acid weathering and during deep burial diagenesis. The two processes have different orders of mineral stability.

Post-depositional diagenesis can be difficult to distinguish from provenance variation. Sands which have undergone significant post-depositional diagenesis have a high proportion of ultrastable minerals (zircon, tourmaline and rutile); whereas unstable minerals (olivine, pyroxene) will be present in sands which have undergone minimal mineral dissolution.

Three methods can be used to recognise provenance changes in altered mineral assemblages:

- Mapping the presence/absence of diagnostic stable mineral species such as chloritoid.
- Determining changes in the ratio of two stable mineral species (e.g. rutile and zircon) (Morton, 1985).

In this study aims at analysis of heavy minerals assemblages of sediments in Almanaqil Ridge, Gezira State, Sudan.

II. Study Area

The study area in Almanaqil ridge is situated, south west of Gezira State, Sudan (Fig. 1). It lies approximately midway between the Blue Nile in the east and White Nile in the west, (latitude 14° 04´ to 14° 29´ N and longitude 33° 97´ to 33° 19´ E). It covers an area of about (220,000 feddan). The two distinctive climatic belts found in the study area (Meteorology Office-Gezira, 1994). The first one is semi-arid climate average rainfall of 100-250 mm/year and maximum mean annual temperature of 42°C found in the north and northeast. The second one is the dry monsoon climate average rainfall of 250 to 450 mm/ year, and maximum mean annual temperature of 47°C found in the eastern and southern parts of the state. Physically the study area, which is part of the Gezira State, is a plain surface intermitted by dispersed hills. The topography of the study area includes three major units. Namely: highlands and isolated mountains in the southeast, plain area characterized by clayey and sandy soil either along flat or gently sloping areas and

valleys (*Wadis*) areas including depositional areas formed of sediment brought down by the Blue Nile from Ethiopian high land (Davies, 1964). The study area is more or less devoid of vegetation possibly due to the land clearance.

III. Materials and Methods

Field Measurements

Representative four soil samples were collected from study area. At each representative samples, about 200g of the soil samples were collected. Each

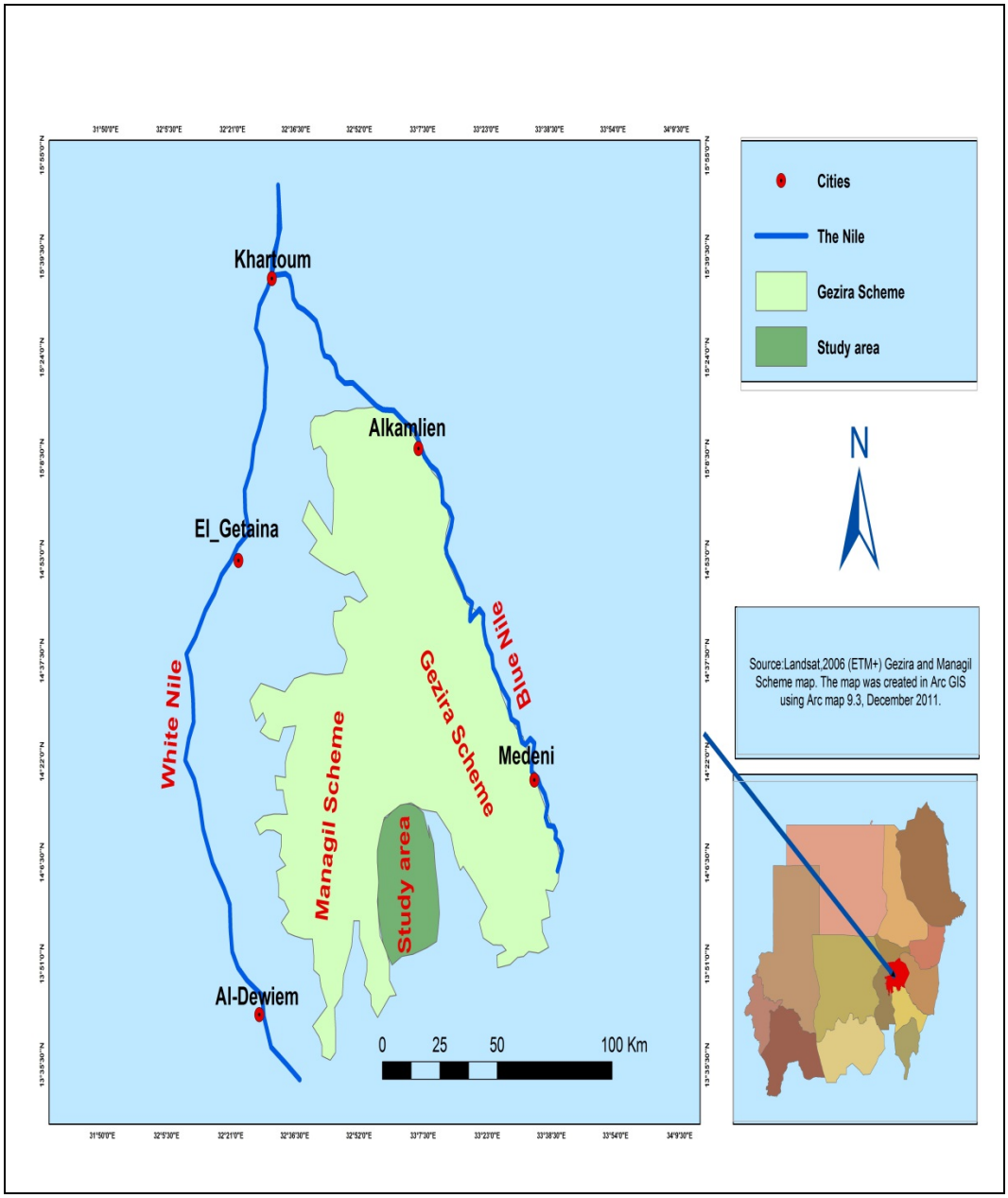


Fig.1: Location map of the study area

sample was packed in cellophane bags, tied, and labeled accordingly and taken to the laboratory for further investigation. Heavy mineral separation analyses were carried out at the Central petroleum Laboratory, Ministry of Energy, Sudan.

Heavy minerals grains of soil samples collected from outside the study area (sample 1 and 2) were compared with those inside the study area (sample 6 and 7). Samples were sieved with a Ro-tap machine and statistical parameters were obtained (Folk and Ward 1957).

A total of 5g of each dried samples was released into a separating funnel using the dense-liquid technique, with bromoform (specific gravity 2.8g/cm3). The above samples were processed for the estimation of total heavy mineral content using Bromoform (CHBr; specific gravity 2.89), as a medium for separation of heavier fractions from the lighter area. Methylene iodide (di-iod methane, 3.3 sp.gr.) heavy medium was used to determine very heavy minerals and light heavy minerals from the total heavy minerals obtained using bromoform heavy medium.

Samples were boiled in 10% Hydrochloric acid for two minutes in order to disintegrate the samples. Boiled samples were rinsed with water to remove the hydrochloric acid and dried in an oven in order to separate the fine sand fraction.

The mixture was vigorously stirred and left for 5 minutes. The heavy minerals present in the sample with specific gravity > 2.85g/cm3 were allowed to settle to the bottom of the separating funnel or after which the filtrate (heavy mineral) were thoroughly washed with acetone to move any trace of bromoform and also dry. The heavy minerals were mounted on slides with the aid of Canada balsam (Pellant, C. and R. Phillips, 1996) and the opaque mineral was identified based on (Mange et.al, 1992).

The non-opaque minerals were studied under a transmission light microscope (Suzuki, 1975). Table1 presents a brief description of heavy mineral grains of study area.

The "ZTR" index, which is a quantitative definition of mineral assemblage, was calculated using the percentage of combined Zircon, Tourmaline, and Rutile grains for each sample (Morton, 1985).

IV. Results and discussions

Polarize microscope photomicrographs of heavy minerals in the study area. Table 1 presents the quantity of the individual heavy minerals and Plate 1 gives a first insight into the heavy mineral spectrum and provides a basis for deciding on further data interpretation.

Zircon:

Zircon is one of the most extremely ultra-stable heavy resistant minerals during weathering and that may explain why it was found relatively in higher concentration in the study area (Table 2). It is higher in the northern part of study area and amounted to about (11%) where the other samples contained moderate level (≈ 1-3 %) from the total 300-350 grains mounted on each slide. The rounded shape of zircon was an indication of distance transportation from the source area, as well as strong recycling effect. The interference colors observed were generally of the forth order. This agreed with Kerr and Syme *et al.,* (USA, 1977). The source rock of zircon is mainly igneous rocks with angular, sub-angular, and complete crystalline shape, it may be as well from sedimentary rocks with rounded and sub-rounded shape. The transportation agent was wind and mixed transportation (wind and water).

Rutile:

Rutile is also an ultra-stable heavy mineral; its concentration was similar both inside and outside the area since any concentration less than 50% indicates similar content (Stapor, 1973). This agreed with Morton and Hallsworth, (1994) in USA. The color of the Rutile varied from reddish brown, dark brown to brown, generally elongated and well-rounded and may look opaque. It was characterized by strong birefringence pleochroism and parallel extension. The sources of this rutile are sedimentary rocks and sometimes the igneous rocks that are transported by wind (Stapor, 1973).

Tourmaline:

Tourmaline is as well a member of ultrastable heavy minerals. It was found in sample 1 (outside the area) contained tourmaline in higher percentage compared to others samples from inside the study area. Tourmaline occurs in sub-angular form with a color that varies from dark brown, light brown to brown. It was stained by iron oxides. The main sources of tourmaline are acid igneous rocks and to some extent metamorphic rocks, in addition to sedimentary rocks. It was transported by wind and water.

V. Summary of heavy sand mineralogy

Heavy minerals of the study area are counted in every slide through microscopes in order to know quantity them as % (Table 2). A Frequency similarity among them was shown (Fig. 2).

The study area was grouped into two physiographic units (1and 2). The results of the study area showed that about 2.34%, 7.89% and 2.69 % of zircon, rutile and tourmaline respectively, fell within low ZTR index in unit 1 (sample 6). Similar results were also found for unit 2 (sample 7), where 1.3%, 13.88% and 2.77% of zircon, rutile and tourmaline respectively, was reported (Table 3).

The results of ZTR index indicate similar results of samples outside the area, 2.63%, 23% and 22.36% of zircon, rutile and tourmaline respectively, fell within low ZTR index (sample1), 11%, 11.31% and3.77% of zircon, rutile and tourmaline respectively, all fell within also low ZTR index (sample 2).

Table 1: brief description of heavy mineral grains of study area

Soil sample No.	Mineral type Zircon No.	Description
1	Z1	Rounded with brown colors, stained by oxide of iron
1	Z2	Sub- rounded with gray colors, stained by oxide of iron
1	Z3	Sub- rounded reddish colors, stained by oxide of iron
2	Z4	Rounded with brown to reddish colors
2	Z5	Angular with gray colors, inside the Quartz
6	Z6	Sub- rounded with brown to gray colors
6	Z7	Sub- rounded with brown
7	Z8	Rounded with brown colors, stained by oxide of iron
7	Z9	Angular with gray colors
7	Z10	Sub- rounded reddish colors
	Rutile No.	
1	R1	Rounded with sub rounded shape
2	R2	Angular, reddish to brown colors
2	R3	Rounded with sub rounded shape
6	R4	Rounded with reddish colors
7	R5	Darkish colors, rounded with sub rounded shape
	Tourmaline No.	
1	T1	Sub-angular, brown with black spot
2	T2	Dark brown colors with oval shapes
6	T3	Sub-angular with oval shape, brown colors
7	T4	Semi rounded or oval shape with grayish to brown colors

Sample 1 and 2 = Outside the study area; sample 6 and 7= Inside the study area; Z= zircon; T= tourmaline; R= rutile

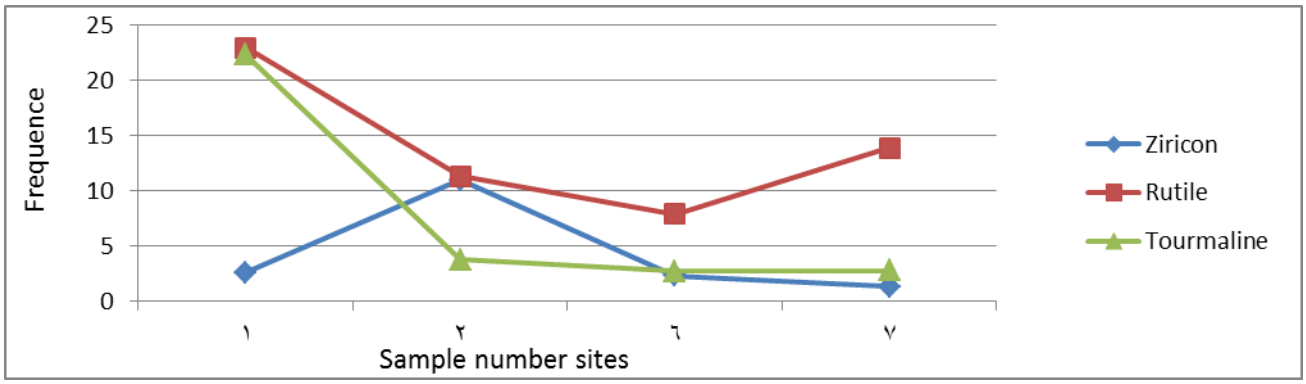


Fig. 2: Frequency symmetry in the mineralogy of outside (samples 1 and 2) and inside the study area (samples 6 and 7)

Table 2: percentage of heavy mineral in soil samples of the selected sites

Soil sample No.	**%**									**Location**
	Quartz	Zircon	Rutile	Tourmaline	Silimanite	Andalusite	Epidote	Garnet	Kynite	
1	21.28	2.63	23	22.36	3.94	10.52	6.57	7.89	1.81	White Nile
2	23	11	11.31	3.77	9.43	24.52	9.43	7.54	-	North of Amanagil city
6	44.98	2.34	7.89	2.69	2.63	5.26	-	34.21	-	North of study area
7	50.33	1.3	13.88	2.77	1.2	8.33	2.75	19.44	-	East of study area

Samles 1 and 2 = Outside the study area ; samples 6 and 7= Inside the study area

Table 3: Zircon, Tourmaline and Rutile Index

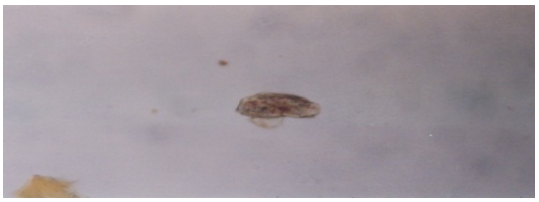
Sample No.	**Zircon**	**Rutile**	**Tourmaline**	**ZTR Index**	Location
1	2.63	23	22.36	47.99	White Nile*
2	11	11.31	3.77	26.08	North of Amanagil city*
Average		**37.035**			
6	2.34	7.89	2.69	12.92	Northern parts of study area (unit1)
7	1.3	13.88	2.77	17.95	Eastern parts of study area (unit2)
Average		**15.435**			

The overall ZTR index of the study area was (average 15.43 %) when compared to that outside the study area (average 37.03%), indicated similar content of heavy-mineral types of both inside and outside the area (3).

Heavy minerals assemblages in the sediments of the study area and that outside the area indicated low Zircon Tourmaline Rutile index. This index is used as a clue for the identification of the source and as measure of the maturity of the sediments.

The low ZTR index might indicate that the mineralogical immaturity mineralogical composition might have been affected by other processes during the sedimentary cycle (Morton 1985). Such processes include: (i) weathering in the source area, (ii) effects of the transport process, (iii) hydraulic conditions during the deposition period and (iv) the digenetic processes that operated after the deposition or to some of the most dynamic geomorphological responses to climate change (Morton and Johnsson 1993).

Moreover, the presence of the smaller and more dense heavy minerals grains (Zircon, Rutile and Tourmaline), are indicative of low energy environments, this agreed with Stapor (1973), who found less dense heavy minerals (Starurolite, Kyanite, etc.), in area with high energy in Northeastern Gulf of Mexico, USA. Roundness was determined by comparing the sand grains with a visual chart. Roundness was found in some samples and sphericity (equal dimensions) in other samples. The characteristics of Zircon, Rutile and Tourmaline (such as sorting, rounding and spheroiding), indicated that the origin of the sediments should therefore, have been acid igneous rocks which were subjected to intensive chemical weathering and reworking process. This agreed with Weisbroaad and Nachmias, (1986) in North Africa.

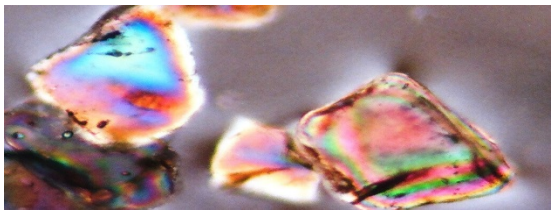


A. GARNET (SITE 2)

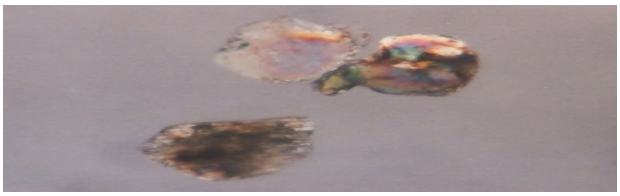
1B. ROUNDED RUTILE AND EPIDOT (SITE 7)

1 C. HORNBLEND AND EPIDOT (SITE 1)

1 D. DIFFERENT TYPES OF QUARTZ IN SOIL SAMPLE FROM RECENT AEOLIAN SOIL OF THE STUDY AREA, CONTAINING ZIRCON AND TOURMALINE TOGETHER WITH QUARTZ AND ANDALUSITE MINERALS (SITE 6)



1E. DIFFERENT TYPES OF QUARTZ IN SOIL SAMPLES FROM THE NORTHERN PARTS INSIDE THE STUDY AREA, CONTAINING TWO TYPES OF ZIRCON (SITE 6)



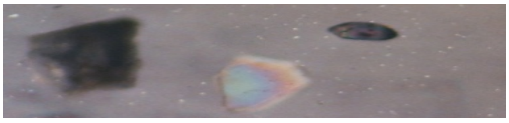
1 F. SILLIMANITE (SITE 7)

1 G. SUB-ROUNDED TOURMALINE AND QUARTZ (SITE 1)

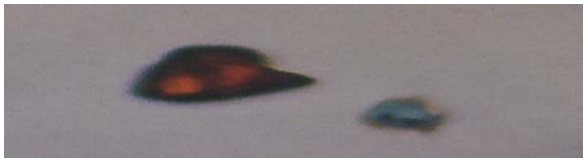
1 H. ROUNDED BROWN TOURMALINE (SITE6)

1I. SILLIMANITE (SITE 1)

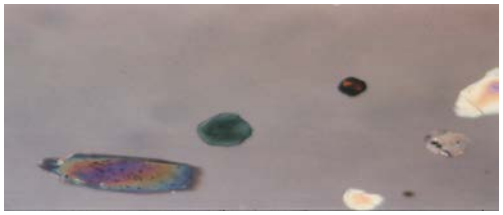
1 J. ROUNDED RUTILE (SITE 1)



1 K. ROUNDED ZIRCON AND ANGULAR RUTILE (SITE 7)



1 L. SUBANGULAR ROUNDED RUTILE (SITE 6)



1 M. HORNBLENDE AND ROUNDED RUTILE (SITE 2)

1 O. SUBROUNDED RUTILE AND TOURMALINE (SITE 7)

1 P. SUB-ROUNDED RUTILE (SITE 1)

1 Q. SUB-ROUNDED ZIRCON (SITE 1)

1 R. SUB-ROUNDED TOURMALINE (SITE 2)

PLATE 1: POLARIZED MICROSCOPE PHOTOMICROGRAPHS OF HEAVY MINERALS GRAINS SAMPLES, INSIDE (SAMPLES 6 AND 7) AND OUTSIDE THE STUDY AREA (SAMPLES 1 AND 2).

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Factors Affecting Consumer Switching Behavior: Mobile Phone Market in Manchester- United Kingdom

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Abstract- The consumer behavior is always remaining under influence of factors, which simulates the behavior of consumers towards either remain loyal with existing brand or switch towards other brands. This research study is aimed to analyze the switching behavior of mobile users in Manchester, UK, whose behavior is affected toward switching from exiting mobile phones towards new mobile phone. The focus of research study has been set to analyze the relationship between influencing factors (affecting consumer behavior) and switching intentions of consumers regarding their mobile phones. The other focus of the research study is to identify the factors, which de-motivates the behavior of consumers from switching towards other mobile phones. The methodology, adopted for this research study employs the interpretivism philosophy, deductive approach of, qualitative research design for conducting research. The sample of 150 people has been selected to include in research, selected randomly and filling the survey questionnaire for collecting data about their switching and non-switching intentions. The results of empirical research, based upon research findings, data analysis and matching with previous research studies of literature review, are confirming the influence of factors, which are affecting the switching behavior of mobile users in Manchester. The findings of this research study are confirming the impact of need based and opportunity based behavior, the impact of technology, innovations, changing demographics, brand image, perception, behaviors, attitudes, loyalty, advertising and other factors, which have the significant effect towards stimulating and de-motivating the behavior of mobile users regarding keeping loyal with existing brand or switch towards another brand.

Index Terms- Consumer behavior, Mobile phone, Market tactics, Marketing, Switching behavior

I. INTRODUCTION

he consumer behavior is identifying, searching, selecting and Tconsuming products and services for satisfying their needs and wants (Solomon et al., 2006). Consumer behavior determines how consumers decide to buy our product and what the various factors responsible for this area" (Bhasin, 2010). The consumer behavior study is basically the psychology of consumers, like when, how, why and people buy and use the products for satisfying their needs. From a marketing point of view, the consumer behavior is, "the psychology of how consumers think, feel, reason and select between different alternatives like brands, products and retailers" (Perner, 2006).

The companies are always trying to build mutual relationships with their customers through delivering better value and fulfilling their commitments, but due to competitive business environment, it's becoming difficult for marketers to do so. The consumer switching behavior is there in between both, companies and customers, because the consumer switching behavior restricts both parties to make long term relationships and even it breaks the pre-developed long term relationships (Zikiene and Bakanauskas, 2006).

Similarly the consumer switching behavior is basically the behavior of consumers in shifting their attitude from one brand (product) to another brand (product) (Zikiene and Bakanauskas, 2006). For instance, Mr. John was using the Apple iPhone, but with launching of the new Samsung Galaxy, then John has changed its cell phone. The factors, which stimulated the John to change its mobile phone, are many in numbers like price, features, speed etc. Now a day, the consumers are the key focus of marketing and even entire business, because a research state that every year, the 83% brand failed to achieve marketing objectives, and there are 11000 products introduced every year and only 56% products reach to the age of 5 year or more and only 8% new ideas are converted into market offerings. The reason is, because any marketing idea, product or strategy, that is not focusing customers or not designed according to the customer's needs and wants, becomes failed or not able to deliver its full strength (Bhasin, 2010).

Generally, there are four categories of factors, which highly affect the consumer behavior and also play an important role in switching consumer behavior (appendix 1). The following figure represents the four categories of factors. (a) Cultural Factors are the major influencing factors, which related to the culture, in which the customer is living and their needs and wants are highly affected by culture, which includes the culture, sub-culture and social class. (2) Social factors are societal norms, values and sagas are also affecting the buying behavior of consumers like reference groups, family members and role & status of each

member in society. (3) Personal factors are the person's consumer behavior is dependent on personal factors like age, life cycle, occupation, income, lifestyle and personality. (4) Psychological factors are the person's motivation, perception, learning, beliefs, attitudes and thinking also affects the buying decisions of consumers.

II. PROBLEM STATEMENT

Previous research studies state that the consumer switching behavior is highly dependent on the cause-effect relationship (Njite, Kim and Kim., 2008); (Zikiene and Bakanauskas, 2006) and (Bhasin, 2010). For example, the multiple causes like consumer demographics, marketing offers, economy stage, previous experience and type of consumer needs are reflecting their effects in shape of switching consumer behaviors. This research further explores the relationship (cause-effect) between consumer switching behavior and the causes along with the impact and their way of affecting the consumer behavior.

III. TARGET AREA OF RESEARCH:

This research study is limited to the study of consumer switching behavior, with the perspective of mobile customers in the United Kingdom. The target customer includes the broad range of the population, because almost every person is having a mobile phone. Further, the research study involves the impact assessment towards influencing the consumer switching behavior. The target area of research study has been selected as, "mobile phone industry" of the United Kingdom.

The impact of mobile phones is revolutionary in human life and the number of mobile phones in the world has reached to 1.8 billion cell phones (mobileyouth.org, 2011). The selected industry has been set to conduct research in mobile phone industry of United Kingdom Market. The main reason for selecting Mobile industry is because the mobile phone is being used by everyone and customers of mobile phones belongs to different segments of the market. With the availability of multiple brands in the UK, the mobile market of the United Kingdom is highly differentiated and competition is intense. There are so many mobile brands, like Alcatel, Apple, BlackBerry, HTC, Huawei, LG, Motorola, Nokia, Samsun, Sony Ericsson (Phones4u.co.uk, 2012). There are 33 million mobile phone owners in the UK, which are using the multiple brands of mobile phones (E-consultancy, 2011).

The reason for selecting this industry is because people are frequently changing their mobile phones and select their desired phone phones of different brands. There changing behavior from one brand to another brand includes the multiple reasons, like Mr. John was using the Apple iPhone, but with launching of the new Samsung Galaxy, then John has changed its cell phone. The factors, which stimulated the John to change its mobile phone, are many in numbers like price, features, speed etc. Similarly, the student, when entered into college or university, they prefer to use Nokia handsets (Dutta, 2009). The focus of research is to explore those factors, which are affecting the consumer behavior and stimulate them to switch their buying behavior.

IV. RESEARCH NATURE

This research includes the exploratory studies for highlighting the important factors, which are influencing the behavior of consumers in switching from one brand to another brand. For this purpose, a descriptive research has been performed to highlight the factors and also checked their impact on consumer switching behavior along with their way of influencing consumers. **:**

This research study has aimed to explore the factors, which effect on consumer switching behavior and how they affect the consumer behavior in switching from one brand to another brand for buying mobile phones. Further, the research study also explores the factors, which de-motivate the switching behavior of mobile users.

V. RESEARCH QUESTIONS:

For current research, the following research questions have been formulated:

Q1. What are the factors, which affect the consumer behavior towards switching from existing brand to another brand?

Q2. Which strategies can be adopted to discourage the mobile phone consumer switching behavior?

VI. LITERATURE REVIEW:

Relevant studies are providing the in-depth knowledge about the previous studies about the consumer switching behavior and factors, which affect the behavior of consumers. Secondly, the relevant studies are also covering the factors, which de-motivate the switching behavior of consumers. Both categories are discussed with past literature and available knowledge.

6.1 Consumer Switching Behavior:

The consumer switching behavior is being considered as complex study of factors, which stimulate the behavior of consumers towards switching their purchase between brands. The following influencing factors are helpful to understand the cause and effect relationship between different variables and their outcomes towards switching consumer behavior.

6.2 Factors which Discourage Switching Behavior:

There are some strategies, which are frequently used by companies to de-motivate the switching behavior of consumers. The promotion function of marketing mix covers not only about advertising and communications, but also involves the sales promotions (Kotler and Armstrong, 2008), an important and commonly used marketing tool, which also have an objective to keep the company's customers in relation with company. In other words, the marketing efforts, like sales promotions, advertising and brand loyalty are also other influencing factors, which de-motivate the consumer switching behavior (Nagar, 2009, p35). The arguments by (Marshal et al., 2011, p871) are confirming the claims of both, Kotler and Armstrong (2008) and Nagar (2009). According to the results of a research study, the companies are not only focusing towards selling just products, but also focusing to build long term relationships with their customers. The marketers believe that ensuring loyalty and reducing churn are

two options, which not only develops good relationships with customers but also reduce the switching behavior of customers (Marshal et al., 2011, p871).

To stop the consumers from switching brands, there are also other factors, other than price, benefits etc. The consumer's emotional intelligence, relationship status and personality factors also play an important role in affecting the consumer switching behavior (Lin, 2010, p3209). By focusing on relationship status factor, the researchers state that when the companies build strong relationships with customers, then this level of relationship de-motivates the consumers from switching brands, even in case of service failure. One model presented by (Gönül and Srinivasan, 1997, p185), which surrounds the two important factors, price and promotional coupons. According to this model, there are two influencing factors (variables), which cause the consumer behaviour towards switching, (a) Brand Loyalty Propensity, (b) unobserved heterogeneity. According to this model, the use of promotions and price cuts demotivates the consumer intentions from switching towards other brands. Furthermore, the research study by (Chiu et al., 2005, p1681) are suggesting that companies cademotivatete the consumebehaviouror through enhancing their loyalty through using relationship marketing.

6.3 GAP FOUND IN LITERATURE:

The relevant studies in literature review provides the detailed knowledge about consumer switching behavior and the factors, which affect the consumer switching behavior and which de-motivates the consumers from switching intentions. The literature review covers the positive arguments and negative arguments about switching behavior and non-switching behavior of consumers. Although there have been found many gaps in literature review such as, the most of literature is about the impact of price, economic factors, technological factors, customer service shopping channel, customer demographics and time limitations etc., But there is less literature about the product related factors and psychological factors of consumers have not been addressed in the literature review. In this research, the focus has been developed towards examining the impact of product related factors and psychological factors towards customer switching behaviors.

VII. HYPOTHESES TO BE TESTED:

The following research hypotheses have been formulated for the research:

H1. The consumer switching behavior of mobile customers in the UK is highly affected through influencing factors.

H2. The only marketing tactics (promotional & loyalty campaigns) de-motivates the switching behavior of consumers

VIII. SAMPLE:

In this research, the random sampling has been decided to select the sample. The survey of 150 people has been conducted by visiting mobile market near Manchester Academy, Manchester, United Kingdom and interviewing the people from there by meeting time and taking time from them.

IX. DATA COLLECTION:

The questionnaire has been given to 150 people for filling their answers. The question had three parts. The first part of questionnaire collected basic details from the mobile users about their mobile, brand, nature of mobile, independent of buying and their likeness to the brand. The second part of questionnaire has been designed for only those people, who are going to change their mobile phone in near future. The last part of the questionnaire was about collecting information from people, who don't want to change their mobile phones. The second part of the questionnaire would answer the first research question, in which the justification of factors has been confirmed from customers about their switching intentions. The third part of questionnaire helps to answer the second research question of research, in which the impact of factors has been confirmed, which is de-motivating the switching intentions of mobile users.

X. ANALYSIS OF FINDINGS

H1. *The consumer switching behavior of mobile customers in the UK is highly affected through influencing factors.*

The first hypothesis is about analyzing the impact of influencing factors towards switching behavior of mobile users. The findings of empirical research confirm the impact of influencing factors. The survey findings include the collection of information about the different aspects of switching behavior. According to the survey of respondents, the 53% people want to change their mobile because of several reasons, as problems reported, due to problems (23%), old model (28%), getting a good price (15%), don't like brand (5%), upcoming model is good (19%) and want more specifications (10%). The survey also covers the impact of several other factors, but for justifications of this hypothesis, only these major reasons have been taken in consideration. The 23% people want to change because of a problem that is showing the "impact of need"; means people want to change their mobile because of problem of needs. The 28% people reported that model is old, that is showing "impact of technology"; showing that the behavior of people is also affected due to the impact of technology. The 15% people reported that they are getting a good price of their mobiles is showing the "impact of opportunity"; means people also switch, when they find the opportunity to get price gain or any other better option. The 5% people reported, they don't like brand that shows the "impact of disliking of brand". The 19% people reported that the upcoming model is good that means the switching behavior is also contributed by "impact of innovations". Last the 10% people reported that they want more specifications that mean "impact of changing demographics"; showing people's behavior is changing due to changing needs of consumers. These are the six major reasons, which are accepted by consumers, which are about to change their mobile phones. On the basis of these findings, this hypothesis is confirmed as true, because the switching behavior of mobile users in Manchester, UK is widely affected by influencing factors such as impact of needs, technology,

opportunity, brand disliking, innovations and changing needs. On the other side, the 47% people don't want to change their mobiles because their mobile is ok (22%), time limitation (13%), money problems (36%), non-availability on desired phones (7%) and brand likeness (19%). These findings show that the influencing factors heavily contribute towards switching and non-switching behavior of mobile users in Manchester, United Kingdom.

H2. *The only marketing tactics (promotional & loyalty campaigns) de-motivates the switching behavior of consumers*

The second hypothesis has been formulated about the de-motivating behavior of mobile users in Manchester, United Kingdom. The findings of empirical research and analysis of the findings do not prove this statement. It states, only promotional campaigns and loyalty campaigns are de-motivating the switching behavior of mobile users. According to the results, the two justifications are relevant. First, the 47% mobile users replied that they don't want to change their mobiles, and they expressed the reasons as, their mobile is ok (22%), time limitation (13%), money problems (36%), non-availability on desired phones (7%), brand likeness (19%) and marketing & promotions (3%). These findings state only 19% people don't want to change their mobiles because they feel loyalty or like the mobile phone and 3% people don't want to change because of marketing & promotions by the company, while the rest of the people expressed the other reasons. It means only 22% people are de-motivated because of promotional and loyalty campaigns that means the majority of other factors is significant in de-motivating the mobile users from switching from existing brand to new brands. Secondly, regarding de-motivating factors, the majority of people reported the four factors durable qualities (33%), innovative features (25%) and customization (17%) and customer services (12%). Here again, the only 6% people reported the reason of the company's advertising. These both arguments are enough for justification about rejection of second hypothesis. In short, it is concluded that although the promotions and loyalty campaigns contribute to de-motivation of switching behavior, but the other factors are more effective, such as offering durable quality, innovative features, customized applications, customer services and accessories etc.

CONCLUSION:

The research findings have provided the response from both mobile users, (a) have switched intentions and (b) have not switched intentions. According to the research findings, the behavior of mobile users is widely affected through influencing factors, which cause them to switch towards others mobile and also de-motivate them to switch towards other mobile. The survey findings also includes the response of users from other aspects as well such as, dependency of buying, mobile usage ratio, the number of mobile they have, kinds of mobile they have, preference towards famous brands and length of buying decisions etc. After screening the conclusion drawn about 148 questionnaires was recorded.

Influencing Factors	People with switching intentions	Influencing Factors	People with non-switching intentions
Phone model is old	28%	Money problems	36%
Phone is having problem	23%	Existing phone is working well	22%
Impressed by new Model	19%	They like their phone	19%
Other	30%	Other	23%

Table 1: Descriptive for different intentions and factors

The first step was to separate the both groups (a) people want to switch and (b) people don't want to switch. In concluding the research, the only highest responses of each finding are selected for concluding research. The results of empirical research state that 53% people in Manchester, UK are having switching intentions, while the 47% people don't want to change their mobile phones.

Starting from potential switchers, the people were asked to express their reasons for switching. The wider problem has been observed as, people want to change their mobile phone as their phone model is old (28%) and they want to change their phone, further the other reason were also selected such as, their mobile phone is having problem (23%) and the new model is good enough (19%). The people were also asked to express their next preferred brand, they want to buy and results are showing that most of people in Manchester want to buy the Apple brand (30%), Nokia (22%) and Blackberry (19%). The survey results also provide the justification about the reason for selection such as, new features (29%), good price and quality (27%) and attractive design (20%). These results states that the majority of people in Manchester want to get Apple, Nokia and Blackberry because they have new features, attractive design and good price and quality (influencing factors causing switching behavior of people). The survey also attempts to collect response of people in different situations, such as, once the people has switched from brand due to any reasons, if that problem happens again, then people would switch again towards next brand, as reported by 68% people. Further, the increase in price also causes the switching behavior of mobile users, because only 32% customer reported that they would not change their switching behavior even the price increases. In case the new innovative model comes in the market, the switching behavior of people is also affected by affordability factors (42%). In case, the consumers are dissatisfied, the majority of people (43%) would change again their mobile phones. The impact of good and bad customer services has been observed significant towards purchase behavior (82%). Similarly, the previous bad experiences of quality are also affecting the switching behavior, as reported by 100% people. The niche buying decision of the people is also mostly supported by people (67%) and the popular phones are also attractive for

people (57%). Last the impact of emotional attachment has been recorded significant towards purchase behavior.

Table 2: Miscellaneous switching behaviors

Miscellaneous factors affecting switching behaviors	
People would switch again towards next brand	68%
People who would not change their switching behavior even the price increases	32%
Affordability factors	42%
Dissatisfaction with current brand and intend to switch	43%
Customer services influence	82%
Previously dissatisfied customer's switching intentions for the same brand	100%
Niche buying decision	67%
Popularity of brand influence	57%

Further the responses of non-switchers have been recorded as well, in which the people are asked to describe their reasons of non-switching from one brand to another brand. The 47% in Manchester, UK don't want to change their mobile phones and the reasons they express include the money problem most important, as reported by 36% people. Further the reasons have been expressed as existing phone is ok (22%) and they like their phones (19%). These findings are helping in understanding that people are not going to change because they feel money problem, they don't feel the need of changing and they like their phones as favor for them. The results of empirical survey also provide the insights about the de-motivating attribute of their existing mobile phones, which restricts them from switching towards other phones. The people in Manchester like their mobile phones, because their phone is having good features (32%), high quality at affordable price (38%), and they are getting innovative features (25%). Last, the result of customer survey also confirms the impact of factors, which cause the loyalty of customers, as reported by people, such as durable quality (33%), innovative features (25%) and Customization & applications (17%). These findings are providing the information to understand about the factors, which de-motivate the switching behaviors of customers.

In concluding the results of a research study, the impact of influencing factors has been confirmed towards switching behavior of mobile users. There have been observed many factors which cause the switching behavior of customers, while there are also other factors, which de-motivate the switching behavior. The results of empirical research studies confirm that the switching and non-switching behavior of mobile users is widely affected by a number of factors, so the implications for marketers to understand those both groups of factors to understand the behavior of consumers.

RECOMMENDATIONS:

In collecting the response of mobile users, the focus was towards analyzing the impact of mobile related features, which causes the switching behavior and also de-motivates the switching behavior. The recommendations for researchers are to conduct more detailed studies towards only mobile related features in order to analyze the impact of features, causing switching behavior of consumers. Secondly, in this research study, the very lesser part of de-motivational factors have been included, but it must be explored in order to identify the factors, which de-motivates the consumer behavior, so that companies can understand the available strategies and tools for retaining the customer loyalty with the brand, as they de-motivates the switching intentions of mobile users.

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Fabrication of PMMA/$CaCO_3$ Nanocomposites: Optimization of Tensile Strength through Taguchi's Analysis

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Abstract- PMMA/$CaCO_3$ nanocomposites have been fabricated by in-situ polymerization. The influence of concentration and stirring speed on tensile strength have been studied. The experimental results were optimized using Taguchi's approach. L9 Orthogonal arrays of Taguchi, the signal-to-noise (S/N) ratio and the analysis of variance (ANOVA) are employed to find the optimal input parameter levels and to analyze the effect of these parameters on tensile strength. Experimental results showed that tensile strength PMMA/$CaCO_3$ nanocomposites increased up to 53 % at 0.6 wt. % $CaCO_3$ and 1000 rpm in comparison to corresponding pure PMMA. The experimental results and various statistical approaches namely, Taguchi methods, Conceptual S/N ratio and drew similar conclusions. The ANOVA analysis showed that speed is more dominant in comparison to concentration.

Index Terms- ANOVA analysis, In-situ polymerization, Nanocomposites, Tensile strength, Taguchi method.

I. INTRODUCTION

In the past decade, polymer nanocomposites are the materials which have attracted a great deal of research interest. Polymer nanocomposites have improved mechanical properties, such as high strength, toughness and hardness [1]. Final properties of polymer nanocomposites depend upon the methods of mixing of filler material and matrix material. The interaction, distribution and concentration of constituents depends upon compounding technique.

Generally in-situ polymerization method is used for synthesis of various Poly (methyl methacrylate) (PMMA) / inorganic nanocomposites, because the type of nanoparticles and the nature of polymer can vary a wide range to meet the requirements [1].

Poly (methyl methacrylate) (PMMA) is transparent, hard, stiff, low water absorption and outstanding outdoor weathering properties [2]. In plastic industries calcium carbonate ($CaCO_3$) is widely used mineral fillers because it is easily available around the world, easy to grind or reduce to a specific particle size, compatible with a wide range of polymer resins and economical. In addition, when the particle size is carefully controlled, $CaCO_3$ helps increase impact strength and flexural modulus (stiffness) and tensile strength [3].

A substantial amount of work has focused on PMMA as the matrix material. PMMA/$CaCO_3$ nanocomposites were synthesized by several researchers for the thermal and mechanical properties. The work done by Xiaoyu L et al.[4] which was with a PMMA/ modified nano-$CaCO_3$ nanocomposites, that results reported in this paper shows 35 % increased tensile strength with respect to pure PMMA by adding up to 1. wt. % fillers. However the work done by Nivin et al.[5] which was with a PMMA/TiO_2 nanocomposites, that results reported in this paper shows 40.47% increased tensile strength with respect to pure PMMA by adding 1.25 wt. % fillers. In the same way the similar type of result obtained by Yang et al [6] which was with a PMMA/silica nanocomposites, that results reported in this paper shows 48.97% increased tensile strength with respect to pure PMMA by adding 5 to 10 % wt. fillers. But the Kim et al [7] achieves the highest increment in tensile strength to 50 % by adding multiwall nanotube of 1% in PMMA matrix.

In conventional polymer composites, micron-size $CaCO_3$ is used as a filler material that is difficult to disperse in the polymer matrix, which leads to coarsely blended composites and hence agglomeration, poor physical and mechanical properties [8].

To overcome these problems, a new method has been reported for the synthesis of PMMA/ $CaCO_3$ nanocomposites by in-situ polymerization reaction. In present study, nanoparticles were added at different stirring speeds during reaction. It was observed that nano-$CaCO_3$ is comparatively well dispersed into the matrix at higher speed, due to which tensile strength shown improvement that may be useful for commercial applications. The settings of polymerization process parameters were determined by using Taguchi's experimental design method. Orthogonal arrays of Taguchi, the signal-to-noise (S/N) ratio and the analysis of variance (ANOVA) are employed to find the optimal levels and to analyze the effect of stirring speed and filler concentration on tensile strength.

II. MATERIALS AND FABRICATION TECHNIQUE

The methyl methacrylate (MMA) monomer with a purity ≥ 99% was purchased from Merk, the free radical initiator, benzoyl peroxide (BPO) with a purity > 98%, was provided by Loba Chemie. For the preparation of nanocomposites, nano-$CaCO_3$ provided by Sisco research laboratories Pvt. Ltd. was used. All other chemical were used without further purification.

In this work nanocomposites have synthesised at three different speeds and at every level of speed the concentration of nano-$CaCO_3$ varied from 0.2% to 0.6 wt. % of pure MMA. So nine different composites have been synthesised along with one pure PMMA for the comparisons of properties.

Fig. 1 shows experimental setup, firstly 650 ml of MMA is taken into 1000 ml beaker. When the temperature of the water bath reached to 80℃ then beaker is clamped. Then a fixed quantity of free radical initiator BPO is added and mixed thoroughly by glass rod to initiate the reaction. Then speed of the stirrer is adjusted to 600 rpm by speed regulator. Now 0.2 wt. % of $CaCO_3$ nano powder is added. After that the solution was left for 90 min. under continuous stirring and a constant heat of 80 ℃ is provided to complete the reaction. After completion of reaction add content of beaker approx. 250 ml methanol (Non solvent) taken in a 1000ml beaker with mild agitation with glass rod. In the second and third series of experiments, speed of the stirrer changed to 800 rpm and 1000 rpm respectively and same procedure have been repeated to get the all composites as reported by Sajjad et al [8].

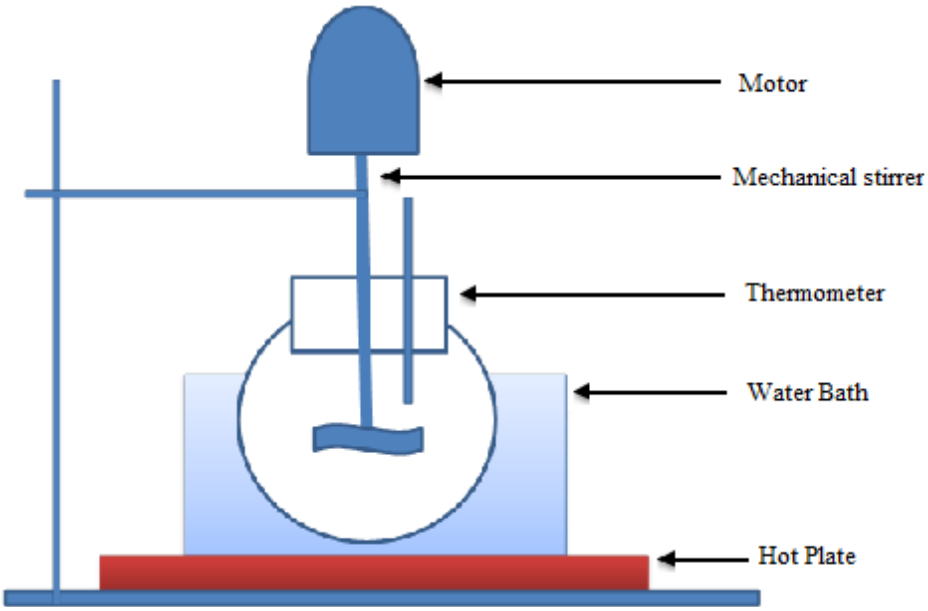

Figure 1: Experimental setup

III. RESULTS AND DISCUSSION

TENSILE STRENGTH

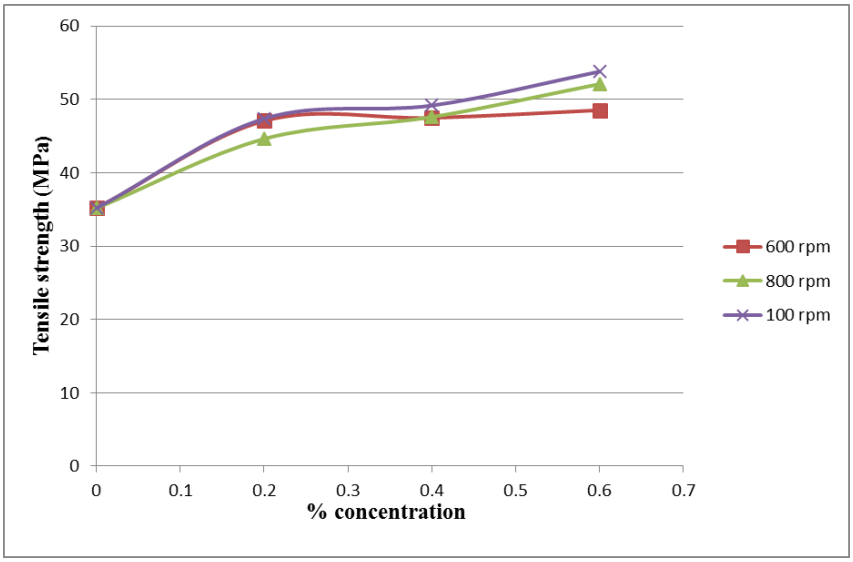

Figure 2: Variation of tensile strength versus concentration at different speeds

The fig. 2 shows that pure PMMA exhibits tensile strength of 35.17 N/mm^2. When the filler concentration is increased to a level of 0.2% the strength increased to 47.08 N/mm^2, 44.62 N/mm^2 and 47.38 N/mm^2 at 600 rpm, 800 rpm and 1000 rpm respectively.
Again, when further increment in filler concentration up to 0.4% the tensile strength improves to 47.48, 47.60 and 49.17 N/mm^2 at 600, 800 and 1000 rpm respectively.
Similarly, at 0.6% filler concentration level again increments in the tensile strength have been recorded to 48.53 N/mm^2, 52.09 N/mm^2 and 53.80 N/mm^2 at 600 rpm, 800 rpm and 1000 rpm respectively.
The figure also exhibits that when filler concentration is increased keeping stirring speed constant tensile strength increases. The tensile strength changes from 47.08 N/mm^2 to 48.53 N/mm^2 by changing filler concentration form 0.2 to 0.6 % at 600 rpm. Again, tensile strength increases to 44.62 N/mm^2 to 52.09 N/mm^2 and 47.38 N/mm^2 to 53.80 N/mm^2 at 800 rpm and 1000 rpm respectively.
The tensile strength of the all nanocomposites synthesised at different speed and concentration via in-situ polymerization shows a large increase over PMMA. This improvement can be attributed to uniform dispersion of nano-$CaCO_3$ in polymer matrix as reported by Bharat et al [9]. So, it also indicates that, with an increase of nano-$CaCO_3$ content in the nanocomposites, the tensile strength also increases as reported by Cooke et al, Koo et al and Huang et al [10] [11] [12].
The work done by Xiaoyu L et al.[4] which was with a PMMA/ modified nano-$CaCO_3$ nanocomposites, that results reported in this paper shows 35 % increased tensile strength with respect to pure PMMA by adding up to 1. wt. % fillers. However the work done by Nivin et al.[5] which was with a PMMA/TiO_2 nanocomposites, that results reported in this paper shows 40.47% increased tensile strength with respect to pure PMMA by adding 1.25 wt. % fillers. In the same way the similar type of result obtained by Yang et al [6] which was with a PMMA/silica nanocomposites, that results reported in this paper shows 48.97% increased tensile strength with respect to pure PMMA by adding 5 to 10 % wt. fillers. But the Kim et al [7] achieves the highest increment in tensile strength to 50 % by adding multiwall nanotube of 1% in PMMA matrix. In the current work the increase in tensile strength is 52.97% at 1000 rpm and 0.6% concentration level which is more in comparison to the previous work.

STATISTICAL ANALYSIS OF RESULTS

TAGUCHI ANALYSIS

Taguchi methods used widely in engineering analysis and to study the effect of multiple variables simultaneously involving a series of steps which must follow a certain sequence for the experiment to yield an improved understanding of process performance [13].
In this work nine experiments were conducted at different concentrations and speeds. Taguchi L9 orthogonal array was used, which has nine rows corresponding to the number of tests, with two columns at three levels. For the purpose of observing the degree of influence of the process parameters on tensile strength, two factors, each at three levels, are taken into account, as shown in Table 1.
Table 2 Taguchi L9, showing the tensile strength values corresponding to each experiment.

Table 1: Process parameters

Variables	Code	Level 1	Level 2	Level 3
Concentration	A	0.2	0.4	0.6
Speed (rpm)	B	600	800	1000

Table 2: Taguchi L9

Experiment No.	A	B	Tensile Strength (N/mm^2)
1	0.2	600	47.08
2	0.2	800	47.48
3	0.2	1000	48.53
4	0.4	600	44.62
5	0.4	800	47.60
6	0.4	1000	52.09
7	0.6	600	47.38
8	0.6	800	49.17
9	0.6	1000	53.80
Pure PMMA			35.17

Table 3: Taguchi Analysis: Tensile Strength versus Concentration, Speed

Experiment	Concentration	Speed	Tensile Strength (N/mm^2)	S/N ratio
1	0.2	600	47.08	33.4567

2	0.2	800	47.48	33.5302
3	0.2	1000	48.53	33.7202
4	0.4	600	44.62	32.9906
5	0.4	800	47.60	33.5521
6	0.4	1000	52.09	34.3351
7	0.6	600	47.38	33.5119
8	0.6	800	49.17	33.8340
9	0.6	1000	53.80	34.6156

Table 4: Response Table for Signal to Noise Ratios

Larger is better

Level	Concentration	Speed
1	33.57	33.32
2	33.63	33.64
3[a]	33.99	34.22
Delta	0.42	0.90
Rank	2	1

Optimum level [a]

The results for various combinations of parameters were obtained by conducting the experiment as per the orthogonal array. The tensile strength value were analyzed using software MINITAB 15. Table 2. Taguchi L9, shows tensile strength values which is average of three replications. The effect of input parameters such as concentration and stirring speed on tensile strength has been analyzed using signal to noise ratio response shown in table 3. Taguchi Analysis: tensile strength versus Concentration, Speed. Table 4. Response Table for Signal to Noise Ratios, shows the ranking of process parameters using signal to noise ratios obtained for different levels for tensile strength.

Fig. 3 Effect of process parameters on Tensile strength, shows the effect of the process parameters on tensile strength values. A greater S/N value corresponds to a better performance. Therefore, the optimal level for the tensile strength is the level with the greatest S/N value. Based on the analysis of the S/N ratio, the optimal input factors for the tensile strength obtained at 0.6 % concentration (level 3) and 1000 (level 3).

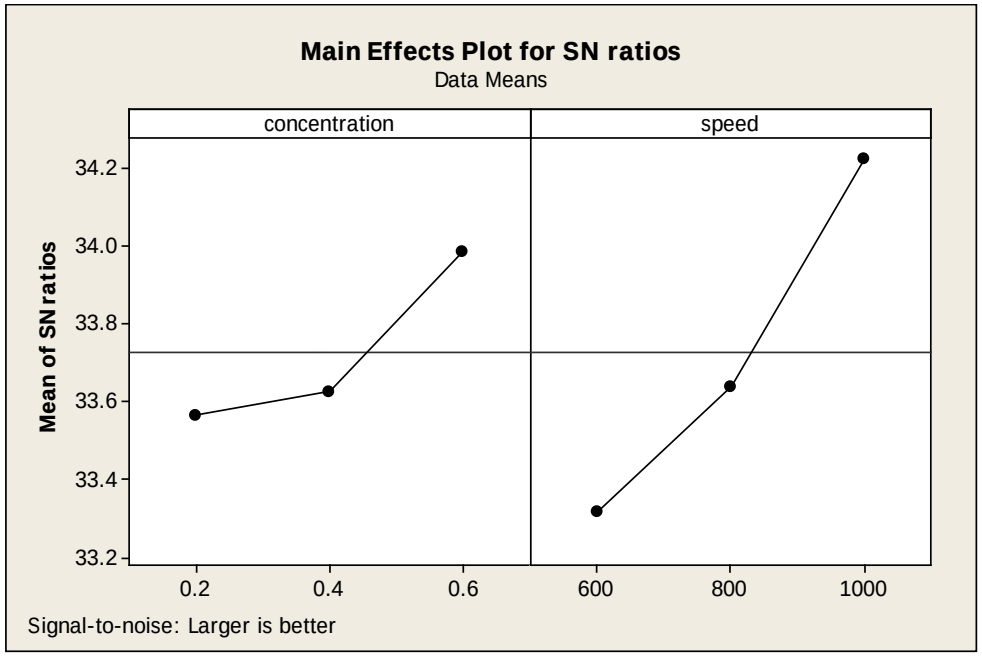

Figure 3: Effect of process parameters on Tensile strength

ANOVA ANALYSIS

ANOVA analysis of tensile strength

Table 5: Two-way ANOVA: Tensile strength versus speed, concentration

Source	DF	SS	MS	F	P	% contribution
Speed	2	10.0753	5.0376	1.88	0.266	16.40

Concentration	2	40.6082	20.3041	7.56	0.044	66.10
Error	4	10.7464	2.6866			17.49
Total	8	61.4299				

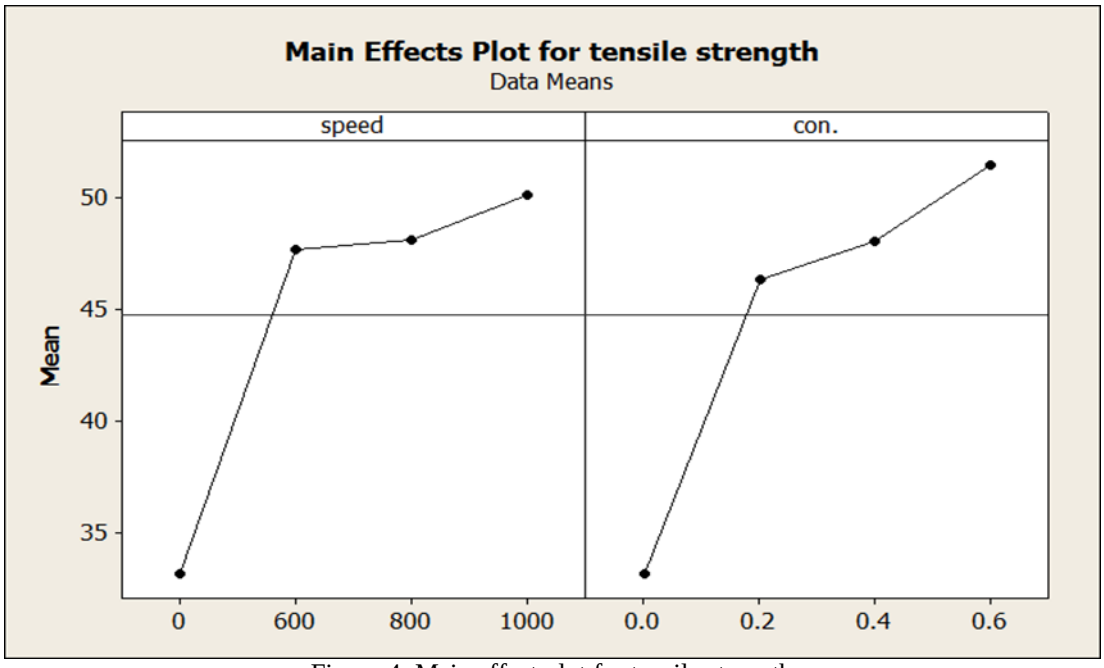

Figure 4: Main effect plot for tensile strength

IV. CONCLUSION

In the present experimental work we have successfully synthesized PMMA/$CaCO_3$ nanocomposites at different concentration and different stirring speeds by in-situ polymerization. In addition to this following conclusions are drawn from the analysis.

1. The tensile strength of composites have increased by the incorporation of nano-$CaCO_3$ powder.
2. The experimental results show that (i) concentration and (ii) speed are the important parameters for the enhancement of tensile strength.
3. Taguchi methods, Conceptual S/N ratio and ANOVA approaches for data analysis drew similar conclusions
4. For tensile strength, the significant parameters are concentration followed by stirring speed. The maximum increase in tensile strength is 53 % at 1000 rpm and 0.6% concentration level.
5. In case of tensile strength, the role of concentration and stirring speed are 66.10% and 16.40% respectively as analysed by ANOVA.
6. The optimum conditions for maximum tensile strength is calculated at 0.6 % concentration and 1000 rpm by Taguchi's optimization method..

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Over The Air Updates of SIM card using GSM modem

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Abstract- Over the air (OTA) is a platform by which GSM provider can send and receive services from and to SIM card. Such OTA Platform are expensive and implemented on operator side only. If SIM vendor want to perform online testing of SIM services they need an special online account with Operator to access their OTA service. To overcome this limitation, GSM modem can be used to perform online testing without special access of operator OTA server with support of *"exposesd"* API of GSM modem.

Index Terms- OTA, SIM, GSM, Modem, USB, Serial,AT,PDU

I. INTRODUCTION

Over the air (or Over-The-Air) is a technology / standard for the transmission and reception of application-related information in a wireless communications system. Using OTA, services provider can perform various new software updates, configuration settings, and even update of encryption keys to devices like mobile phones, DTH set top box or voice communication device. Over the air technology also enables an operator to introduce new SIM services and to modify Over the Air content of SIM cards in a rapid and cost effective way. OTA is based on client/server architecture where at one end there is an operator's back-end system (like support system, auto bill system & could be application server also) and at the other end there is a SIM card.

The operator's back-end system sends service requests to an OTA Gateway which transforms the requests into Short Messages and sends them onto a Short Message Service Centre (SMSC) which transmits them to one or several SIM cards in the field. This paper focus on propose solution for SIM update via OTA using GSM modem only.

In General if OTA technology need to implement, the following components are must needed:

- A back end system to send requests.
- A Over the air gateway to process the requests in an understandable format to the SIM card.
- A short message service center to send requests through the wireless network.
- A medium to send the request: today it is the SMS bearer.
- Mobile device to get the request and transmit it to the SIM card.
- A working SIM card to receive and execute the request.

These above system comprise a complete package which help SIM vendor to perform their online testing but with an expensive subscription, complex procedure & most important always have dependency on network operator to get access. Now further we are discussing what is actually a "GSM modem" is and how we could replace it with such an huge & complex OTA system which is implemented at server side.

GSM modem is a specialized hardware with a serial or USB connectivity, which accepts a standard size SIM card & operates over a subscription to a mobile operator, it is similar like a mobile phone. When any GSM modem is connected to a PC, It allows the computer to use the GSM modem to communicate over the mobile network. A GSM modem exposes some **"interface"** that allows PC's applications to send and receive messages over the modem interface. Using this provided interface of Modem, User can perform Over the AIR (OTA) testing of SIM card using different GSM Sms services.

For the purpose of this paper, the phrase GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols in the GSM evolutionary class, It include the 2.5G, GPRS and EDGE technologies, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA also. GSM modems is a quick & efficient way to get started with Short message service (SMS), because a special subscription with an SMS service provider is not required & sender itself is paying for the message delivery.

A GSM modem could be a dedicated device with a serial, USB connectivity or Bluetooth connection, such as the Falcom Samba 75, Centrion MC35i, Wavecom, Multitech and iTegno.

A GSM modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. Additionally any phone that supports the "extended AT command set" for sending/receiving SMS messages can also be used as GSM modem.

GSM modem	Frequency(MHz)	Modem type
Ultralight	900/180	EDGE
Cinterion	900/1800	GSM/GPRS/EDGE
Samba 75	850/900/1800/1900	GSM/GPRS/EDGE
iTengo	850/900/1800/1900	GSM/GPRS
Multitech	850/900/1800/1900	GSM/GPRS/EDGE/HSPA+
Wavecom	900/1800	GSM

Table 1 : GSM modem availed in Market

Research Elaboration for proposed solution- Basic thought behind this paper is to provide an approach and solution to replace such a huge system of expensive subscription & server dependency where SIM vendor itself can not perform OTA updates / Service on SIM card they are supplying until they have access to some operator specific premium service which are quite expensive & always have dependency on operator to do such OTA updates on SIM. Such dependency could be remove with special hardware device know as GSM modem.

For this purpose, a GSM modem, application interface & dedicated Server (optional but good to have) required which can access to exposed interface of GSM modem. This application interface allow user to send / received any kind of SMS from & to SIM card. The kind of message send and receive via GSM modem could be GSM /3GPP compliance text message , Cell broadcast message & SMS PP Data download message.

II. Proposed Implementation

The Personal Computer (PC) provides a user interface to the GSM modem(this could be silent java api or user interface), Where GSM modem is operated in special mode called Protocol Data Unit (PDU) mode, which allows SIM vendor to message with required content as per their requirement (i.e. message could be of text or data download or broadcast message). All short message service (SMS) are transmitted with special OTA commands for the SIM card (here card could be Java or Native but must compliance to GSM03.48 & GSM03.40). These are special commands (APDU) for the cards which is understood by Network, mobile equipment & SIM card. With this paper concept, SMS to be sent must be generated by PC application which could be divided into two parts:

- The SMS header
- The SMS-body

These two part required later in message sending process to include in AT command, which suppose to transmitted to the GSM modem by PC Application. AT command are special "**A**t**T**ention" command which help PC Application to communicate with GSM modem.

Here GSM modem must contain a "normal" SIM with access to GSM network so that it can connected to SMSC. Once Modem connected to network it can receives the APDU generated by PC & using AT command generated APDU will be send to the selected SMSC. The SMSC forwards the SMS to the receiver with the help of destination address which PC application will include SMS header part.

The receiver is in this case actually have the test SIM (or any live SIM which required new service update) with any terminal (Mobile or M2M). Optionally, with SIM card monitor the communication between the SIM and the terminal can be logged, then it is possible to recognize how the SMS received by the terminal & it is forwarded to the SIM.

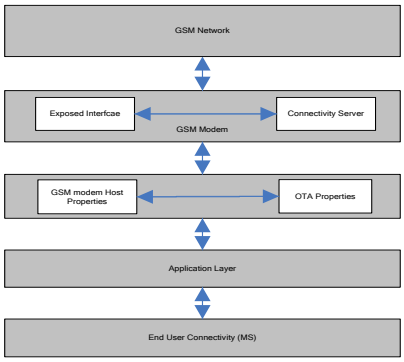

Figure 1: Connectivity Layerd View

To implement such in house OTA system, complete communication is dived into following four steps & further we are discussing what are these steps and how it will implemented to get such system. As a outcome of these steps we will have a system where SIM vendor can send/receive an SMS from GSM modem to test or update services to SIM card's:

1. PC → GSM-Modem
2. GSM Modem → SMSC
3. SMSC → Terminal
4. Terminal → Test SIM

With these steps whatever data need to transmit offline (To GSM modem) must be transmited via AT command & should transferred either via RS232 or RFID, depending on used GSM modem.

Further explaining how four step work.

1. PC → GSM-Modem

There are two ways of sending and receiving SMS messages, by text mode and by PDU (protocol description unit) mode. To send any message in PDU mode(see Table5), The AT command "AT + CMGS" will sent from the PC to the GSM modem. The command data here can be transferred either via RS232 or RFID , depending on used GSM modem. Following are the AT command(See GSM07.07) need to implement in PC application.

1) **AT** Test Command

Command	Response
AT	OK

Table 2

2) **AT+CPIN** service Center Address (to entering SIM PIN)

Command AT+CPIN=?	Response OK
Read Command AT+CPIN=?	+CPIN:<code> OK
Write Command AT+CPIN=<pin>[new pin]	OK SCA : SC address coded according GSM04.11 ToSCA : Type of Address

Table 3

3) AT+COPS to gather information about available network

Command	Response
AT+COPS=?	+COPS:List of <stat>,<oper>, numeric <oper>[,supported

	<mode>, supported <format>] OK (Returns the current network operator)
Read Command AT+COPS?	+COPS:List of <stat>,<oper>, nummeric <oper>[,supported <mode>, supported <format>] OK state 0 = Unknown, 1 = Available 2 = current operator 3 = forbidden Returns the available network operators
Write Command AT+COPS=<mode>[,<format>[,<oper>]]	OK, Mode: 0 Automatic, 1 Manual (<oper> must be set)

Table 4

4) **AT+CSCA** service center address: Specifying the service center to be used if this is not specified in the explicit SMS PDU .

Testcommand AT+CSCA=?	Response OK
Read Command AT+CSCA?	Response +CSCA:<sca>,<tosca> OK
Write Command AT+CSCA=<sca>[,<tosca>]	Response OK SCA : SC address coded according GSM04.11 ToSCA : Type of Address

Table 5

5) **AT+CMGF** select message format : Switch between text and PDU mode

Testcommand AT+CMGF=?	Response +CMGF: (list of supported modes) OK
Read Command AT+CMGF?	Response +CMGF:<mode> OK
Write Command AT+CMGF=[<mode>]	Response OK Mode 0 → PDU mode Mode 1 → Text mode

Table 6

6) AT+CMGS Send SMS direct from Terminal:
Sending an SMS (only PDU format)

Testcommand AT+CMGS=?	Response OK
Execute Command AT+CMGS=<length> <CR>	Response
PDU <ctrl Z> **Note:** < lenght > indicates the longer the PDU passed , however, the bytes are not counted for the SMSC number .	+CMGS: <mr>[,ackpdu] OK MR = Message Reference number

Table 7

After AT command Procedure, Now comes to the Structure of SMS Submit PDU:
The Data to be transferred to the GSM modem to send via a short message (SMS Submit PDU) consists of two main parts :

- The address to be used SMSC (optional)
- The actual SMS -SUBMIT PDU , how it is transmitted in the network

It is composed as follows :

SCA	FO	MR	DA	PID	DCS	UDL	DU
1-12	1	1	2-12	1	1	1	0-140

SCA	Service Center Address
FO	First Octet of submitted SMS (PDU-Type)
MR	Message Reference Number
DA	Destination Address
PID	Protocol Identifier
DCS	Date Coding-Scheme
UDL	User-Data-Length (Length of Characters)
UD	User-Data

For SMS Submit PDU seperate fields are explained below.
A) Service Center Address (SCA): This field consists of three parts

- Length of SCA
- Type of SCA
- Address Field

B) First Octet (FO):

7	6	5	4	3	2	1	0	
0	0	1	0	0	1	0	1	TP-MTI: Message Type Indication: 01 'SMS-SUBMIT 00 'SMS-DELIVER
								TP-RD: Reject Duplicates 0: No 1: Yes
								TP-VPF: Validity Period 0: No 1: Yes
								TP-SRR: Status Report Request 0: No 1: Yes
								TP-UDHI: User Data Header Ind 0: NoUDH
								TP-RP: Reply Path 0: No 1: Yes

C) Message Reference Number (MR): Local reference number used for the mailing to instant message . Delivery reports or error messages may include this reference number. The modem may automatically assign a unique reference number, if MR is already given modem can use it.
D) Destination Address (DA): Recipient address, encoded as Service Center Address.
E) Protocol Identifier(PID): The SMs Protocol on which sending data is based,allowed scheme for modem are:

- 0x00 provides loud GSM 3:40 is the default value for text messages.
- 0x7F shows "SIM Data Download"

F) Data Coding Scheme(DCS):
Indicates to the receiving terminal, such as the data of the short message to be decoded.

- 0x00 Class 0 Text message (7 bit character encoding)
- 0xF4 Class 0 Text message (8 bit character encoding)
- 0xF6 Class 2 message (SIM specific message, 8-bit coding)

G) User Data Length(UDL): Length of user data (User Data)
H) User Data(UD): The actual user data,

2. GSM Modem → SMSC

The GSM modem now transmits the received SMS to the selected SMSC . The SMSC away some fields of the PDU that are only relevant for the SMSC - Other information that has only the SMSC and are important for the recipients of the message are also included in the PDU so that the SIM card can understand the PDU. The actual user data are transparent, i.e. without any modification by the SMSC during transfer of data.

3. SMSC → Terminal

When Modem has transmit the data to SMSC, SMSC has responsibility to transfer it to receiver end with the following structure (according to GSM 03.40).

SCA	FO	OA	PID	DCS	SCTS	UDL	UD
1-12	1	2-12	1	1	7	1	0-140

SCA	**Service Center Address**
FO	First Octet of delivered SMS (PDU-Type)
OA	Orginator Address
PID	**Protocol Identifier**
DCS	**Date Coding-Scheme**
SCTS	Service Center Time Stamp
UDL	**User-Data-Lenght (Length of Characters)**
UD	**User-Data**

The highlighted - printed fields of Deliver PDU were virtually one on one of the submit PDU adopted by the SMSC . The other fields were supplemented or modified .

Service Center Address (SCA): Address of the service center , which the SMS has passed . Encoding as mentioned above

First Octet (FO): This parameters are coded as follow.

7	6	5	4	3	2	1	0		
0	0	1	0	0	1	0	1		
						TP-MTI		Message Type Indication: 01 'SMS-SUBMIT 00 'SMS-DELIVER	
					TP-MMS			More Message to Send 0: No 1: Yes	
				-	-				
			TP-SRR					Status Report Request 0: No 1: Yes	
		TP-UDHI						User Data Header Ind 0: No UDH	
	TP-RP							Reply Path 0: No 1: Yes	

Originating Address (OA): Address of the sender of the SMS. Coding as above .
Protocol Identifier(PID): Protocol which is the sent data based.
Data Coding Scheme(DCS):
Shows how the data of the short message to be decoded by the receiver .
Service Center TimeStamp (SCTS): Unique time stamp of when the (incoming) SMS has reached the service center .
User Data Length(UDL): Length of user data (User Data)
User Data(UD): The actual user data,

4. Terminal → SIM

The terminal has finally received the SMS , this is either transmitted through an envelope or Update Binary command to SIM. example of envelope commands is shown below, the user data are coded according GSM03.48 . The bottom line shown in shaded define which fields originate from the SMS - Deliver TPDU . The other fields are added by the terminal .

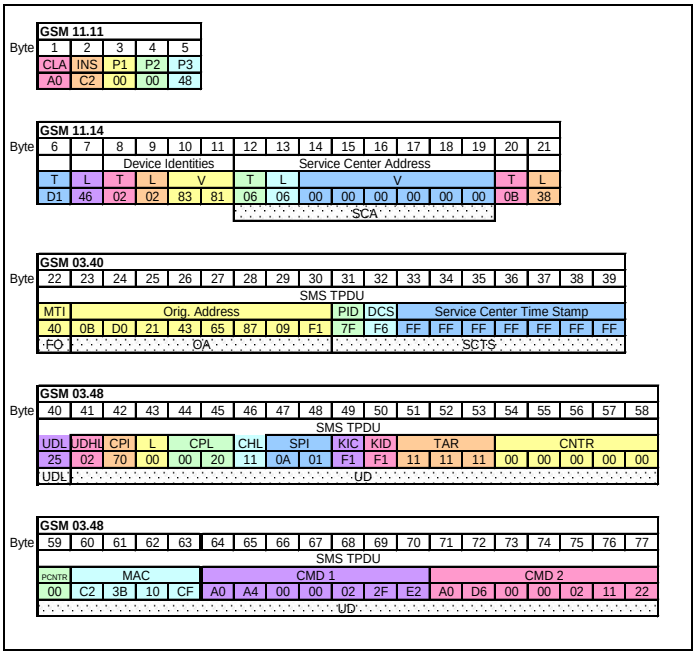

Figure 2: Envelope commands

So these are the four steps we need to adapt to get implemented in house OTA system.

Communication of PC application here could be done with an open source like kannel (Kannel is a compact and very powerful open source wireless application protocol (WAP) and SMS gateway, This gateway is used widely across the globe both for serving trillions of short messages (SMS), WAP Push service indications and mobile internet connectivity.)

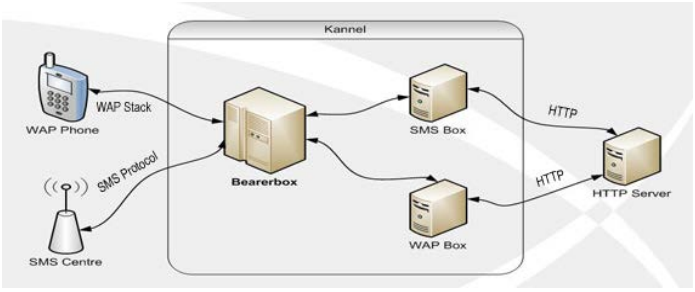

Figure 3: Connectivity

Here our PC based application or API can communicate with Kannel and kannel may send command to GSM modem which further transmit the PDU/Text Message to Network. With this implementation in house server is ready for Over the Air Testing of SIM Card using GSM modem.

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Monitoring and Evaluation Skills, Performance Contracting System and Organizational Performance in Government Ministries in Kenya

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Abstract- This paper presents results of the influence of Monitoring and Evaluation (M&E) skills on the relationship between Performance Contracting (PC) system and organizational performance in government ministries in Kenya. Descriptive survey design and correlational research designs were used in a mixed methods research approach. Quantitative data was collected through a questionnaire while qualitative data was collected through an interview guide. Research instruments were pilot tested for validity through content related method and reliability through test-retest criterion. A sample size of 310 respondents was selected by use of Sekaran's (2003) sampling size criterion from a population of 103,010 employees in government ministries through multi-stage sampling technique. Arithmetic mean and standard deviation were used for analyzing descriptive data while Pearson Product Moment Correlation (r) and Stepwise Regression (R^2) analysis were used for analyzing inferential data. F-tests were used to test the hypothesis in the study. Tests of statistical assumptions were carried out before data analysis to avoid invalidation of statistical analysis. With $R^2 = 0.14$, $F(3,177) = 9.588$ at $p < 0.05$, the null hypothesis was rejected and it was concluded that the strength of the relationship between PC system and organizational performance depends on M&E skills. Monitoring and Evaluation skills, therefore, moderate the relationship between PC system and organizational performance in government ministries in Kenya. It is recommended that implementers of PC system in government ministries in Kenya should be equipped with M&E skills.

Index Terms- Monitoring and Evaluation, Performance Contracting System, Organizational Performance

I. Background to the Study

Performance management systems have been introduced in public sectors by various governments to enhance performance (Cheung (1997). The performance management system adopted in the public sector in Kenya is Performance Contracts (PCs). Performance Contracts were introduced in the public sector in Kenya in 2003 as tools for monitoring and evaluating performance to hold officials in public service accountable for delegated authority. Nuguti (2009) suggests that the PC system in Kenya compares favourably with the Monitoring and Evaluation (M&E) system advanced by Kusek and Rist (2004).

While many scholars such as Kusek and Rist (2004), Crawford and Bryce (2003), Joley (2003), Mohan (2001) and Marsh and David (1999) argue that M&E skills are essential requirements for organizational performance, previous literature reviewed has not examined the moderating role played by M&E skills on the relationship between a performance management system and organizational performance. The purpose of this paper, therefore, is to examine the moderating influence of M&E skills on the relationship between PC system and organizational performance in government ministries in Kenya. Findings from this study are expected to help policy makers in government ministries in Kenya to enhance performance in the public sector through critical evaluation and implementation of the role played by M&E in the PC system.

The research objective of this paper is to establish the extent to which M&E skills influence the relationship between PC system and organizational performance in government ministries in Kenya. The research question in this paper is: To what extent do M&E skills influence the relationship between PC system and organizational performance in government ministries in Kenya? The hypothesis that was formulated and tested is:

H_O: The strength of the relationship between PC system and organizational performance does not depend on M&E skills.

H_A: The strength of the relationship between PC system and organizational performance depends on M&E skills.

II. Literature Review

This study is grounded on Results Theory. This is because studies such as Hatry (2006) and Nuguti (2009) suggest that Performance Contracts are monitoring and evaluation (M&E) tools designed for measuring organizational results. In addition, Nuguti (2009) indicates that the tools that were designed in the PC system in Kenya complied in many aspects with the M&E system proposed by Kusek and Rist (2004). The M&E system proposed by Kusek and Rist (2004) is also grounded on Results Theory. Further, Dobbin (2012) portrays Results Theory as a participatory management approach which is the grounding principle of PCs. Derived from Results Theory, Eltville Results Model illustrates attainment of results in three levels whereby attainment of third level results (outputs) leads to attainment of second level results (objectives) which in turn lead to the ultimate project result (project goal) (Balogun, 2008).

Although Rapp et al. (2013) studied the influence of time management skill on the curvilinear relationship between organizational citizenship behavior (OCB) and task performance, type of M&E skills and level of M&E skills as indicators of implementers' M&E skills and the role of M&E skills on the relationship between PC system and organizational performance were not examined. While Sylvia (2008) attempted to bridge the gap in M&E on organizational performance, the study did not

examine the moderating influence of M&E skills on the relationship between PC system and organizational performance. Since results from matching survey data collected from 212 employees and 41 supervisors and from task performance metrics collected several months later in the study carried out by Rapp et al. (2013) indicated that the curvilinear association between OCB and task performance is significantly moderated by employees' time management skill; the study can be enriched by testing the moderating influence of M&E skills on the relationship between a performance management system and organizational performance.

Similarly, while clear measurement of multidimensional constructs such as managerial performance and technical skills is essential, limitations in the work carried out by Sylvia (2008) which include self-selection bias and availability of objective technical skills measures can be minimized by developing component-based measures of these constructs. In particular, the said knowledge gaps have been eliminated in the current study by identifying the type of M&E skills and level of M&E skills as indicators of M&E skills among PC implementers.

III. Research Methodology

Descriptive survey design and correlational research design were used. The choice of these two research designs was informed by the descriptive and inferential data analysis required in this study. While descriptive survey helped the researcher to describe phenomena, correlational research design helped the researcher to identify predictive relationships by using correlations and stepwise regression modelling. Mixed mode research approach was used. By use of mixed mode research approach, qualitative and quantitative data analyses were carried out simultaneously in a cross-sectional manner. This means that descriptive, inferential and qualitative data analysis were carried out in the study with the research freedom to make use of both descriptive and inferential data analysis techniques as advanced by pragmatism research paradigm, the philosophy that guided this study.

The research population was 103,010 public service employees in the 18 Government Ministries in Kenya (GOK, 2013) who are employed on permanent terms basis and are involved in performance contracts. Multi-stage sampling technique was used because the research context comprised government ministries which are large and complex organizations in respect to departmentalization. Huber (2004) argues that multi-stage sampling technique would be the most preferred sampling technique for large organizations with various departments in research situations whereby it is desired every sub-population to be presented in the sample.

At the first stage of the sampling procedure, 50% of the government ministries were selected. In selecting 50% of the government ministries, the 18 ministries were arranged alphabetically and every even number ministry was selected for study. The 9 selected ministries formed the research sub-population. At the second stage of the sampling procedure, departments (research categories) were randomly selected for study from the ministries (sub-populations). For ministries with less than 30 departments, only one department was selected at random. For ministries with more than 30 departments, 2 departments were selected at random. In total, therefore, 10 departments were selected.

At the third and last stage of the sampling procedure, individual respondents were randomly sampled from the selected 10 departments. This is because by selecting respondents from each strata (research category) in the research population, the sample was more representative. For acquisition of the qualitative data, the ten departmental heads for the selected departments were interviewed. The sample size was 310 respondents. Three hundred (300) of the respondents were selected from ordinary employees while 10 of the respondents were the heads of the selected departments. In the determination of the sample size, Sekaran's (2003) criterion on selection of sample size was considered.

Secondary data was used to acquire information on the performances of the ministries of government. This information was obtained from previous evaluation reports carried out as well as the performance contracting documents. Raw data was gathered directly from the respondents and was used to analyze the relationships that were being investigated in the study. To obtain sufficient information, triangulation of research instruments was done. The research instruments that were used in this study for data collection were a self-administered structured questionnaire and an interview guide. A self-administered structured questionnaire was used to collect the quantitative strands while the interview guide was used to collect the qualitative strands of the research.

Reliability of research instruments was done through test-retest method using Cronbach. In the pilot test, the composite Cronbach's α (Alpha) Reliability Coefficient for the research instrument was 0.705222. This method involved administering the same test twice to the same group after a time interval of two weeks between the first and the second administration of the research instruments. The test re-test criterion was selected because the respondents were expected to understand the significance of the research and were, therefore, expected to willingly fill the questionnaires for the second time. In addition, ministries of government in Kenya, being public entities, were easily accessible and hence the practicality of re-testing the research instruments.

While collecting data from heads of the selected departments from the 9 ministries of government under study, interviews were conducted by the researcher. Data collection from the ordinary employees in government ministries was done with the aid of nine research assistants trained in research; each assigned one ministry to enhance the rate of return of questionnaires.

Mixed methods data analysis techniques were employed in this study incorporating both descriptive and inferential data analysis. Non-parametric data was analyzed descriptively by use of measures of central tendency and measures of dispersion as the tools of data analysis. The arithmetic mean was the measure of central tendency statistical tool that was used for data analysis while the standard deviation was the measure of dispersion statistical tool of data analysis that was used. In data analysis, measures of central tendency are used when the set of data values are finite and the data is expected to cluster around some central value (Weisberg, 1992).

To analyze the influence of the moderating variable on the relationship between the independent variable and the dependent

variable, Stepwise Regression (R^2) analysis was used. Larry (2013) indicates that Stepwise Regression (R^2) involves mathematical modeling whereby the predictor variables are deliberately chosen without necessary being backed by theory. Although literature has been cited in this study on the influence of M&E skills on the dependent variable, no previous literature has been identified that directly indicates the influence of the moderating variable on the relationship between the main predictor variable and the dependent variable. Since the influence of the moderating variable on the relationship between the main predictor variable and the dependent variable was deliberately chosen in this study, then the requirement for the use of Stepwise Regression (R^2) for parametric data analysis was satisfied. The regression model that guided the inferential analysis in this study was:

Organizational Performance = f (PC System, Organizational Structure)

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_{14} X_1 X_4 + \beta_{24} X_2 X_4 + \beta_{34} X_3 X_4 + \varepsilon$$

Where

y	-	Organizational Performance
X_1	-	PC Targets
X_2	-	PC Tools
X_3	-	PC Implementer Participation
X_4	-	M&E Skills
$\beta_0, \beta_1, \beta_2, \beta_3 \ldots$	-	Beta Values
ε	-	Error Term

Although various tests are used to test hypotheses for Stepwise Regression (R^2), Moriya (2008) argues that in practice, F-Tests are the most commonly used to test confidence intervals and hypotheses. If for a given sample, F(r) is the Fisher transformation of r, and n is the sample size, then F(r) approximately follows a normal distribution given the assumption that the sample pairs are independent and identically distributed and follow a bivariate normal distribution. Thus an approximate r-value can be obtained from a normal probability table. For a large enough sample where n > 30 as was the case in this study, then F-values can be obtained using Fisher transformation and the hypotheses tested normally by use of F-Tests (Moriya, 2008). In stepwise regression modelling, if the moderating variable under consideration was excluded from the final regression model, H_O was accepted. Where H_O was rejected, R^2 values were considered in determination of the strength of the relationship.

IV. Findings

Out of the 300 questionnaires that were administered, 184 questionnaires were duly filled and returned and, therefore, regarded as the responsive instruments, and, formed the basis for data analysis. This formed a response rate of 61.3%. Forty two percent (42.1%) of the respondents were females while 57.9% were males and they were normally distributed in respect to government ministries, age group, level of education and tenure of service in public service. Kolmogorov-Smirnov test statistic (KS-test) and Shapiro-Wilk test (SW-test) were carried out to ascertain that the research data was collected from a normal population.

Existence of singularity and multicollinearity between predictor variables were also checked before undertaking regression analysis through correlations and residual tables generated by SPSS by analyzing the tolerance values under collinearity to ensure that the linear assumptions were not violated. Scatter diagrams were plotted prior to undertaking correlation analysis among the independent variables to check existence of homoscedasticity while existence of heteroscedasticity was checked through the correlation and residual tables generated by SPSS that were used to test for existence of collinearity.

Type I error was minimized by using a confidence level of 95% implying that the standard variate was 1.96 and the sample proportion (p) was less than or equal to 0.05 while Type II error was minimized by taking a large enough sample of 310 respondents. The weighting criteria of responses of Likert-type data assumed an equidistance of 0.8 whereby Strongly Disagree (SD) 1 < SD < 1.8; Disagree (D) 1.8 < D < 2.6; Neutral (N) 2.6 < N < 3.4; Agree (A) 3.4 < A < 4.2; and Strongly Agree (SA) 4.2 < SA < 5.0.

Theoretical literature links M&E skills with organizational performance. Empirical review indicates that M&E skills influence organizational performance. Ten items were developed to measure the extent of this relationship. In the descriptive analysis, the composite mean score for these items was 3.7115 while the composite standard deviation was 0.56682. This result indicates that respondents agreed that M&E skills positively influenced the relationship between the PC system and organizational performance.

To analyze inferential data, stepwise multiple regressions were used. The regression results for the moderating influence of

M&E skills on the relationship between PC system and organizational performance are presented in Table 1.

Table 1: Regression Results for the Influence of Implementer M&E Skills on the Relationship between PC System and Organizational Performance

Model	r	R^2	Adjusted R^2	F	Beta	Predictor Variables
1	.268a	.072	.067	13.841	3.007	Constant Term
					.234	M&E Skills
2	.331b	.110	.100	10.973	3.007	Constant Term
					1.042	M&E Skills
					-.199	(PC Targets + M&E Skills)
3	.374c	.140	.125	9.588	2.527	Constant Term
					1.288	M&E Skills
					-.278	(PC Targets + M&E Skills)
					.145	PC Tools

a. Predictors: (Constant); X_4

b. Predictors: (Constant); X_4; X_1X_4

c. Predictors: (Constant); X_4; X_1X_4; X_2

Model 1: $F(1,179) = 13.841$ at $p < 0.05$ level of significance

Model 2: $F(2,178) = 10.973$ at $p < 0.05$ level of significance

Model 3: $F(3,177) = 9.588$ at $p < 0.05$ level of significance

Since the components of PC system are PC targets, PC tools and implementer participation; stepwise multiple regressions were performed to determine the best linear combination of PC targets, PC tools, PC implementer participation and implementer monitoring and evaluation (M&E) skills for predicting organizational performance.

At the first step in stepwise regression modelling; PC targets; PC tools and PC implementer participation were excluded leaving implementer M&E skills as the only predictor variable of organizational performance. By substituting the beta values as well as the constant term, model 1 emanating from step one in regression modelling is as follows:

$y = 3.007 + 0.234X_4$

Based on the beta values of model 1, it can be argued that implementer M&E skills (X_4) contribute to 23.4% of the model. Since $F(1,179) = 13.841$ at $p < 0.05$ level of significance, it can 95% confidently be concluded that implementer M&E skills predict organizational performance (y). The R^2 values of the model indicate that implementer M&E skills explain 7.2% of organizational performance. Although implementer M&E skills are identified as predictors of organizational performance; at 7.2%, they are weak predictors at the first step in the regression modelling.

At the second step of stepwise regression modelling in this research objective; PC tools and PC implementer participation were excluded in stepwise modelling leaving implementer M&E skills and a combination of PC targets and M&E skills as the predictor variables of organizational performance. By substituting the beta values as well as the constant term, model 2 emanating from the second step in regression modelling is as follows:

$y = 3.007 + 1.042X_4 - 0.199X_1X_4$

Based on the beta values of model 2, it can be argued that implementer M&E skills (X_4) contribute to 104.2% of the model while PC targets negatively influence organizational performance by 19.9% in the model. Since $F(2,178) = 10.973$ at $p < 0.05$ level of significance; it can 95% confidently be concluded that the interaction between M&E skills (X_4) and PC targets (X_1) negatively influence organizational performance (y) at this step of the regression modelling. The R^2 values of the model indicate that the combination of implementer M&E skills and PC targets explain 11.0% of organizational performance.

At the third and final step of stepwise regression modelling in this research objective; implementer participation was excluded in stepwise modelling leaving implementer M&E skills; a combination of PC targets and M&E skills; and PC tools as the predictor variables of organizational performance. By substituting the beta values as well as the constant term, model 3 emanating from the third step in regression modelling is as follows:

$y = 2.527 + 0.145X_2 + 1.288X_4 - 0.278X_1X_4$

Based on the beta values of model 3, it can be concluded that implementer M&E skills (X_4) contribute to 128.8% of the model while PC tools contribute to 14.5% of the model. The interaction between M&E skills and PC targets negatively influence organizational performance by 27.8% in the model. Since $F(2,177) = 9.588$ at $p < 0.05$ level of significance; it can 95% confidently be concluded that the interaction between M&E skills (X_4) and PC targets (X_1) negatively influence organizational performance (y). Since model 3 is the last step in stepwise regression modelling, the R^2 values of the model

indicate that the interaction between implementer M&E skills and PC system explain 14.0% of organizational performance.

Therefore, it can be concluded that, implementer M&E skills moderate the relationship between PC system and organizational performance. The null hypothesis is, therefore, rejected and it is concluded that the strength of the relationship between performance contracting system and organizational performance depends on implementer M&E skills. The implication of these findings in the context of Government Ministries in Kenya is that organizational performance is influenced by the type and level of implementers' M&E skills. Therefore, for Ministries of Government in Kenya to enhance performance, implementers of the PC system need to be equipped with M&E skills.

Although descriptive statistics indicate that respondents had monitoring and evaluation skills, interviews conducted indicate respondents were inadequately equipped with Monitoring and Evaluation (M&E) skills for continual improvement of the PC system. For instance, although descriptive statistics indicated that respondents were neutral on whether Government Ministries had an Integrated Performance Management System (IPMS), interviews conducted indicate that there is no IPMS implementer in Government Ministries. That descriptive statistics indicate that implementers were neutral on whether IPMS existed in Government Ministries suggests that PC implementers may not have been knowledgeable on Integrated Performance Management System. Another possibility for the findings from the descriptive statistics is that respondents did not want to look ignorant in as far as monitoring and evaluation skills were concerned. This is because interviews conducted indicated that respondents did not have most of the skills required in performance measurement like development of clearly stated performance indicators, conducting and writing evaluation reports and generation of performance based quarterly reports based on objectively verifiable indicators.

V. Discussions of Findings

The research objective in this study is to determine the extent to which implementer Monitoring and Evaluation (M&E) skills influence the relationship between performance contracting system and organizational performance in government ministries in Kenya. The PC system implemented in government ministries in Kenya is regarded in the current study as a monitoring and evaluation system. Studies carried out by Nuguti (2009) indicate that the PC system in Kenya compares favourably with the monitoring and evaluation (M&E) system proposed by Kusek and Rist (2004). Ability to identify and develop performance indicators, conduct and write evaluation reports and generate quarterly reports based on objectively verifiable indicators are pointers of M&E skills. Marsh and David (1999) indicate that ability to undertake performance evaluation, develop performance indicators, undertake project appraisals, produce quarterly reports, develop work breakdown structures and develop M&E frameworks are indicators of M&E skills.

Research hypothesis in this study is, therefore, developed to test whether the strength of the relationship between performance contracting system and organizational performance depend on implementer M&E skills. This hypothesis was formulated because although other studies link M&E skills with organizational performance in a performance management system, no previous study was found that examine the moderating role played by implementer M&E skills on the relationship between a performance management system and organizational performance. Findings from this study indicate that M&E skills moderate the relationship between performance contracting system and organizational performance in government ministries in Kenya. This implies that despite having an effective performance management system in the form of PC system, implementer M&E skills were required to achieve desired organizational performance.

Descriptive statistics indicate that respondents had the requisite M&E skills needed for effective implementation of the PC system. However, interviews conducted indicate that respondents did not have the necessary M&E skills required at their performance level of operation in respect to implementation of the PC system. For instance, at the lowest level of management, unit/section heads, respondents are expected to be in position to identify and develop objectively verifiable indicators and produce quarterly reports. At higher levels of management, departmental heads, respondents are expected to be in position to conduct performance evaluations and produce commensurate reports. For the M&E units in Ministries, respondents, being the M&E specialists, are expected to be in position to develop integrated M&E systems.

Without the required M&E skills for performance measurement, even though government ministries may outsource the services of external consultants, it will be difficult to objectively appraise reports submitted or systems implemented through outsourcing. Interviews conducted indicate that there is hardly any formal M&E training undertaken by M&E experts in government ministries, and, even most of the implementers charged with the specialized responsibility of the M&E units had not undertaken comprehensive M&E training at University level standards, but rather, they had a few days or weeks of rushed trainings through seminars. There is, therefore, need for government ministries to equip PC implementers with comprehensive M&E skills to enhance organizational performance.

VI. Conclusions

The research objective in this study is to determine the extent to which implementer monitoring and evaluation (M&E) skills influence the relationship between performance contracting system and organizational performance in government ministries in Kenya. The indicators of M&E skills are the type of M&E skills and level of M&E skills. The indicators for organizational performance are the rate of customer satisfaction, rate of employee satisfaction and level of participation in corporate social responsibilities. Regression modelling indicates that M&E skills moderate the relationship between performance contracting system and organizational performance.

It is, therefore, concluded that M&E skills significantly influence the relationship between performance contracting system and organizational performance in government ministries in Kenya. Based on the descriptive findings, it is concluded that an integrated performance management system across all Ministries should be developed to enhance organizational

performance. In addition, it is concluded that all employees in government ministries should be trained on M&E skills geared towards equipping employees with skills to develop performance indicators, performance evaluation, performance personal work breakdown structures, project appraisals and generation of quarterly reports.

VII. Recommendations

It is recommended that PC implementers in government ministries in Kenya should be trained with relevant M&E skills. Specifically, PC implementers should be equipped with skills to develop performance indicators, development of work breakdown structures, development of M&E systems, conducting project evaluations and production of evaluation reports.

It is also recommended that practical M&E skills be incorporated in University lecturing. This implies that besides teaching students on monitoring and evaluation, learners should be exposed to industrial attachments where M&E is practiced to acquire practical skills that will equip and prepare them to effectively implement the PC system in government ministries.

In addition, it is recommended that policies be enacted to ensure that implementers of the PC system in government ministries in Kenya are skilled in M&E. As such, policies should be enacted to ensure that public officials deployed in the M&E units in government ministries have the requisite M&E skills and are continually enhancing their skills through regular trainings and publications as well as participating in professional conferences. This will enhance organizational performance in government ministries in Kenya.

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Incidence and Susceptibility of Beta-Lactamase Producing *Klebsiella pneumoniae* to Extract from *Phyllanthus niruri*

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Abstract- Antibacterial resistance to common antibiotic has increased overtime; there is thus the need to look for an alternative medicine to stem the trend. This study reported incidence of β-lactamase producing *Klebsiella pneumonia* from patients. The antibacterial activity of crude aqueous and ethanolic extract of *Phyllanthus niruri* was also investigated against some test bacteria. Antimicrobial activities were analyzed using agar diffusion method. Experiments were performed in triplicate and reported as mean ± standard error of mean and difference was analyzed using one way ANOVA at $p \leq 0.05$. Sixty five percent (65%) and 25% of urine and wound samples were positive to β-lactamase producing *K. pneumonia* respectively. The highest zone of inhibition (22.0mm) was observed in a concentration of 0.5g/mL from ethanolic extract against *K. pneumonia.* While the minimum inhibitory concentration (MIC) of aqueous and ethanolic extract of the plant was evidenced in 0.2g/mL and 0.1g/mL respectively. From the foregoing this study has shown that *P. niruri* extract have potential to be remedy for infectious disease caused by β-lactamase producing *K. pneumonia*.

Keywords- Antibacterial, β-lactamase, *Phyllanthus niruri*

I. INTRODUCTION

Plants have always been a major component of traditional system of healing in developing countries, which have also been an integral part of their history and culture. Medical plants offer alternative remedies with tremendous opportunities. Many traditional healing herbs and plant parts have been shown to have a medical value especially in the rural areas and that these can be used to prevent and cure several human diseases. Even today, majority of the world population depend on herbal health care practices (Kunle *et al*., 2012; Narendra *et al*., 2012).

Extracts of many plants are known to elicit certain reactions in human body when applied in a prescribed manner including *Phyllanthus niruri* L., (Syn.*P. franternus* Webster) belonging to the family Euphorbiaceae. It has been claimed to be an excellent remedy for jaundice and hepatitis (Abbasi *et al*., 2009). It also has antioxidant and hepatoprotective effect as reported by Makoshi *et al*. (2013) The plant is considered analgesic, aperitif, digestive, emmanagogue, laxative and stomachic tonic (Khanna *et al*., 2002) and is helpful in treating oedema, anorexia and diabetes (George and Pamplona-Roger, 2002). Its roots, leaves, fruits, milky juice as well as the whole plant are used as medicine with no adverse effect on the body organs (Ajibade and Famurewa, 2013). Recently, lignansniranthin, nirtetralin and phyltetralin have been isolated from the leaves (Tabasum *et al*., 2005). To buttress these points a recent study by Ajibade. (2014) reported saponin and alkaloid extracted from *P. niruri* posses antimicrobial properties thus may offer an alternative therapeutic agent against bacterial infections.

The strategic importance of reviving indigenous medical practice to provide safe and affordable primary health care to the people of the world is now recognized. During the last two decade or so WHO health assembly has passed a number of resolution in response to this resurgence of interest in the study and use of traditional medicine and in recognition of the importance of medical plant to health care of people in many developing countries (Kunle *et al*., 2012).

Klebsiella pneumoniae is ubiquitous as it is found in mammals and ecological environment. It has pathogenic effects worldwide. There is evidence of community-acquired and hospital-acquired infections in countries such as Taiwan and South Africa. Community-acquired *K. pneumoniae* has been found, in some places, to be associated with alcoholism. There are a large number of infections acquired when it affects different organs of the body. It can affect the liver, urinary tract and lungs (Vuotto *et al*., 2014).

The bacterium is an important cause of human infections. Infections or diseases are usually nosocomial or hospital-acquired. In 1998, *K. pneumoniae* and *K. oxytoca* accounted for 8% of nosocomial bacterial infections in the United States and in Europe. Diseases include urinary tract infections, pneumonia, septicemias, and soft tissue infections (Vuotto *et al*., 2014) The diseases caused by *K. pneumoniae* can result in death for patients who are immunodeficient. Bacteria from the genus Klebsiella causes numerous infections in human, which are often treated with β–lactam antibiotics. The indiscriminate use of antibiotics has revealed a considerable increase in outbreaks caused by microorganisms resistant to antimicrobial drugs, such *K. pneumoniae*. This research work is thus centered on investigating the potency of aqueous and alcoholic extract of *P. niruri* on Beta Lactam producing *K. pneumoniae,* thereby ascertaining the therapeutic importance of natural products.

II. MATERIALS AND METHODS

A. Collection and Processing of Plant Material

K. Pnuemoniae were isolated from 40 samples each of urine, ear, sputum, pus and wound. Samples were immediately brought to the laboratory for analysis. The plant was collected from farmlands in the Federal Polytechnic Ado–Ekiti during the raining season between the months of September and December 2010. The plant was dried at room temperature ($28^oC \pm 1^oC$). The plant was milled using centrifugal milling machine (GallenKamp) and stored in air-tight plastic container. Identification and authentication of plant was done in the Department of Science Technology, Federal polytechnic Ado–Ekiti, Nigeria where a voucher specimen (No. MED. PLT 0-2008-10) was kept. 100grams of the milled samples was soaked with 400ml of distilled water and Alcohol respectively. It was allowed to stand for 24hours. Both solutions were filtered by using Whatman no. 4 filter paper and evaporated to dryness at 20^oC using a rotary evaporator. The residues were reconstituted to different concentrations using distilled water.

B. Isolation and identification of B-lactam producing K. pneumoniae

Clinical isolates of *K. pnuemoniae* were obtained from seven hospitals in four local government areas of Ekiti state, South-Western, Nigeria.

Identification was accomplished by colony characteristics and lactose fermentation in Macconkey agar (oxoid), biochemical reactions (gas from glucose, acid from lactose and acid from dulcitol and citrate utilization). Selection was based on non-outbreak isolates of *K. pneumonia* with resistance to *B- lactam* antibiotics.

Testing for antibacterial resistant of *K pneumoniae* was carried out by direct plating method (Clinical and Laboratory Standards Institute 2014).

Isolates were stored at -70^0C and were sub-cultured on trypticase soy agar plates containing 5% defribinated human blood. For each isolate, plates were inoculated by using cell suspension equivalent to a 0.5 Mcfarland standard which was spread on a Macconkey agar (oxoid) to yield uniform growth and multo-disk containing the B-lactam antibiotics (penicillin to cephalosporin) were asceptically placed on the agar surface. Diameter of zone of inhibition was calculated. Those with decreased zone of inhibition were indicative of *B-lactam* production and were isolated for further studies.

C. Susceptibility Testing

The agar diffusion method described in (Clinical and Laboratory Standards Institute 2014) was used. Reactivated culture from stock, diluted serially to 10^3 was used as inoculums. The inocula were spread uniformly on sensitivity agar (Oxoid) using a sterile glass spreader. Pasteur pipette was used to introduce different concentration of 0.1g/mL-0.5g/mL of the extract into the well bored (7.0mm) onto the surface of the culture. A control well containing extracting solvent was also incorporated. Standard antibiotic disc of Oflaxacin in concentrations of 20µg, 25µg and 30µg were used as positive control. The plates were incubated at 37^oC for 24hrs in an incubator. The diameter of zones of inhibition was measured in millimeter and recorded.

D. Statistical Analysis

Statistical analysis was performed by using SPSS software version 20.0 and Microsoft Excel. Data on antimicrobial activities were expressed as mean ± SEM and differences were statistically analyzed using one way ANOVA. P value was set at ≤ 0.05.

III. RESULTS AND DISCUSSION

A study by Podschun and Ullman (1998) have reported that *K. pneumoniae* is an enteric Gram-negative bacillus causing debilitating and dangerous infections in debilitated or immuno-compromised individuals. They accounted for up to 10% of all nosocomial bacterial infections (Spencer, 1996). Usually, these debilitating infections are treated with β-lactam antibiotics, which are usually hydrolyzed by β-lactamases produced by such microorganisms resulting in drug resistance (Bush *et al*., 1995). Therefore this study was designed to determine the efficacy of aqueous and methanolic extracts of *Phyllanthus niruri* against Extended spectrum β-lactamase producing *K. pneumoniae* to optimize empirical therapy in natural product which might lead to suggestion of a therapeutic regimen against it.

Forty *K. pneumoniae* strains were isolated from various sources (i.e. ear, sputum, wound, urine and pus) obtained from hospitalized patients. 32 (80%), 26(65%), 20(50%), 15(38%) and 10(10%) were isolated from sputum, urine, ear swab, pus and wound respectively (Table 1). This is not in congruent with results from Amin *et al*. (2009); where 52% and 7.5% were isolated from pus and urine respectively. A study among students in Nigeria reported that 55% of their sample yielded *K. pneumoniae* isolates (Chikwendu *et al*., 2010) this is not in tandem with our results. Prevalence of *K. pneumoniae* in urine sample was higher in females than in the male samples (Table 1). This level of prevalence agrees with other studies (Chikwendu *et al*., 2010; Anjun and Mir 2010) that also reported a similar trend with regards to sex. This increased prevalence in females could be attributed to the differences in physiology between the males and females, where the urethra is short, and the distance between the anal and vaginal opening is small. Bacteria therefore easily invade and colonize the urinary tracts (Chikwendu *et al*., 2010). But our result is not in congruent with a recent study by Akanbi *et al*. (2013) that reported non-significant relationship in occurrence of *K. pneumoniae* in male and female. As shown in Table 1; 66% of *K. pneumoniae* was isolated from male sputum, this is slightly higher than 53% recently reported by Al-Mussawi *et al*. (2015).

Table 1: Incidence of B-lactam producing *Klebsiella pneumoniae* in 40 samples each

		Sex (n%)		Age (n%)	
Samples	**Positive sample (n%)**	**Male**	**Female**	**≤13 years**	**>13 years**
Urine	26(65)	6 (23)	20(77)	-	26(100)
Ear	20(50)	10 (50)	10(50)		20(100)
Sputum	32(80)	21(66)	12(34)	5(16)	27(84)
Pus	15(38)	9(60)	6(40)	8(53)	7(47)
Wound	10(25)	7(70)	3(30)	5(50)	5(50)

There is well documented evidence of the antibacterial activities of *P. niruri* which revealed that it contains bioactive compounds with significant potency (Ajibade and Famurewa, 2012; Oseni and Banini, 2014). This shows that this plant represents a potential source for the discovery of novel antimicrobial agent with little or no side effects (Ajibade and Famurewa, 2012; 2013; Ajibade and Ajenifuja, 2013; Ajibade, 2014).

The minimum inhibitory concentration (MIC) of aqueous and ethanolic extract of the plant was evidenced in 0.2g/mL and 0.1g/mL respectively (Table 2 and 3); this is in-tandem with a recent study in Ghana that reported MIC of 0.2gmL for ethanolic extract against *K. pneumoniae* (Oseni and Banini, 2014). The highest zone of inhibition (10.0mm) was observed in a concentration of 0.2g/mL from ethanolic extract against *K. pneumoniae*, this is in total agreement with 11.00mm reported recently by Oseni and Banini. (2014).

Table 2: Antibacterial effect of aqueous extracts on *K. pneumonia* at different concentrations

Samples	**Diameter of zones of inhibition (mm) at different concentration (g/mL)**				
	0.1	**0.2**	**0.3**	**0.4**	**0.5**
Ear	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Sputum	6.0 ± 1.2^{b}	10.0 ± 2.2^{d}	15.0 ± 3.2^{e}	9.0 ± 1.3^{g}	16.0 ± 3.2^{i}
Wound	6.0 ± 1.6^{b}	6.0 ± 1.8^{b}	7.0 ± 1.9^{f}	8.0 ± 2.1^{h}	12.0 ± 2.1^{j}
Urine	5.0 ± 1.1^{c}	6.0 ± 1.0^{b}	6.0 ± 1.2^{b}	7.0 ± 3.1^{f}	10.0 ± 1.2^{k}
Pus	5.0 ± 1.5^{c}	9.0 ± 2.2^{d}	6.0 ± 1.5^{b}	9.0 ± 1.2^{g}	12.0 ± 1.2^{j}

Data are expressed as mean ± SEM; data with different superscript are significantly different at $p \leq 0.05$
SEM: Standard error of mean.

Table 3: Antibacterial effect of ethanolic extracts on *K. pneumonia* at different concentrations

Samples	**Diameter of zones of inhibition (mm) at different concentration (g/mL)**				
	0.1	**0.2**	**0.3**	**0.4**	**0.5**
Ear	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Sputum	10.0 ± 1.9^{b}	10.0 ± 1.2^{b}	15.0 ± 3.2^{d}	19.0 ± 1.0^{e}	20.0 ± 3.2^{f}
Wound	10.0 ± 2.3^{b}	10.0 ± 2.2^{b}	11.0 ± 2.4^{b}	15.0 ± 2.4^{c}	15.0 ± 2.0^{c}
Urine	10.0 ± 1.5^{b}	16.0 ± 1.8^{c}	16.0 ± 1.2^{c}	16.0 ± 2.0^{c}	16.0 ± 1.2^{c}
Pus	15.0 ± 3.1^{c}	16.0 ± 3.9^{c}	16.0 ± 2.9^{c}	19.0 ± 3.5^{e}	22.0 ± 2.9^{g}

Data are expressed as mean ± SEM; data with different superscript are significantly different at $p \leq 0.05$
SEM: Standard error of mean.

In this study ethanolic extract of *P. niruri* showed better antibacterial activities when compared with aqueous extract, reason might be due to the fact that ethanol extract posses the ability to retain more active ingredient than water. The strong antibacterial activity of the P. niruri observed in this study has been strongly linked with the presence of bioactive compounds especially the flavonoids and alkaloids, this had been reported by other studies (Osuntokun and Ajayi, 2014; Oseni and Banini, 2014). One other strong bioactive compound that has been extracted from P. niruri and it is of high efficacy is saponin, this was reported by Ajibade and Famurewa, (2012).

IV. CONCLUSION

The extracts from this plant have been investigated to be active *in vitro* and *in vivo* when applied to infected rabbits that suffer from diarrhoae, dysentery and typhoid fever (Ajibade and Egbebi, 2011). This study has authenticated the phytotherapeutic position of *P. niruri* extracts and may be recommended as remedy for infectious disease caused by β-lactamase producing *K. pneumoniae*.

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Performance Improvement of Intelligent Weather System for Satellite Networks

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Abstract- In high frequency satellite systems prediction of channel characteristics can be of immense value in improving the quality of signals. Signal attenuation impacts QoS in wireless and satellite networks. An intelligent decision support system is therefore necessary for service providers by accurately calculating cloud, fog, rain, gaseous, and scintillation attenuations using predicted signal-weather correlated database in collaboration with ITU-R propagation models combined with gateway, and ground terminal characteristics. The effect becomes a key feature in adjusting and improving satellite signal power, modulation and coding schemes, monitored and controlled altogether by a powerful and efficient intelligent-based attenuation countermeasure system. Weather attenuations can have a distorting effect on signal fidelity at higher frequencies that lead to excessive digital transmission error. This loss of signal is commonly referred to as signal attenuation. Signal attenuation impacts QoS (Quality Of service) in wireless and satellite networks. An intelligent decision support system is therefore necessary for service providers by accurately calculating the attenuations [1]-[5]. In this project we are calculating rain attenuation. The fuzzy logic is added into the system. The fuzzy system will determine the ambiguous signal during the attenuation performed.

Index Terms - Intelligent system, Rain attenuation, fuzzy logic, Ku-Band satellite.

1. INTRODUCTION

Rain attenuation (RA) is major source of impairment to signal propagation at microwave and millimeter wavebands. These impairments become particularly severe at high frequencies, especially above Ku band. As such, it is extremely hard to optimally manage satellite dependent network resources that are impacted by weather attenuations. Thus, the need arises to properly predict significant attenuation factors that affect quality of service (QoS) [1].

To improve receive signal over satellite communications in DVB-S, We propose the fuzzy logic to deploy over the system. Rain attenuation is a dominant source of attenuation over Ku-band satellite communication. Because of the frequency of Ku-band was affected in rhythm of rain attenuation. In case of both of them are synchronized, the signal will loss or attenuated. This is vital problem to occur in Ku-band where high frequency is deployed [3].

We use ITU-R model to accurately compute rain attenuations as a function of both propagation angle and rainfall rate. This data controlled by the intelligent system via a Fuzzy Logic decision mechanism, provide a better estimate satellite networking parameters such as link and queuing characteristics. The derived parameters would enable the IS(intelligent systems) to maintain QoS and SLAs(service level agreements).

In view of these analytical approaches, dealing with weather-impacted QoS and reliable satellite communications are currently non-existent. Other thrusts in satellite service providers are shifting their resolution towards intelligent- based prediction methods. These types of methods accurately predict relevant atmospheric metrics by adaptively applying the prediction methods to regulate transmit power, transmission rate, modulation schemes and channel coding[4]. Consequently, these methods will promptly adjust to new signal changes through the inter-connected network entities, before attenuation problems actually manifest themselves, to maintain end-to-end QoS requirements.

The remaining section of the paper are as follows:
In section 2 we describe fuzzy logic based unit followed by fuzzy variables, membership function and defuzzification process. In section 3 signal to noise ratio modification is presented. Finally, conclusion is outlined in section 4.

1.2. Problem Defination

Rain is a dominant source of attenuation for Satellite networks over higher frequency bands. The signals should be properly received and transmitted with attenuation or not. If SNR is better , we will assume the quality of signal as better. In term of QoS, end user must get quality signal from transmission link weather rain attenuation or clear sky. Service must be strength and quality of signal must be maintained. In order to achieve this, we proposed a good process which can resolve the problem of rain attenuation by applying fuzzy logic inside the exiting Intelligent system.

2. FUZZY-LOGIC-BASED UNIT

Fuzzy logic is a conceptualized as a generalization of classical logic and a mathematical theory, which encompasses the idea of vagueness when defining a meaning. For example, there is uncertainty are ‘fuzziness’ in expressions like ‘tall’ or ‘short’ , since these expressions are imprecise and relative. Variables considered thus are termed ‘fuzzy.’ Fuzziness is simple one means of describing uncertainty. The objective of every receive signal utility is to operate at correct receive bit signal from source. It use fuzzy logic to solve problem.

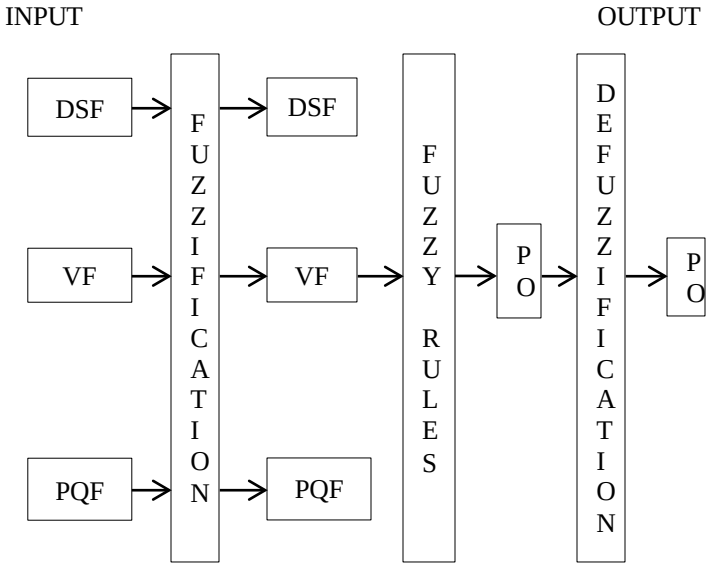

Fig.1. Block diagram of unit commitment using fuzzy logic

DSF: dB State Factor
VF: Voltage Factor
PQF: Phase QPSK Factor
PO: Production Output

2.1 Fuzzy Variables

Signal has characteristic which is sine wave. In mathematically form we can write the equations as below.

$$s(t)=A \sin(\omega t) \quad (1)$$

Fuzzy box has three parameters. This parameter comprise of dB state factor (DSF) is the output of the signal, Second is Amplitude (A), where represent the strength of signal. Phase (ωt) which perform in QPSK factor.

Then we map below parameters to the input parameter for fuzzy.

Fuzzy input variables

- dB State Factor (DSF) as s(t)
- Voltage Factor (VF) as (A)
- Phase QPSK Factor (PQF) as (ω)

Fuzzy output variables

- Production Output (PO)

dB State Factor is first input of the fuzzy, because dB state factor is direct parameter that make effect to retrieve accurate information when signal from satellite admit to the receiver.

If it has high power as regular perform (clear sky) good quality of signal will obtain but in contrast when rain attenuation power, the power will drop.

Second is Voltage factor. It is the second input of the fuzzy, because voltage factor is parameter that make effect it retrieve accurate information. If voltage is high at regular perform (clear sky) good quality of signal will obtain but in contrast when rain attenuation voltage, the voltage will drop.

Third is phase QPSK factor. It is taken to be the input of the fuzzy, because QPSK is modulation for ku-band satellite by ωt is phase QPSK factor and sensible to receive signal from satellite when it has rain attenuation. Therefore, if it has phase QPSK factor as regular perform (clear sky) good quality of signal will obtain but in contrast when rain attenuation phase QPSK , the phase QPSK will drop.

2.2 Fuzzy Set Associated with Unit Commitment

After identifying the fuzzy variables associated with the unit commitment, the fuzzy set defining these variables are selected and normalized. This normalized value can be multiplied by a selected scale factor to accommodate any desired variable.

The sets defining the dB state factor (DSF) are as follows:
DSF(dB) ={high, middle, weak}
The Voltage Factor (VF) is stated by the following sets.
VF(v) = {low, strong}
The Phase QPSK Factor (PQF) is defined by the following sets.
PQF = {right, near, outside}
The Production output, is given by,
PO = {rain, somerain, clearsky}

2.3 Membership Function

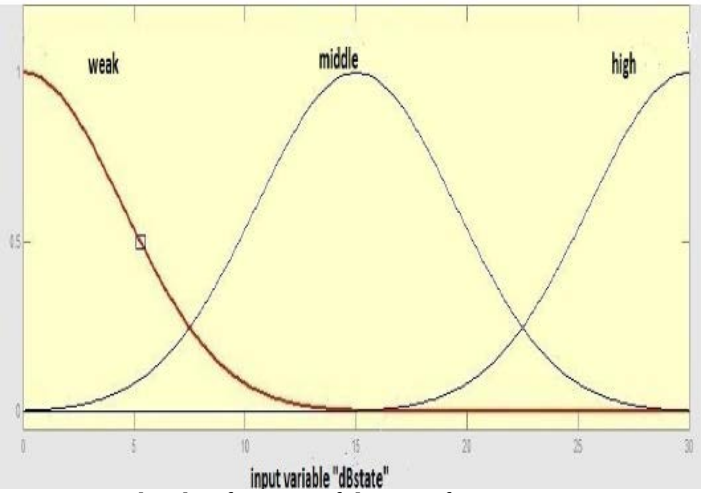

Fig. 2 Membership function of dB state factor

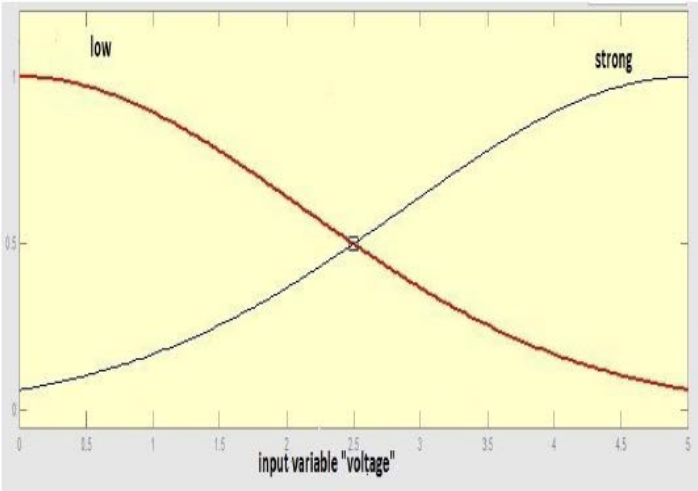

Fig. 3 Membership function of Voltage Factor

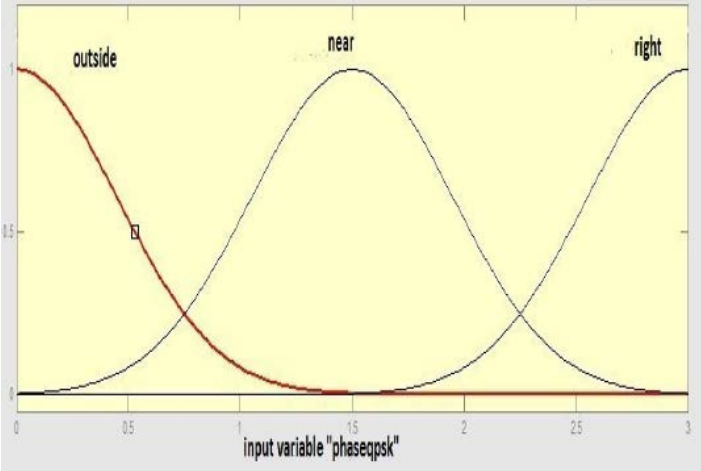

Fig. 4 Membership function of Phase QPSK Factor

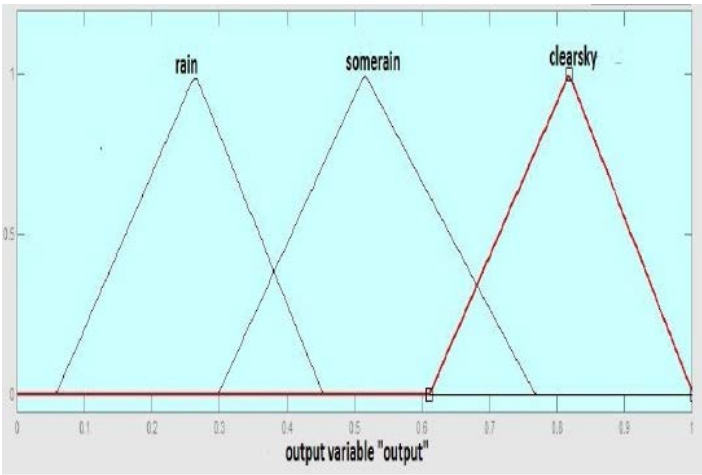

Fig. 5 Membership function of Production output

Based on the aforementioned fuzzy set, the membership functions are chosen for each fuzzy input and output variable . A shape membership function is chosen for all the fuzzy variables.

Fuzzy If – Then Rules

The fuzzy-logic–based approach ,decisions are made by forming a series of rules that relate the input variables to the output variable using If-Then statement. The if (condition) is an antecedent to the Then (consequence) of each rule. Each rule in general can be represented in the following manner:

If (antecedent) Then (consequence)

dB state factor , Voltage Factor and Phase QPSK Factor are considered as input variables and production output is treated as the output variable. This relation between the input variables and the output variable is given as;

Production output = {dB state factor} or {Voltage Factor} or {Phase QPSK Factor}

In fuzzy set notation this is written as

$$PO = DSF \cup VF \cup PQF$$

We use above notation, fuzzy rules are written to associate fuzzy input variables with the fuzzy output variable. Based on these relationships and with reference to Figs., a total of 18 rules can be composed (since there are 3 subsets for dB State Factor, 2 subset for Voltage Factor and 3 subset for Phase QPSK Factor (3*2*3=18)).

For instance, rule 3 can be written as follows:

Rule 1: If (dB State Factor is high) or (Voltage Factor is strong) or (Phase QPSK Factor is right) then (Production Output is clear sky).

Rule 2: If (dB State Factor is middle) or (Phase QPSK Factor is near) then (Production output is some rain).

Rule 3: If (dB State Factor is weak) or (Voltage Factor is low) or (Phase QPSK Factor is outside) then (Product Output is clear rain).

In similar manner total 18 rules can be formed.

After relating the input variables to the output variable, the fuzzy results must be defuzzified through what is called a defuzzification process, to achieve crisp numerical values.

2.4 Defuzzification Process

Defuzzification is final step in process fuzzy logic based. One of the most commonly used methods of defuzzification is the centroid or gravity method. Using this method, the production cost is obtained as follows:

$$\text{Production output} = \frac{\sum_{i=1}^{n} \mu(PO)i * POi}{\sum_{i=1}^{n} \mu(PO)i}$$

where
$\mu(PO)i$ is the membership value of the clipped output
POi is the quantitative value of the clipped output
n is the number of the point corresponding to quantitative value of the output.

3. SIGNAL TO NOISE RATIO MODIFICATION

SNR is a measure of signal strength for satellite signal relative to attenuations and background noise. Signal attenuations caused by rain, gaseous, cloud, fog and scintillation attenuations limit satellite's QoS links and system availability that operate at frequencies above Ku-band. Several factors such as power, modulation, etc., can perform an immense role in improving SNR and in maximizing system throughput and availability of the link. The entire system can be modeled as below.

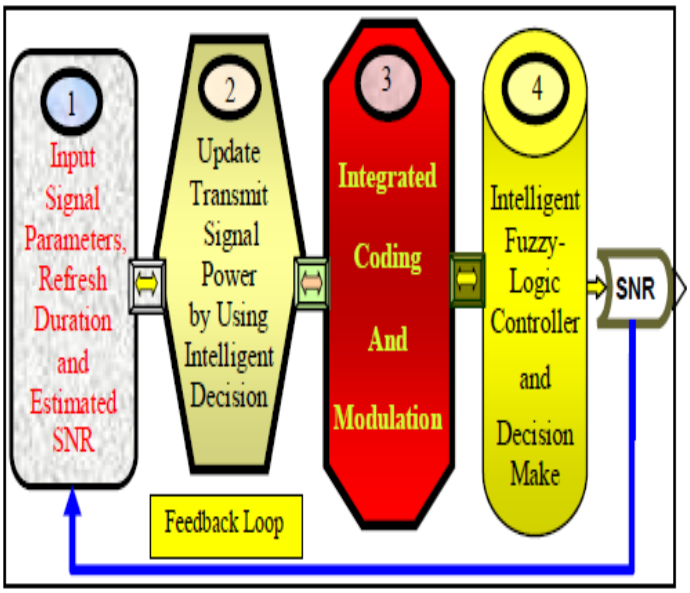

Fig 6. Intelligent Weather aware Scheme for Satellite Network

By controlling rain attenuation factor that supply the fuzzy logic mechanism, to allow better estimates for satellite networking parameters such as link and queuing characteristics. These derived parameters adaptively adjusting signal power, coding, modulation, and would enable the proposed system to maintain SNR by transmission rate under unpredictable forecast. Intelligent systems are employed in the control of satellite systems to improve signal to noise ratio (SNR) by using predicted RAs and SNR factors under extreme signal-weather conditions by adjusting signal power, modulation and coding schemes. Using these scheme, BER(Bit error rate) will be reduced.

By definition,
Es (symbol energy) = C.Ts
= C / Rs,
transmission rate Rs (symbol/sec) is inversely equivalent to Ts (symbol duration) = 1/Rs

Es / N0: Can be used to determine the bit error rate of a digital transmission scheme or visa versa. Fig 6. illustrates a manner for changing parameters of the communication system in order to overcome the deteriorating effect of atmospheric impairments, and to increase reliability of the data transmitted throughout the channel. In the first stage, the system holds input signal parameters such as frame size, propagation angle, etc. and SNR estimated values that were compared against threshold level, in a single database. In the last stage, the system will compromise among different SNR achieved outputs and make decision based on the intelligent fuzzy logic controller according to available parameters and requirements. The given feedback will keep looping until a satisfactory value is reached. Thus, this system can also change data rate, frame size, frequency, etc. in order to adjust SNR in cases such as unpredicted bad weather condition by using refresh duration that is located in the first stage

4. CONCLUSION

This research indicated that the frequency of rain directly affected to QoS on the satellite system. The outcome is key factor in diagnosing, adjusting and improving satellite signal power, modulation and coding schemes, monitored and controlled altogether by a powerful and efficient intelligent-based attenuation countermeasure system. However this research finds method to improve signal can receive the better signal when rain attenuation by use of fuzzy logic in the system. In simulation use of fuzzy logic method can improve receive bit in system more than regular system.

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A Study of Building an Reverse Dictionary

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***Abstract*—** A traditional forward dictionary is where the user inputs a word and gets one or more definitions as output. Whereas, in a reverse dictionary the user enters the desired phrase with logic and gets a certain number of words as outputs similar to the concept of the user input phrase. The reverse dictionary addresses the wide spread problem of knowing the meaning of a word, but unable to recall the appropriate word on demand .In this paper introduce a broad overview of the reverse dictionary and what are the techniques is used in reverse dictionary, some limitation of the reverse dictionary.

***Keywords*—**Reverse Dictionary, Pos Tagging, Concept mining, stemming

INTRODUCTION

A reverse dictionary can be viewed as an organized collection of concepts, word meanings or phrases and this is in contrast to a forward dictionary. So its function is similar to that of a thesaurus where one can look up a phrase by a general word or find a similar word or synonyms to the input word. The user enters the desired phrase with logic and gets a certain number of words as outputs similar to the concept of the user input phrase. The user input may be matching the definition that is already present or not.

Such a reverse dictionary would be useful for linguists and poets who might be looking for words ending with a particular suffix, or by an anthropologist or forensics specialist examining a damaged text (e.g. a stone inscription, or a burned document) that had only the final portion of a particular word preserved. Reverse dictionary of this type have been published for most major alphabetical languages. By way of contras, in a standard dictionary words are organized such that word and subsequent letters proceeding toward the end of that word.

A reverse dictionary performs a reverse mapping i.e., given a phrase describing a desired concept. It provides words whose definitions match the entered definition phrase, as opposed to a regular dictionary that maps words to their definitions. For example, a forward dictionary informs the user that the meaning of the word “regret” is “to feel sorry.” Whereas reverse dictionary, offers the user an opportunity to enter the phrase “feeling of loss or longing for someone” as input, and can be expected to receive the word “regret” and possibly other words with similar meaning as output.

Most of the techniques for the creation of reverse dictionary is based on the creation of multiple databases for synonyms, hyponym, antonym etc.

This paper is organized as follows. In Section II, we present the system study of the Reverse Dictionary (RD). In section III, the previous works related to this research are reported. In section IV, we present the problem description. Conclusion is presented in the final section V.

SYSTEM STUDY

In this section we describe about what is reverse dictionary and structure of the reverse dictionary and how it is works.

A. History of Reverse Dictionary

A **reverse dictionary** is a dictionary organized in a non-standard order (usually referring to being in a so called "reverse" order) that provides the user with information that would be difficult to obtain from a traditionally alphabetized dictionary. Reverse dictionaries were historically difficult to produce before the advent of the electronic computer and have become more common since 1974 when Stahl and Scavnicky's Reverse Spanish Dictionary appeared (the first computer sorted reverse dictionary ever published).

The reverse word dictionary refers to a dictionary where the word entries in the dictionary are not alphabetized in the same manner as traditional dictionary. For example, *A Reverse Dictionary of the Spanish Language* and *Walker's Rhyming Dictionary* are reverse dictionaries, the organization of which is based upon sorting each entry word upon its last letter and the subsequent letters proceeding toward the beginning of that word. Consequently, in these reverse dictionaries all words that have the same suffix appear in order in the dictionary. Such a reverse dictionary would be useful for linguists and poets who might be looking for words ending with a particular suffix, or by an anthropologist or forensics specialist examining a damaged text (e.g. a stone inscription, or a burned document) that had only the final portion of a particular word preserved.

Reverse dictionaries of this type have been published for most major alphabetical languages (see numerous examples listed below). By way of contrast, in a standard dictionary words are organized such that words with the same prefix appear in order, since the sorting order is starting with the first letter of the entry word and subsequent letters proceeding toward the end of that word. Some sort utilities can sort on a reversed version of the sort key, making it easy to generate reverse dictionaries on the fly if the dictionary data is available in electronic form.

Another use of the term "reverse dictionary" is for a reference work that is organized by concepts, phrases, or the definitions of words. This is in contrast to a standard dictionary, in which words are indexed by the headwords, but similar in function to a

thesaurus, where one can look up a concept by some common, general word, and then find a list of near-synonyms of that word. (For example, in a thesaurus one could look up "doctor" and be presented with such words as healer, physician, surgeon, M.D., medical man, medicine man, academician, professor, scholar, sage, master, expert.) In theory, a reverse dictionary might go further than this, allowing you to find a word by its definition only (for example, to find the word "doctor" knowing only that he is a "person who cures disease"). Such dictionaries have become more practical with the advent of computerized information-storage and retrieval systems (i.e. computer databases).

B. Architecture for a Reverse Dictionary

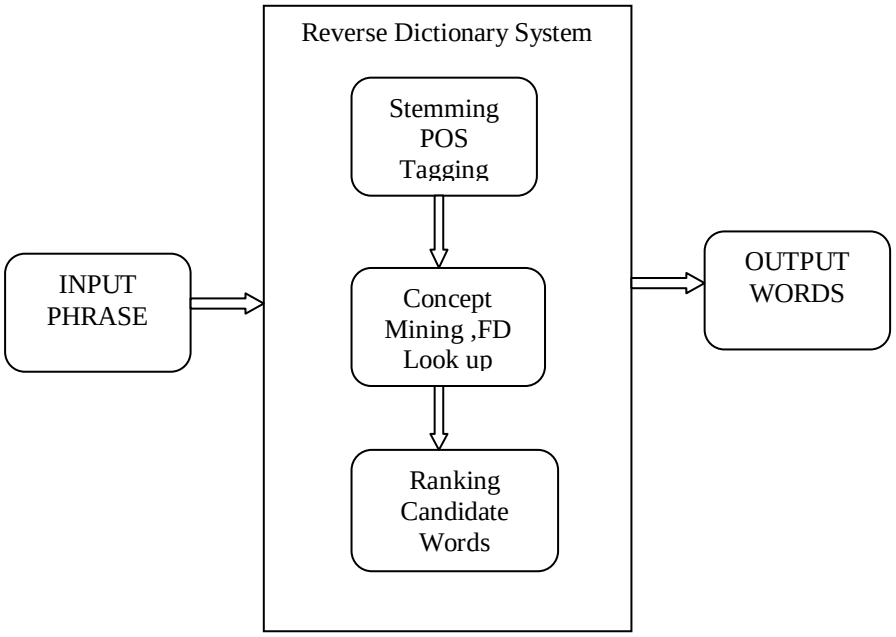

Fig., 1: Architecture for a Reverse Dictionary

The general steps involved in most of the reverse dictionary systems available today. The following steps as follows

a) Stemming

Steaming is the process of finding the root word of a word contained in a given phrase. Normally stemming is accomplished by means of porter stemmer.

b) POS Tagging

Part-of –Speech Tagging is the process of each word in a sentence is partitioned into the each word (and other token), such as noun, verb, adjective, etc. pos tagger is piece of software which performs pos tagging. English taggers us the Penn Tree tag set.

c) Concept Mining

Concept mining is the process of extracting meaning from a sentence or a set of words. Normally the conversion of words to concepts has been performed using a thesaurus. A number of methods are available now days to extract meaning from a given phrase or sentence.

d) Forward Dictionary Look Up

The meaning extracted after the concept mining phase can be used and consults a forward dictionary to selects those whose definitions are similar to this concept.

e) Ranking Candidate Words

After the forward dictionary look up phase a set of words whose meaning similar to the input phrase can be identified and this words has to be ordered by means of some probabilistic methods.

PREVIOUS WORKS

In a reverse dictionary a user phrase is given and we receive certain number of words as output ranked with an algorithm. The related works to this reverse dictionary are the reverse dictionaries [1] [2].

Reference[3] Deals with the design and implementation of a reverse dictionary It described finding candidate words from a forward dictionary data source for user phrase. Candidate words are ranked by quality of match. It consists of two key sub steps build the RMS and Query the RMS. Some Limitation of this paper as follows

- The response efficiency is not to be similar to forward dictionary online lookups.

- There is no enough words or less than the target number of words, we can extend the search using Synonyms, hypernyms, hyponyms.
- Database is not updated dynamically.
- The lack of contextual information.

Reference [4] described Input phrase is analysed using semantic similarity measures and SVM assisted by Word Net. Applying algebraic analysis to select candidate words and rank them. The similarity and relatedness measures are Jiang and Conrath (JCN) and Lin. Semantic similarity measure between each member of the input is ranked and highest values words are chosen. Some Limitation of this paper as follows

- Context Based target words are not achieved properly.
- Only nouns as word members of the semantic space.
- There is no Dynamic updation of reverse dictionary database.

Kesavaram.P.H [5] described the search is enhanced by considering the synonyms, hypernyms and hyponyms of that particular word. The final step is to sort out the results based on its rank. Some Limitation of this paper as follows

- Inflected forms of the words are not considered. For example: Root word “sleep” is considered from “sleeplessness”.
- Spell checker is not provided.

PROBLEM DESCRIPTION

In Reverse Dictionary, similarity is calculated based on sentence phrase which is effective as compared with similarity based on each word. Context Based target words are not achieved properly. And only nouns as word members of the semantic space, There is no Dynamic updation of reverse dictionary database. The drawback of [4] is overcome from this proposed system. This paper is in proceeding

- Each word in a sentence is partitioned into a list of tokens words using Part-Of-Speech Tree tagger.
- Here Porter stemming algorithm is used. Porter stemming is a process of removing the common morphological and inflexional endings of words.
- The similarity of the sentences based on the similarity of the pairs of words is computed.
- Most appropriate sense for every word in a sentence can be found using Word Sense Disambiguation.
- List of possible target words are given as suggestion in addition to the required word.

V CONCLUSION

In this paper, we discuss the steps and different methods involved in the creation and implementation of the reverse dictionary has been analyzed. It is found that the various techniques that are used in the steps involved in the creation of reverse dictionary can be replaced with more accurate methods. The main challenges that are identified in the creation of reverse dictionary are, first a user input is unlikely to exactly match the definition of a word in the forward dictionary and second the response efficiency needs to be similar to that of forward dictionary look up. The most effective methods for overcoming these challenges.

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PROGNOSTIC SIGNIFICANCE OF HRV FOR DIFFERENT AGE GROUPS

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Abstract: Heart Rate Variability (HRV) can be measured with the variation of RR intervals exhibited in a sequence of ECG sample. For a short-term HRV, measuring time is usually defined. However, with numerous possibilities of shortening the measuring time to evaluate the HRV further precision can be exhibited. This paper elucidates on analyzing raw ECG data and then further pre-processing it to obtain a smoothened data to detect mean HRV value .Further the ECG Data subsets of different age groups is taken and analyzed to find out the implications HRV has in patient's lives and as a predictor of mortality. Heart rate variability (HRV) has been a strong predictor of heart failure and its prognostic significance is yet to be explored. The data in the experiment are taken from publically available source physionet.

Index Terms:--HRV, ECG ,Mortality, RR interval, Pre-processing, SDNN , LF ,HF

1. Introduction

Heart rate variability (HRV), are the changes in the beat-to-beat heart rate calculated from the electrocardiogram (ECG), is a key indicator of an individual's cardiovascular condition. HRV assessment has been shown to aid clinical diagnosis and resulting in better prognosis for a person's cardiac status and health.Over the past many years there has been a widespread interest in the study of variations in the beat-to-beat timing of the heart. In normal subjects, a variable heart rate is the normal physiological state. It has been suggested that the healthy heart has a long range 'memory' which prevents it from developing extremes of pace, and that this memory fades away as age or disease develops [1] . A loss of variability is associated with an increased mortality in patients post myocardial infarction [2].Although previously many papers have been published analyzing HRV as a predictor of sudden cardiac death in chronic heart patients [3] and improving the efficiency of HRV while correlating it to the ANS by applying ANN and Different Signal processing methods [4] .For instance , Bigger et al. elucidated the correlation of HRV spectral indices with arrhythmic death and Sudden Cardiac Death in patients suffering from Myocardial Infarction in the MPIP study [5] , which included 715 patients with acute Myocardial Infarction.The measurement of central autonomic activity is usually correlated to the myocardium and its thus denoted by HRV values .It is the equilibrium between sympathetic and parasympathetic activities to the myocardium, moreover , HRV analysis stands as a non invasive method of detecting the autonomic cardiac impairment early [6]. A high HRV indicates a good cardiac adaptability while a lower HRV often indicates an abnormal and insufficient adaptability of the autonomic nervous system and is associated with a high risk of cardiovascular adverse events. [7]. There are studies depicting that HRV assessment can even be extended to a timely diagnosis of impaired autonomic activity status which is linked with increased mortality in patients suffering with Rheumatoid Arthritis.[8] In heart failure, the data on prognostic significance of time-domain HRV indices in prediction of SCD are debatable and controversial as discussed in many publications before in the domain of HRV analysis
[9-12]

This paper focuses on Preprocessing of raw ECG data from publicly available source physionet.org and then creating a mother wavelet to compare the HRV. Further different Age groups have different HRV Analysis. The moment a person enters the 3rd decade of his life span and turns 30 plus, their strength drastically reduces and it is experienced in both the genders mainly predominant in males as compared to females. Autonomic down-regulation appears to play a major role in triggering the reduction in physical capacity. Bodily functions deteriorate with aging. Besides the evident changes in a person's appearances and skin, eyes, ears and hair, autonomic functions also undergoes similar modifications through the aging process .

The two subsystems of the autonomic nervous system (ANS), namely, the sympathetic and parasympathetic branches, work in sync to balance and regulate autonomous functions such as respiration, circulation, metabolism and digestion. In this study, we have focused on expounding age-related changes during the thirties compared with previous decades. This paper elucidates on how a person entering the 3rd decade of his life and his cardiac activity can be correlated to HRV analysis and the mortality factor. The raw signal undergoes pre-processing by the application of various filters then the HRV analysis is done on both the gender subsets with patient data of Age greater than 30.

II . Methodology

Preprocessing of raw ECG Signal includes multiple steps. Mostly real time recording of ECG incurs many errors and noises. In order to increase Signal to Noise ratio and to obtain precise results for prognostic significance, we performed the initial preprocessing by (Step 1) removing power line interference. After removal of power line interference, (Step 2) multi-level wavelet decomposition is performed in which 1-D wavelet analysis is done using a standard mother-wavelet. Then reconstruction of signal branch using 'approximate' coefficient method is done.(Step 3) Baseline wandering is removed using a low pass filter and a moving average filter is applied to remove the glitches in order to obtain a smoothened waveform.(Step 4) Peak Value detection is done and then calculation of R-R interval. (Step 5) HRV Analysis of ECG signal subsets of different age groups, primarily focusing on 30 plus population. Age Related changes in both male and female subset show correlation to SDNN, TP, HF,LF VLF are computed and plotted to display dramatic results. The presented system algorithm is developed completely in MATLAB version 8.1.

A. Pre Processing of the Raw ECG Signals

i) Power Line Interference Removal

Power Line interference is common while real time recording of ECG, As the dataset used is in European data format we have used 50 Hz notch filter to remove any power line interference in the raw ECG data . The response of the filter is shown in Figure 2. The transfer function for the filter is defined by H(z) which is given in the eq. 1. The designed filter structure is direct form II transposed with non linear phase with three numerator and denominator length .

$$H(z) = \frac{0.99553 - 1.89361z - 1 + 0.995532z - 2}{1 - 1.89361z - 1 + 0.9910z - 2} \qquad (1)$$

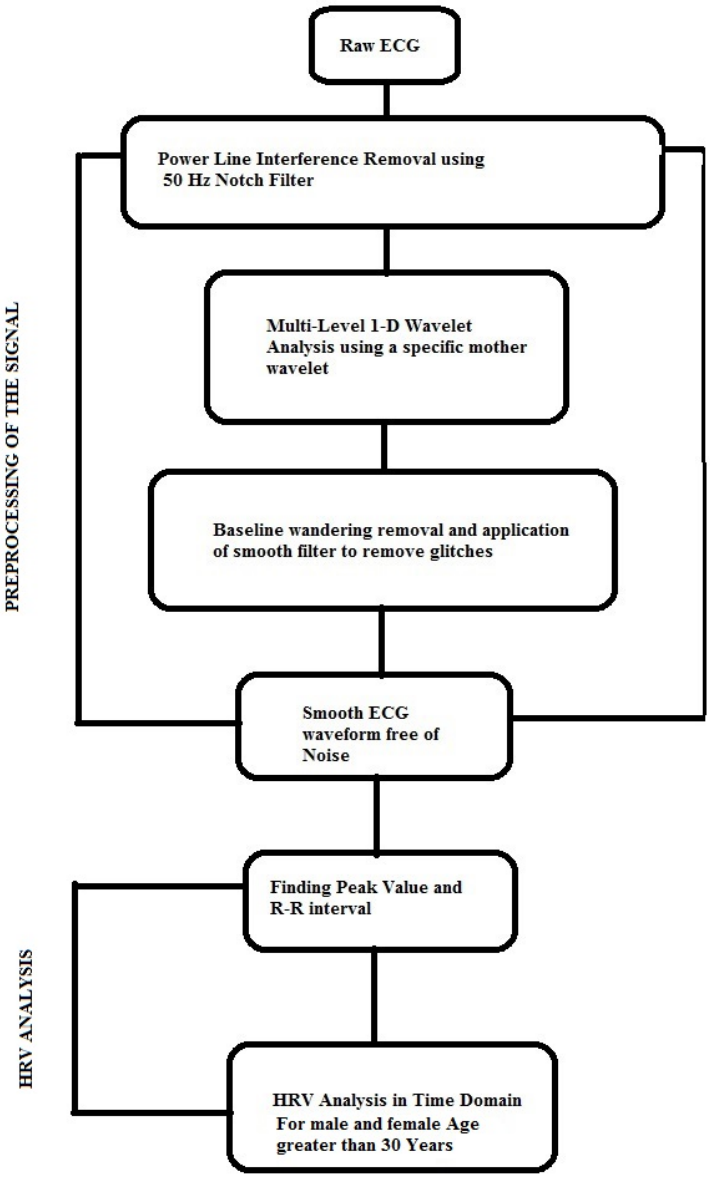


Figure 1: Methodology

(1)

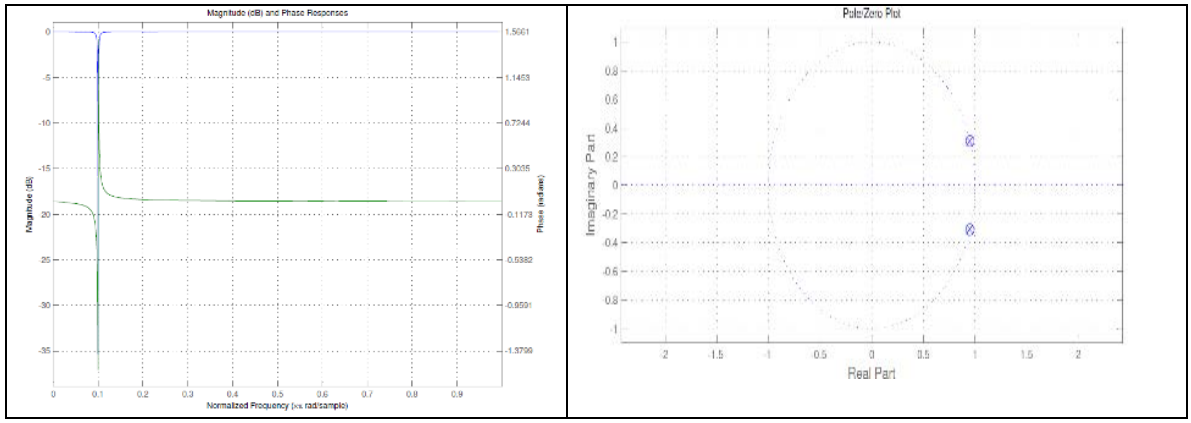


Figure 2: Notch filter response (a) Magnitude and phased delay response(b) Pole –zero plot

ii) Multilevel 1-D wavelet analysis using a mother wavelet and Glitches Removal

` Multilevel one dimensional analysis using a mother wavelet db4 and db6 of debecius family is used , which convolutes the signal with the specified mother wavelet at required frequency as the wavelet is also in the form of filter then the signal is reconstructed using approximate coefficients and then computes the vector of reconstituted coefficients. A low frequency level of reconstruction is used to remove the baseline wandering in the processed ECG signal. After this we have applied a moving average filter to smoothen the waveform, thereby the smooth filter removes any glitches available in the waveform.

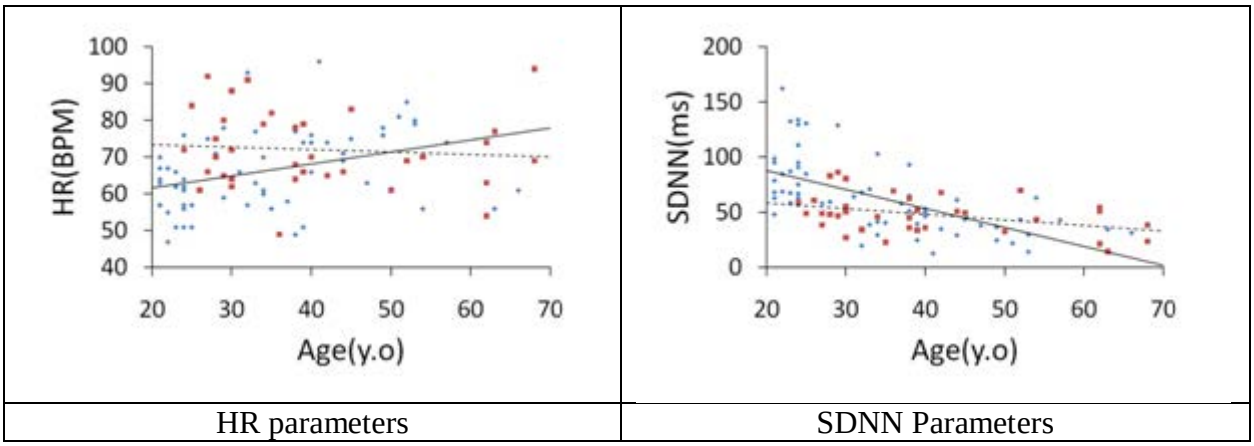
B.Heart Rate Variability Analysis

Analysis of heart rate variability (HRV) includes time and frequency domain measures. Respiratory Sinus Arrhythmias denote heart rate fluctuations which can be estimated by computing Standard deviations of N-N interval (SDNN) derived from time-domain analysis, SDNN emulates the parasympathetic activity [13]. Power spectral analysis of time indices yields frequency domain measurements. Total power (TP), the overall spectral power, is regarded as an index of comprehensive autonomic activity [14]. Additionally, HRV is categorized into three levels of power: high-frequency (HF), low-frequency (LF) and very-low frequency (VLF). As with SDNN, HF denotes components derived from respiratory sinus arrhythmia and is considered to represent vagal control. LF is jointly contributed by sympathetic and vagal nerves and represents the feedback regulation of blood pressure. Currently VLF is utilized solely for the standardization of LF and HF as its physiological significance is much less defined.

III RESULT

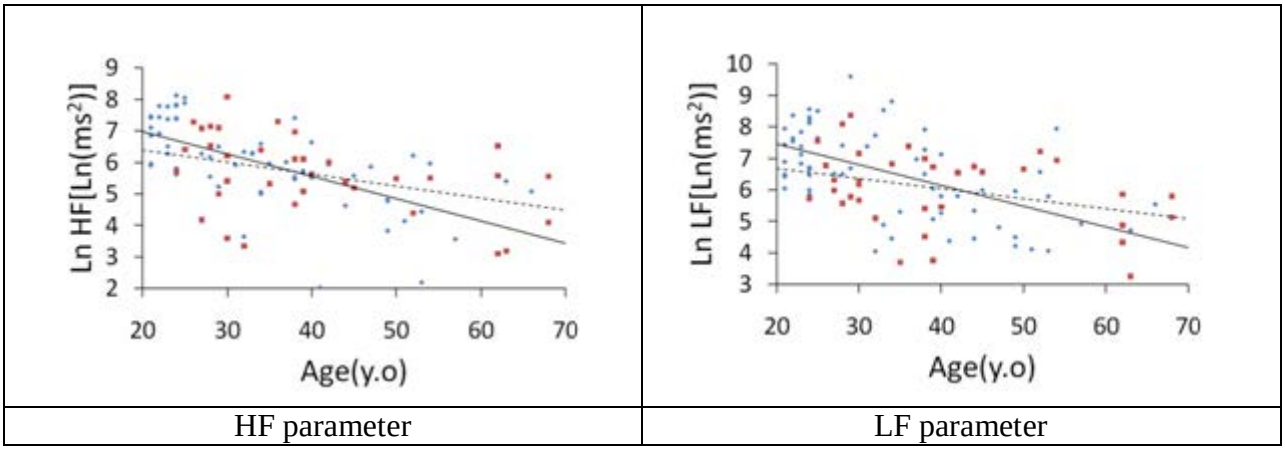
Scatter plot and the analysis are presented for age and hrv parameters are shown in figure3, figure 4,figure 5. Mean HRV parameters according to age and gender is shown in Table 1 and Table 2 respectively. A correlation was seen in heart rate and age for men but not for women. Other than Ln (LF/HF) ratio all parameters have shown negative correlation for age in both male and female. No relation was associated for Ln (LF/HF) ratio and age for both male and female. A very high correlation of (-0.7 <r < -0.5) for age and SDNN,

Ln LF, Ln HF and LN TP was observed. All results indicates that around 44.2% of Ln TP is the closest and the best fit. Negative correlation was also observed for women with (-0,5 r< -0.3), though a lesser degree of predictive accuracy can be observed than men from regression analysis. If slope for regression analysis was observed for each parameters, data associated with men had less steep than that for women, only Ln LF/HF was exception. The parameters declined in greater proportion compared to women with advance in age.



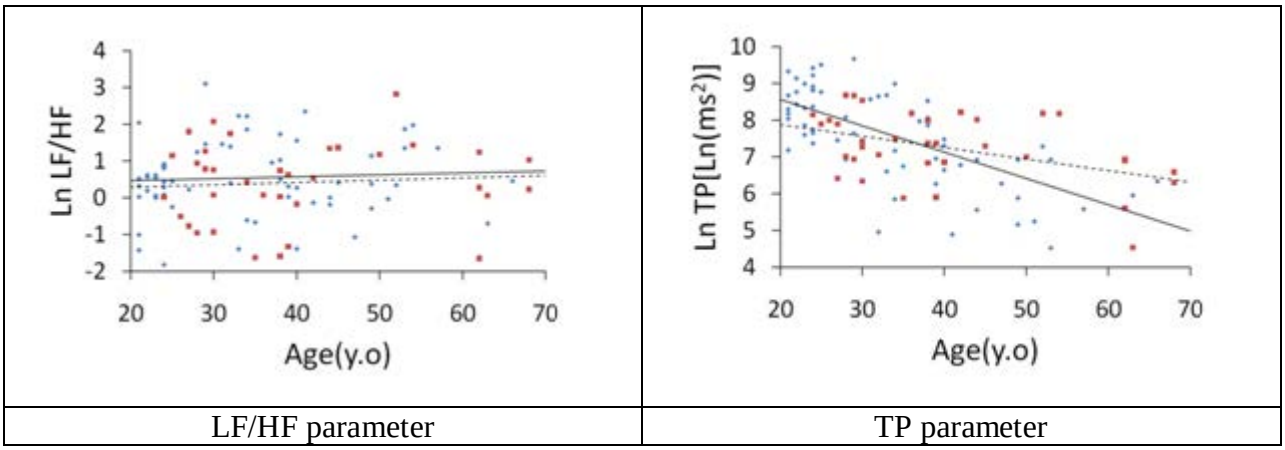
HR parameters	SDNN Parameters

Figure 3 HRV Parameters: HR & SDNN , Red cluster for Female and Blue cluster for Male



HF parameter	LF parameter

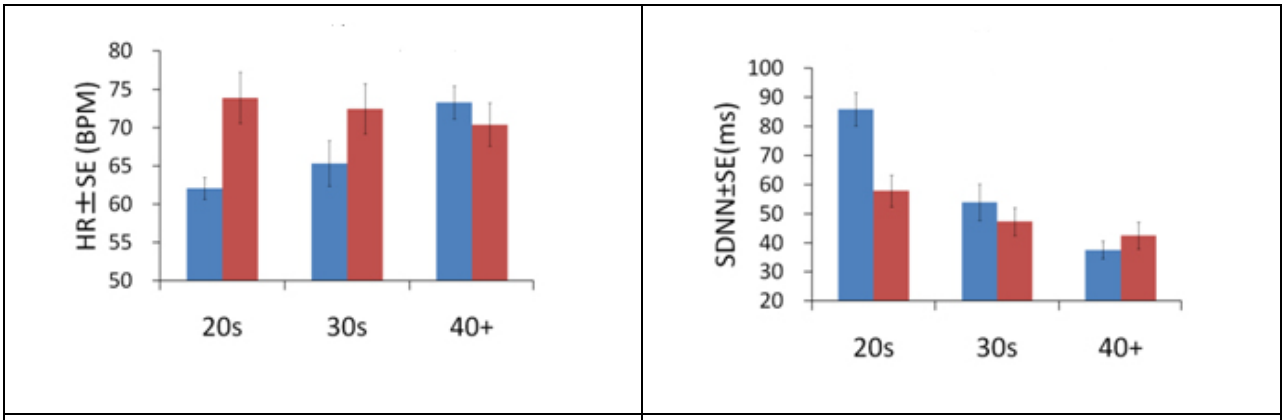
Figure 4: HRV Parameters: HF & LF , Red cluster for Female and Blue cluster for Male



LF/HF parameter	TP parameter

Figure5: HRV Parameters: LF/HF & TP , Red cluster for Female and Blue cluster for Male

If we compare changes in heart rate with age for SDNN, TP, HF, LF, and LF/HF ratio as shown in Figure 6, Figure 7 and Figure 8. The following observations were made. For men with maturity reduction was shown except for heart rate and LF/HF ratio. There was a prominent difference in SDNN was observed for men in between their twenties and forties plus , Differences in LP for age between twenties and thirties, thirties and forty plus was observed . 36 % reduction in LF/HF was shown in forty plus men compared to thirties. For women HRV indices other than LF/HF declined with age. LF/HF ratio of thirties had a 79 % reduction and after forty LF/HF ratio was eight fold higher than thirty and 79% greater than twenty.



HR parameters | SDNN PArameters

Figure 6: HR and SDNN parameters for Age-related changes in Heart Rate, Red for female and Blue for Male

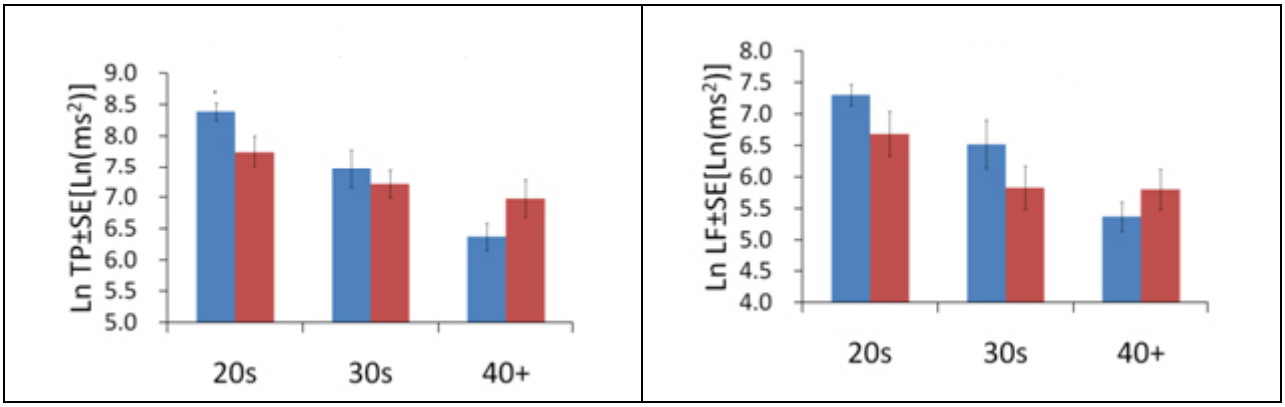
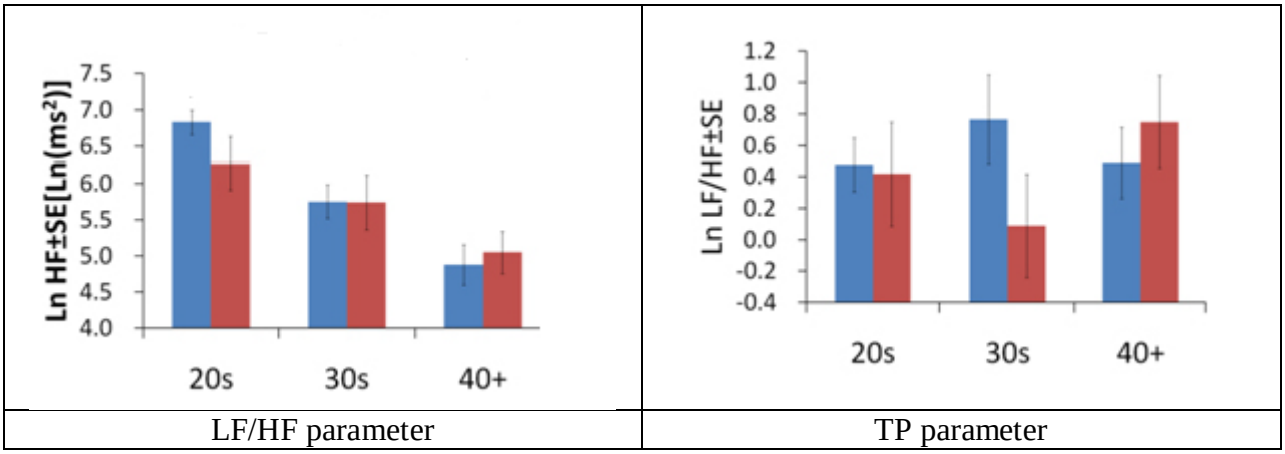


Figure 7: TP and LF for Age-related changes in Heart Rate, Red for female and Blue for Male



LF/HF parameter | TP parameter

Figure 8: HF and LF/HF parameters for Age-related changes in Heart Rate, Red for female and Blue for Male

Parameters	20-29(age)	30-39(age)	40+(age)
HR	62.07	65.33	73.30
SDNN	85.91	53.94	37.5
Ln TP	8.39	7.46	6.37
Ln LF	7.30	6.52	5.36
Ln HF	6.83	5.75	4.88
Ln LF/HF	0.47	0.77	0.49

Table 1: Mean HRV parameters for male according to age and gender

Parameters	20-29(age)	30-39(age)	40+(age)
HR	73.89	72.46	70.38
SDNN	57.83	47.28	42.54
Ln TP	7.74	7.21	6.98
Ln LF	6.69	5.82	5.80
Ln HF	6.27	5.74	5.05
Ln LF/HF	0.42	0.09	0.75

Table 2: Mean HRV parameters for Female according to age and gender

IV CONCLUSION

Based on the results of age groups for both the genders , HRV was significantly observed higher for men than women during their twenty and also thirty while the case reversed in their forty .TP had a remarkable evaluation in men .In forties women showed greater activity against all HRV parameters. If we summarize in terms of para and autonomic activities with age in men and women., a significant variation or decline in parasympathetic and autonomic activities with age in men and women is observed, a significant decline is seen in thirties due to sudden decrease in physical vitality on the flip side a more gradual decline was seen in women which accounts for higher longevity in women than men.

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Mining Geological Studies of Avagudem Manganese Vizianagaram District Andhra Pradesh India

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Abstract: India is the third largest producer of manganese ore in the world. The countries most important ore deposits are Syngenetic, epigenetic and lateritic. Supergene enrichments associated with the first two groups. On the basis of mode of occurrence and association with different kinds of country rocks, the Indian manganese ore deposits have been classified as **Gondites**, **Kodurites** and **Laterite**. Indian manganese ore deposits occur mainly as metamorphosed bedded sedimentary deposits associated with Gondite Series (Archaean) of Madhya Pradesh, Maharashtra, Gujarat, Odisha and with Kodurite Series (Archaean) of Odisha and Andhra Pradesh and Proterozoic sedimentary manganese deposits of Penganga group Adilabad district of Telangana. The subject area is a part of the Archean terrain consisting of Biotite Gneisses, Garnet Sillimanite Gneisses, Feldspathic Quartzites, Calc-granulites, quartz veins etc. The Garnet Gneisses occur individually or intermixed with Kaolin or in Red loam. The lithomarge is generally yellow to brown in colour and at the contacts of the ore body, it is dull grey which is due to the presence of Manganese Oxide and it is termed as Wad. The general strike of the ore body is NNW-SSE with dip 0f 700 towards east.The environmental aspects are being monitored regularly and seasonally by an environmental laboratory. As such the portability of air is fresh and unpolluted in this area.

Key words: Manganese, Gondites, Kodurites and Laterite, Syngenetic, Epigenetic and Supergene Enrichments, Environmental aspects

I. INTRODUCTION

Manganese makes up about 1000 ppm (0.1%) of the Earth's crust, making it the 12th most abundant elementEmsley,John(2001)[1].Geochemically, Mn behaves like Mg, Fe, Ni, and Co and tends to partition into minerals that form in the early stages of magmatic crystallization. Significant quantities of Mn persist, however, in melts and can be plentiful in late-stage deposits such as pegmatites. Mn is readily depleted from igneous and metamorphic rocks by interactions with surface water and groundwater and is highly mobile, as Mn (II), in acidic aqueous systems. Near the Earth's surface, Mn is easily oxidized, giving rise to more than 30 known Mn oxide/hydroxide minerals. These oxides are the major players in the story of the mineralogy and geochemistry of Mn in the upper crust and the major sources of industrial Mn.

Indian manganese ores are preferred by many as they are generally hard, lumpy and amenable to easy reduction[4].In the Indian continent, the deposition of manganese must have taken place in varying environmental settings and by different geological processes but the sedimentary mode of formation far outweighed other methods such as supergene enrichment[3]etc. These manganese ores have been selectively exploited either for direct use or for sweetening the otherwise available phosphor-rich ores. Favorable geological and geomorphological settings, existing well connected rail and road links, easy amenability of ores to beneficiation and liberal Govt. policies make the exploitation of Indian manganese deposits practically a no risk proposition.

The 96% of global production of manganese today is from barely 8 countries viz. China (17%), RSA (15%), Australia & Brazil (12% each), Gabon, India and Kazakhstan (9% each) and Ukraine (8%) in decreasing order of tonnages raised annually. The global resource base is close to 52 billion tones including Indian reserve of about 378 million tones.

Manganese is a vital component of steel and over 90% of manganese produced world over is used for metallurgical purpose. Ore utilization mode and smelting practice vary from Operator to operator but the general world-wide approval is to produce high-carbon ferromanganese. Mn ore deposits are not evenly distributed in geologic time. Instead they cluster in three groups, one in the Palaeo-

proterozoic, the second in the Neo-proterozoic and the third in the Cenozoic. There is also a striking disappearance of sediment-hosted deposits from 1800 to 1100 Ma: The Palaeo-proterozoic peak is by far the largest and corresponds in time to the major episode of Banded Iron Formation deposition. Iron formation is also a common companion for the Neo-proterozoicMn deposits, but the Cenozoic peak, largely confined to the Oligocene, has no associated Fe mineralization. The largest volume of Palaeoproterozoic Mn is in the Kalahari region of South Africa. The largest Neo-proterozoic deposit is in Brazil with many smaller deposits occurring in China. The Oligocene deposits are centred on the Black Sea.

In recent years world manganese production has increasingly come from large sedimentary deposits of shallow marine origin. Stratigraphic units containing valuable manganese concretions consist of carbonates of fine clastic and represent deposition during high sea level stands, particularly on the margins of stratified basins.

II. GEOLOGY

India is the third largest producer of manganese ore in the world. the countries most important ore deposits occur in the form of sedimentary stratified metamorphic deposits in the Dharwar system , the manganese deposits are generally either Syngenetic {Ref.4} (sedimentary) as in Madhya Pradesh and Maharashtra, epige 82-87% manganese (residual enrichment and oxidation) as in Jharkhand, Orissa, Goa and Karnataka or lateritic and supergene enrichments associated with the first two groups. On the basis of mode of occurrence and association with different kinds of country rocks, the Indian manganese ore deposits have been classified as...

A) Gondites ores which are associated with metamorphosed manganiferous sediments: **{Ref.5}.**

B) Kodurites ores which are produced due to reactions the country rocks and an invading magma or composition.

C) Lateriod ores which are produced to metasomatism replacement and residual concentration. Georgia has huge deposits of manganese ore India is the third largest producer of manganese ore in theWorld**{Ref.4}.** The country s most important are deposits occurring (in the form of sedimentary stratified metamorphic deposits in the Dharwar system.

In India, extensive and rich manganese deposits occur in Madhya Pradesh, Orissa, Jharkhand, Andhra Pradesh, Maharashtra and Karnataka **{Ref.6**}. Indian manganese deposits display some distinct geological formations which are...

A) Deposits associated with the Khondalite rocks (garnet, sillimanite, gneisses) found in the Srikakulam district of Andhra Pradesh and in the kalahandi and Koraput districts in Orissa {**Ref.**[8]}

B) Deposits associated with in the iron bearing rocks (schist's) found in Karnataka states in the sandur hills **{Ref.13}.**

C) Deposited associated with limestone and dolomite which occur in the Sausars-manganese –marble and Adilabad manganese ore associated with the limestone .province of Madhya Pradesh ,Jharkhand and Gangapur , Ratnagiri in Maharashtra and Adilabad district in Andhra Pradesh **{ Ref.**[7]**}.**

Indian manganese ore deposits occur mainly as metamorphosed bedded sedimentary deposits associated with Gondites Series (Archaean) of Madhya Pradesh (Balaghat, Chhindwara&Jhabua districts), Maharashtra (Bhandara& Nagpur districts), Gujarat (Panchmahal district), Odisha (Sundergarh district) and with Kodurites Series (Archaean) of Odisha (Ganjam&Koraput districts) and Andhra Pradesh (Srikakulam&Visakhapatnam districts) and Proterozoic sedimentary manganese deposits of Penganga group Adilabad district Andhra Pradesh.

III. GENERAL GEOLOGY

The rock unit exposed in this region of the subject area belongs to Khondalie suite of Rocks of Archean system.

A. Local Geology

The subject area is a part of the Archean terrain consisting of Biotite Gneisses, Garnet Sillimanite Gneisses, FeldspathicQuartzites, calcgranulites, quartz veins etc. In the subject mine the Manganese ore horizon is associated with Garnet Gneisses, Lithomarge. The Garnet Gneisses occur individually or intermixed with Kaolin or in Red loam. The Garnet gneisses with Kaolin or as such are predominant in the area. The lithomarge is generally yellow is yellow to brown in colour and at the contacts of the ore body, it is dull grey which is due to the presence of Manganese Oxide and it is termed as Wad. The Manganese forms intrusive in contact on both the sides by Calc gneisses/Kaolin. The Ore in the pits is generally Psilomalene-brown, brownish black to black in colour and it is friable in nature. The general strike of the ore body is NNW-SSE with dip 0f 700 towards east.

B. *Evaluation of Manganese ore and Classification of deposit as per UNFC*

A total of 5 cross sections (A-A' to E-E') have been drawn across the exposed strike length. The drilled Boreholes (Core bore holes) have been projected on to the respective Cross sections. The interception of the ore zone in boreholes has been plotted on the respective cross Sections. The depth of the ore body is extended from surface to the intercepted depth of the borehole and the same has been placed under the G1 category scale of exploration (Sections A-A' to C-C'). Further in the remaining sections D-D' and E-E' where the ore body is exposed in the pit and to a depth of 8 m has been considered under G3 category of UNFC system. The strike influence of the ore zone is restricted to an exposed length of the ore zone. The respective cross sectional area has been multiplied by the exposed strike length, i.e. strike influence to get the volume. In turn the volume is multiplied by the bulk density to arrive the insitu tonnage. The results of the drill hole and the pit logs are almost synonymous.

A proved Mineral reserve(111) is the economically mineable part of a measured mineral resources that includes diluting factors and allowances for losses, which may occur when mineral is mined and the economically mineability being demonstrated by a feasibility study/actual mining activity which is being aided by detailed exploration. A 75% recovery factor to the insitu reserve has been adopted sincethe loss in recovery is mainly due to the friability nature of the ore. The 25% of recovery loss is attributed to intercalated clayey/Lithomarge and handling losses. The other factor attributed for 25% recovery loss is the waste that is removed while upgrading the ore/value addition for competitive price. Otherwise as such the entire ROM is marketable at low price. This conclusion has been drawn after a thorough exercise carried out on the ROM produced from the mine over a period of time. The reserve catagorised under UNFC of 111 in the present context is being justified up to a intercepted depth of drill hole data in the following manner

IV. ECONOMIC AXIS

1) The Manganese mineralization in the subject mine is strata bound and is confined to Khondalite formation and a detailed exploration by means of Core bore holes with a cumulative meterage of 156 m had been carried out. Thus the detailed exploration parameter has been fulfilled.
2) The mine is in operation continuously since 1968. All the pits are in operation. Even in lean period, the lessee continued the mining operation. Thus the mining of the Manganese ore is viable.
3) So far whatsoever Manganese ore produced from the mine was marketed. The Manganese ore of the mine has very good mineral composition both in respect of elements of Mn and others i.e. Fe and P and put together is 50%. It is best suitable for blending of Manganese ore of the other mines of the lessee which are low in Fe and high P content. The ore is friable in nature and sold to Steel plants with the end use specifications as given below.

Radical	Vizag steel plant	Bhilai steel plant
Mn	26-28%	28-30%
Fe	13-15%	-
Sio_2	14-16% max	30% max
Al	7.5% max	5% max
P	0.3-0.5% max	0.3-0.5% max
size	20-60mm	+25 to -85mm

Table 1

Thus the grade of the ore produced from the mine is marketable, since it is meeting end use specifications of the industry.

Therefore the first digit of economic axis i.e. **'1'** is justified up to a exposed depth of Manganese horizon from the existing surface RL.

A. Feasibility axis

1) As said, the ML area is thoroughly explored through the ongoing mining activity since 1968 and further by means of exploratory drill holes. Thus the geometry/disposition of the ore body has been delineated precisely and shown in the Surface Geological plan and Geological cross sections (Refer Plate – IV & IV A)
2) Mining is done by opencast semi mechanised method and it is meticulously guided by the incidence and behavioral trend of the ore and with which it is continued till date. The mining in the M.L. has witnessed both sides viz the lean as well the boom periods of market and the ore has sustained its tenability since inception of the mining.
3) As said mining is done by semi mechanised means and which does not have much effect on the Quality of present ambient air. Pollution to the air is on account of dust which gets airborne due to plying of dumpers and loading of Manganese Ore and waste. Loading of Manganese ore is generally done by manual means and thus it does not contribute to air pollution. As far as water pollution is concerned there are no rivers, tanks and other perennial water sources in and around area. The present pit has reached about 35 to 40m and as such lot of seepage collected in the sump and it is bailed out.

4) The sump water is analysed and found to be no incidence of toxic elements. The top soil generated during the mining is stored separately and it is utilized for the productive purpose of plantation and raising nursery at the mine.

5. The material produced from the mine is highly friable in nature and disintegrates at each stage of handling. In general it is observed that the ROM consists of 65-75% fines and 25-35%of lumpy material. As the ore is friable, the lithomarge gets admixed with the fines. To separate lithomarge hand picking operation is being done on every day basis from the surface of ore heaped before any fresh material is dumped over it. Secondly the process of hand screening or hand sieving is also being done to prevent the disintegration of lumps during the process of sieving

6. The area falls in survey of India Topo sheet no. 65 / N / 11 is located about 2 kms on North-West from road point on Vizianagaram-GarividiPWD Road, situated at a distance of 1.5km towardsVizianagaram from Garividi Railway level crossing. The villagers mostly on agriculture and mining work. Electricity is available in the area and also in the villages.A main substation located at a distance of about 500m where power is received from Government Electric feeder. The electricity requirement of the ML is met by drawing private feeder lines from this substation. The power is utilized only for the purposes of pumping out the pit water. The lessee is also maintaining pucca structures for office, First aid station and shelters

   Thus the ML area can be considered and provided with all man power, infrastructure and other services.

7. The Manganese ore occurring in the area is found to be good quality and is continued to get good response in the domestic as well as International market in the market scenario. The mining operation has positive impact on the socio economic of the local population. The small scale mining operation in the ML has no effect on the ecology and surrounding environment of the ML area. All the statutory provisions with regards to mining, labour and other taxations have been meticulously implemented since inception of the mining operations. At no point of time any statutory agency or any court has given any adverse directions.

   In view of the above the second digit of Feasibility axis can be assigned as **'1'**

B. Geological Axis

1) A detailed exploration where in the ML area has been mapped on a scale of 1:2000 covering the length and breadth of the ML area (Refer Plate – III Surface Geological plan).

2) A total of 34 exploratory boreholes (Auger holes) with a cumulative meterage of 339.34m had been carried out. During the preceding Scheme period 4 DTH holes with a total meterage of 63.7m were drilled and three deep trial pits were sunk (for details see Litho logs-Annexure IV C and Plate V-Geological cross sections where the Borehole intercepts are projected. Further in the year 2014, Core Boreholes have been drilled. The samples so obtained at a 1m interval from the Boreholes were subjected for chemical analysis for radicals namely Mn, Fe, Sio_2,Al and P(refer Annexure – IVA)

3) The samples so obtained from the Boreholes were composited and subjected for chemical analysis for radicals namely Mn, Fe, Sio_2,Al and P (refer Annexure – IX C)

   In view of the above the third digit of Geological axis can be assigned as **'1'.** Thepossible Mineral resource (333): The ore zone exposed in the pit and in the absence of exploratory data in such ore zone to a depth of 8m has been considered to be possible category with the UNFC codification of (333).

   Considering the above parameters and justification of UNFC system, the Reserve/resource estimation has been done by Cross Sectional method. The details of estimation have been furnished vide Annexure- . The abstract of the reserve/resource is as below:

C. *Grade*

Total 5 core samples of manganese ore from Boreholes Cores are being collected .These samples have been labeled as Sample-1,2 (Borehole no.1), Sample-3 (Borehole no.2), Sample-4 & 5 ((Borehole no.3) were collected for assessment of the grade. The grade of this as follows:

Table -2

Classification	Code	Quantity (Tonnes)	Grade (Mn %)
-1	-2	-3	-4
Total Mineral Resources (A+B)		**5,65,082**	
A. Mineral Reserve			
(1) Proved Mineral Reserve	111	**3,90,222**	
(2) Probable mineral reserve	122		Mn – 12.38 to 40.28
B. Remaining Resources			Fe – 6.93 to 17.31
(3) Feasibility Mineral Resource	211		SiO_2 – 2.58 to 30.79
(4) Pre-feasibility Mineral Resource	221 & 222	-	P – 0.14 to 1.75
(5) Measured Mineral Resource	331	-	
(6) Indicated Mineral Resource	332	-	
(7) Inferred Mineral Resource	333	**1,74,860**	
(8) Reconnaissance Mineral Resource	334		
		5,65,082	

Radical	Grade in %
Mn%	14.43- 37.32
Fe%	8.3- 13.74

Table-3

Depending upon the degree of exploration and the geometry of the ore body as exposed in different sections of the mine and the results of core drill holes, the Geological axis has been demarcated and the Tonnages available up to the intercept of the drill holes have been placed under G1 area and the reserve estimated based on the delineation of such G1 area is placed under proved category in terms of other axes like Feasibility as 1 and Economic axis as 1 since the market for such ore from the mine is established and the reserve so obtained is placed under proved category of **111 of UNFC** and the remaining as discussed were placed under G3.The reserves estimated under UNFC are furnished in table 3.

V. UNFC CLASSIFICATION OF RESERVES AND RESOURCES

A. Mining

i) The existing method of mining is opencast method of mining for winning of Manganese. The Mining operations fall under A-other than fully mechanized category. Mining done so far resulted in breaking of the 3.32 ha lease hold. There were 2 pits in the lease area which was merged into a single pit and the present mining is going in the merged pit. The ore being soft and friable, no drilling and blasting is required. Simple implements are used for digging the ore to avoid contamination of clayey material with the ore. The pit reached an average depth of about 26 m from the surface.

ii) Proposed Method of mining: Development and production will go hand in hand as practice in vogue by continuing the opencast method of mining involving removal of overburden and keeping overburden benches well in advance of ore benches to prevent contamination of ore. The removal and handling of overburden done by deploying hydraulic excavator in conjunction with set of tippers and this shall be deployed for a limited period in a year. The removal of ore and excavation of the overburden in juxtaposition of the ore zone is done by manual means only as a precautionary measure against contamination of ore. The ore loading into the tippers is also purely manual. Requisite pumping capacity is provided along with suitable sumps and coursing drains to facilitate the mining operations. The height of over burden

benches shall be 3m, with a width more than the height which will be developed by machinery. The ore benches shall not exceed 1.5m height and width of more than 1.5m for stability and safety.

iii) Working of deposit with design parameters. The mining activities will be essentially in the pit where the manganese ore is exposed. Development of the over burden/side burden benches shall be formed by deploying machinery. The benches in overburden shall be of 3m height and width of 3- 5m. The benches in ore shall be formed manually with 1.5m height & width. As the manganese ore is soft and friable, no blasting is required. This is being the practice in the past and also present. The water that is encountered in the pit shall bail out by deploying suitable pumps.

B. Open Cast Mining

i) Mode of Workings: Opencast method of mining will be continued to win Manganese ore by semi mechanised method. The development shall be carried out by excavator with combination of tippers. The benches in overburden shall be of 3m height and width of 3-5m. The benches in ore shall be formed manually with 1.5m height & width. As the manganese ore is soft and friable, no blasting is required. The ore produced is screened and sorted for up gradation.

VI. ENVIRONMENTAL MANAGEMENT PLAN

A) Baseline Information

i) **Existing land use Pattern**: The subject area is a private patta land it is being used for mining. The details of exiting land use pattern as on date is given below.

a)	Area covered by pits (Pits: 1)	3.2965 Ha.
b)	Area covered by dumps (Dumps: 1)	1.2085 Ha.
c)	Area covered by ore stack yard	0.1327 Ha.
d)	Area covered by roads	0.5321 Ha.
e)	Area covered by site services	0.0156 Ha.
f)	Area covered by plantation	10.426 Ha.
g)	Area covered by storage topsoil	0.0834 Ha.
	Total	**15.6948 Ha.**

Table. 4

ii) **Water Regime:** Generally the ground water table in this locality is below 20m from the ground level. The pit has gained a depth of 25-30m. The rainwater on surface flows through the slopes and drains out the lease area. The water accumulates due to seepage in the pit is being bailed out by deploying a 15Hp pump.

iii) **Flora and Fauna:** The subject area is a palm oil garden. There is no report of existence of wild animals in this region.

iv) **Quality of Air, Water and Ambient Noise Level:** The subject area is away from industries. There is no scope of air, water & sound pollution by industries. The environmental aspects are being monitored regularly and seasonally by an environmental laboratory. As such the portability of water & air are fresh and unpolluted in this area. The environmental monitoring stations are shown in the Environmental Management Plan i.e. Plate –

v) **Climatic Conditions:** The area has a tropical climate. The peak summer will be in the month of May. Highest temperature of 45oC is recorded in this area during the month of May and the lowest temperature of 16oC is recorded in the month of January. The rainfall in this area is about 1500-2000mm.

vi) **Human Settlement**: The following villages are located within 5km radius of the mining lease area. The population and direction of the villages with respect to applied area are given in the following table.

Name of the Village	Population	Direction
Garividi	11450	E
Sadanandapuram	2500	SE
Devada	1800	SE
Chukkapeta	1700	SW
Vijayarampuram	2150	E
Tatiguda	850	NW
Penubarthi	926	SW
Nallalavalasa	750	S

Table. 5

vii) **Public Building, Places of Worship and Monuments:** There are no Public Building, places of workshop and Monuments within or near by the area.

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pH of Raw Oysters *(Crassostrea iredalei)* in Capiz, Philippines

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Abstract- This study was conducted at Mambusao, Capiz, Philippines, at DOST-VI, Iloilo Philippines last September 2011 to determine the pH value of raw oyster samples from selected outlets in Capiz. Raw oyster samples from Sapian, Ivisan and Roxas City outlets of Capiz were bought, extracted from its shell and frozen last September 6,13,20 and 27, 2011 and were then transported and subjected to pH analysis at Department of Science and Technology, Region VI Laboratory last September 7,14 ,21 and 28, 2011. The pH of raw oyster meat samples are within the microbial growth range for salmonella spp, staphylococcus aureus and Escherichia coli.

Index Terms- Raw Oysters, pH, Philippines

I. INTRODUCTION

Seafood has traditionally been a popular part of the diet in many parts of the world and in some counties constituted the main supply of animal protein (FAO, 1994). In the Philippines, oyster (Crassostrea iredalei) is one of the famous seafood . There are at least 20 known provinces in the Philippines with established growing areas for shellfish. Province of Capiz is one of them specifically from the Sapian and Ivisan Bay.

However, oyster is a filter feeding bivalve molluscan shellfish wherein accumulation and concentration of bacteria and viruses from the environment is generally taking place (FAO, 1994). Bivalve molluscan shellfish are filter feeders, extracting marine algae, bacteria and nutrients from surrounding waters. Because of this, they are prone to contamination from the growing environment. Some pathogenic bacteria, especially Vibrio spp. are endogenous to aquatic environments and can survive and grow in oysters, presenting a risk to health if ingested (NSW Food Authority, 2009).

In the Philippines, oysters are known to be of poor sanitary quality. The report on quality has remained significant compared to the total exports in the world market, thus, they are usually distributed locally. Measures have not been adopted to ensure safety and wholesomeness of the shellfish products (SRDC, 1991 as cited by Miguel, 2000).

Oyster (Crassostrea iredalei) in Ivisan and Sapian Bay, Capiz, Philippines was collected and studied last September to December 2007 and was found to contain parasites such as Nematopsis sp. as the most prevalent parasite (71.33% and 65.0%) at 2 sites with a moderate intensity of infection. Tylocephalum sp. cestode was found in the connective tissue around the digestive gland, with a prevalence of 60% and 52.3% in 2 sites, with a moderate intensity of infection. Digenean trematodes had a 37.80% prevalence at site 1 and a 22.45% prevalence at site 2. Ciliates were also observed with a prevalence of 18.75% (site 1) and 13% (site 2). The observed infection of oysters had no apparent effect on oyster production at these sites maybe due to low infestation levels or to the fact that the parasites have no pathological effect. (Erazo-Pagador, 2010).Raw oysters from outlets of Calumpang(Iloilo City,Philippines), Arevalo (Iloilo City,Philippines) and Miag-ao (Iloilo,Philippines) showed presence of salmonella spp, vibrio sp. and staphylococcus aureus in all samples. The pH of raw oyster ranges from 6.10 to 6.37 (Miguel, 2000).

Generally, in the Philippine setting, oysters from cultivation area are transported to outlets where it is sold in wholesale or retail basis before they are brought to public markets or restaurants, "carinderias", and even in the outlets or "talabahan". Oysters are consumed then as uncooked or partially cooked in which fresh oysters could be a potential vehicle of foodborne illnesses.

This study might provide baseline information to provide a link between the pH and future microbiological as well as physico-chemical studies related to fresh oyster in the Philippines.

II. RESEARCH ELABORATIONS

Materials included the raw oyster meat samples, oyster knife, thermochase, ice, water, face mask, laboratory gown, thermometer, sterile plastic bags, 70% isopropyl alcohol, weighing scale, water containers and Lysol.

For the collection and transportation of samples, raw oysters were bought from the outlets of Ivisan (A), Roxas City (B) and Sapian (C) bays and were immediately transferred to Science laboratory building, Capiz State University,Poblacion Mambusao Campus. All samples were then opened immediately in that area on the day the samples were collected. From each source, 60 to 70 pieces of collected raw oysters were kept in clean sterile plastic bag that was placed in a bowl filled with ice (at a temperature of below 5^{o}C). Each set of samples was labeled, carefully sealed and handled in order to prevent breakage of plastic bag and possible contamination of the sample.

For preparation for sample examination, proper sanitation and disinfection was observed before the preparation of the sample. Masks and laboratory gowns were then worn by the extractors. Any growth and loose materials from raw shell stock was scrapped off and washed under running water. The cleaned shell stock was drained after. Before removal of shell contents, the hands of the examiner was scrubbed thoroughly with soap and water and rinsed with 70% alcohol. The shell was opened with a knife and the meat obtained was quickly collected in

sterile plastic container and immersed in a bowl with crushed ice. After a 500 grams of raw oyster, was obtained, the sterile plastic container was immediately sealed and placed in freezer in order to be ready for transporting of the samples the next day at the at. pH analysis of oyster samples was done using Electrometric method conducted at Department of Science and Technology, Iloilo City, Philippines.

For statistical analysis, mean was used to determine the pH present in raw oysters at every sampling period at different outlets.

III. RESULT OR FINDING

Table 1. Ph value of raw oyster samples from Selected Outlets in Capiz,Philippines

Period of Sampling	Sources		
	Ivisan	Roxas City	Sapian
Sept.6,2011	5.89	5.83	5.94
Sept.13,2011	5.93	5.88	5.70
Sept.20,2011	6.08	5.96	6.02
Sept.27,2011	5.94	5.88	5.81
Mean	5.96	5.89	5.87
	**Ph Growth Range of Some Pathogenic Bacteria (Jay, 1986).		
	Pathogens		Ph Range
	Salmonella spp		4.5 to 9.0
	Staphylococcus Aureus		2.6 to 10.0
	Vibrio cholera		6.0 to 9.6
	Vibrio parahaemolyticus		5.0 to 9.6
	Escherichia coli		4.6 to 9.5

The ph of raw oyster ranges from 5.07 to 6.08. The ph of raw oyster from the three outlets are within the pH growth range of salmonella spp, staphylococcus aureus, Vibrio parahaemolyticus and Escherichia coli.

IV. CONCLUSION

The pH of raw oyster meat samples are within the microbial growth range for salmonella spp, staphylococcus aureus, Vibrio parahaemolyticus and Escherichia coli.

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A study on the Emotional Intelligence Levels of the urban students and rural students – with special reference to SVIM

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Abstract- Education is illumination. It plays extremely significant role in the lives of individuals by empowering them with various abilities, skills, competencies, and thus paving way for enhancing the quality of life.

The students come from various backgrounds such as rural and urban regions. The students undergo a lot of pressure to with stand today's competition, mainly at the moment of their establishment stage in career. In order to cope up with the stress and pressure of today's competitive world, the students should have a balance in their emotional stability. Emotional Intelligence is a type of intelligence that has been heavily studied in social sciences, psychology and business sector, but not in educational arena.

The present study helps us to know about the emotional intelligence levels of students in the post graduation specifically the students coming from rural and urban regions. It is a comparative study of emotional intelligence levels of students belonging to rural and urban backgrounds, so that it is helpful to assess the student's emotionality, well-being, sociability and self control. By this which back ground students can easily cope up with the today's competition in the market can be identified which will help the faculties to have much concentration on the students depending on their backgrounds. Along with this the impact of EI on their academic performance is also studied .so that it will be helpful for the faculties to develop the EI along with their academic performance.

I. INTRODUCTION

The 21st century has brought with it a new workplace with highly competitive environment, one in which everyone must adapt to a rapidly changing society with constantly shifting demands and opportunities.

The economy has become global which is driven by innovations and technology and Organizations have to transform themselves to serve new customer expectations. Today' economy is dramatically very uncertain with challenging opportunities. It is based on skill knowledge and performance driven. To be a successful leader the present scenario demands respect, participation, empowerment, teamwork and self management. With the above challenges a new kind of leader is needed to guide business through turbulence. Today's Managers in their organizations do this task.

A manager is someone who coordinates and oversees the work of other people so that organizational goals can be accomplished. It is not about personal achievement but helping others do their job. Managers may also have additional work duties not related to coordinating the work of others. All the above have to be inculcated from the student stage through the education. Education plays a major role in the success of human in each and every aspect of the discipline. Education provides the platform to each and every student to enhance their skills, prepare them physically, and develop their confidence levels. The students come from various back grounds like rural & urban. The students at this stage feel lots of problems like lack of communication skills, stage fear, not able to cope up with the faculties, lack of participative nature etc., incorporating social and emotional learning programs into colleges can be challenging, as programs must address a variety of topics in order to be successful.

Emotional intelligence quotient, or EQ, is the new term which is being used more and more in the human resources departments and it is also making its journey towards the executive board rooms. This article will give essential information on what EQ is how it is different from personality, and how it has proven to impact the rural and urban students in their academic performance.

Emotional Intelligence (EQ) is the emerging concept. There is a controversial question arising from many researchers whether the EI can be learned and taught and whether this EI will help the students' to succeed in school and in life.

EI is the concept which is very practical in nature and seems to be very essential for the development of the human life. The researchers still believe in the philosophy that intelligence and success are proportional to one another but now they are not viewed in the same way. The results of the students are not because of the deviations from the basics. The present day focus the success of the student not only on their reasoning capacities as well on the self awareness, emotions, and interpersonal skills.

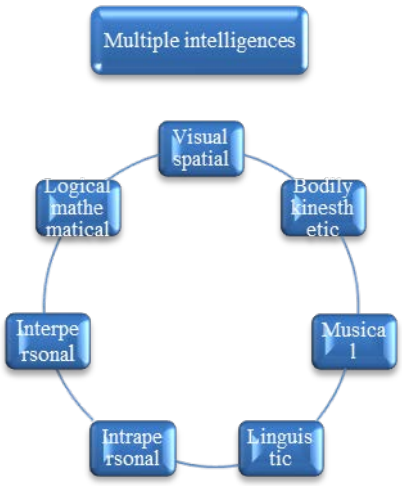
In the last two decades, Multiple Intelligences theory was introduced by Howard Gardner in 1983 and the Emotional Intelligence theory by Bar-On in 1988, Mayer and Salovey in 1990, and Goleman in 1995. This theory of emotional intelligence gave a new aspect that the intelligence quotient(IQ) is not the only measure for success. Emotional intelligence is the tamper of projections with the view point of education which brings out the best in students not only just in academic achievement. It specifies that the EQ competencies are needed to enhance the personal skills leading to success in academics. The students who are excellent academically seem that the education system has not provided them the subjects to lead their life happily and to shape them productive citizens. According to this

theory learning the skills which are necessary to function effectively in life are more important than achieving academically. Many of the EQ idealists believe that the students who achieve academically have not yet developed their emotional intelligence and are not likely able to achieve their full capacity. The students do perform well unless and until they are engaged in developing their emotions, learning styles, personality and motivation.

II. Emotional Intelligence And Its Origins

The areas of interest which have been studied throughout the human history and found to be recursive are Human intelligence and logical thought. There were many various interpretations of these concepts (Mayer, Roberts, & Barsade, 2008). Taking into account the changing nature of these two concepts, the current definition of intelligence is "a mental ability (or set of mental abilities) that permits the recognition, learning memory for, and capacity to reason about a particular form of information" (Mayer, Roberts, & Barsade, 2008; p.509). There is no one single and unitary form of intelligence (Goleman, 1995), but a series of them, and part of these intelligences focuses on the way individuals see emotions and how they react to them; this is at the core interest of EQ (Mersino, 2007).

In 1920's the basic concept behind the EQ were developed by Eduard Thorndike while he was working with social intelligences; as an predecessor to the comprehensive idea of intelligence (McEnrue, Groves, & Shen, 2007;Dulewicz, Higgs, & Slaski, 2003). The social intelligence definition given by Thorndike (1920) was as "the ability to understand men and women, boys and girls – to act wisely in human relations".
These were the initial steps which paved the way for evolution of EQ. Thorndike did not create any theoretical concept of social intelligence; he used this as an illustration to reveal that the intelligence can be exposed in different ways. The idea of multiple intelligences was further developed by Gardner in 1980's.from the educational perspective he identified seven components to intelligence:



A. *What Is Emotional Intelligence*?

EQ is defined as a set of competencies demonstrating the ability one has to recognize his or her behaviours, moods, and impulses, and to manage them best according to the situation. Typically, "emotional intelligence" is considered to involve emotional empathy; attention to, and discrimination of one's emotions; accurate recognition of one's own and others' moods; mood management or control over emotions; response with appropriate (adaptive) emotions and behaviours in various life situations (especially to stress and difficult situations); and balancing of honest expression of emotions against courtesy, consideration, and respect (i.e., possession of good social skills and communication skills). EQ is something which helps the people's to think or have a better choice than the other in making the appropriate judgement.

B. *How Is EQ Different from Personality*?

In psychology, personality refers to the attributes, ideas, skills, talents competencies and behaviour patterns unique to an individual. Personality refers to one's tendencies, such as a penchant for introversion or extroversion. Intelligence quotient can envisage EQ but the personality cannot do it. Nevertheless, EQ can identify both the prejudice and lucidity in one's thinking pattern allowing him to take perfect decisions, personality deals only with the individual behaviours.

C. EQ Competencies leading to Success

Apart from the technical skills, cognitive skills and standard personality traits there are five emotional intelligence competencies that contribute to the success of individuals in the workplace:

1. Intuition and empathy
2. Political acumen and social skills
3. Self-awareness
4. Self-regulation
5. Self-expectations and motivations

*1).Intuition and empathy***:** This deals in knowing about other's feelings, requirements and concerns. This competency plays important role in the workplace due to the following reasons:

- Knowing and understanding others' feelings and perspectives
- To recognize and meet the requirements of customer's
- To know about what others need in order to develop and helping them in their growth
- Humanising opportunities with diverse people.

*2).Political Acumen and Social Skills***:** This deals in expertness of stirring up of desired responses in others. It is important in the work place due to the following reasons:

- To influence by using tactics and techniques in attaining desired results
- To communicate effectively by giving clear and convincing messages
- To inspire and direct the individuals
- To negotiate and resolve the conflicts
- To enhance the interpersonal relationships for the success of business
- To create synergy in pursuing collective goals.

*3).Self-Awareness***:** This deals in knowing about one self. It is important in the workplace for the following reasons:

- To know about one's own emotions and impact on others.
- To know about one's strengths and confines
- To know about self-worthiness and capabilities.

*4).Self-Regulation***:** This deals in knowing how to control and manage one's own emotions. It is important in the work place for the following reasons:

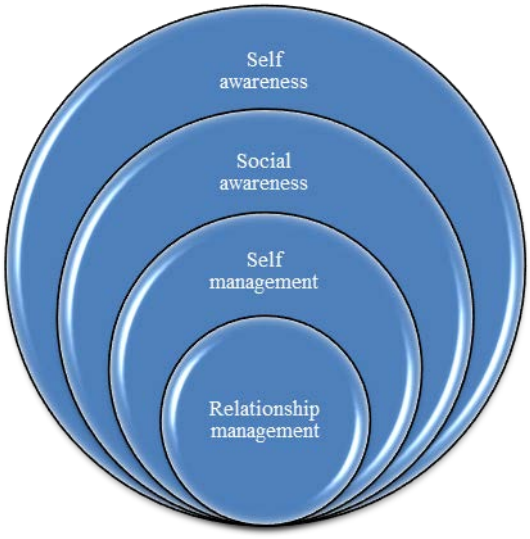
- To manage disruptive emotions
- To maintain honesty and integrity
- To have dynamism in handling change
- To take-up responsibility and accountability
- To inculcate innovativeness

5).Self-Expectations and Motivation: this deals in knowing the Emotional tendencies that help in reaching goals. It is important in the workplace for the following reasons:

- To drive ourselves towards the standard of excellence.
- To be committed towards the organisation
- To take up the initiation to act on the opportunities
- To be optimistic in nature in the achievement of goals

D. *Goleman's in his first book he identified five domains of EQ*:

- Knowing your emotions
- Managing your own emotions
- Motivating your self
- Recognising and understanding others emotions
- Managing relationships
-



Goleman (1999) wrote, "Evidence suggests that emotionally intelligent leadership is key to creating a working climate that nurtures employees and encourages them to give their best.

E. Various definitions for Emotional Intelligence

Presently this concept is widely used in the academic world. There is some controversy regarding the actual conceptualization of EQ. This controversy has given the definition of EQ into conflicting theories (Giorgi, 2013; Silong, et al. 2012; Rosete & Ciarrochi, 2005):

- EQ as mixed model – In which EQ firmly sticks to mental abilities with other personal attributes, describing it as a "non-cognitive intelligence". This conceptualization is mainly supported by academics such as Bar-On and Goleman.
- EQ as an ability based model –in which EQ is identified as standard intelligence similar to that of Cognitive intelligence (i.e. IQ) and is supported by academics such as Salovey and Mayer.

1). The Mixed Model

Mersino (2007) and especially Bar-On (2006) have given similar definitions in the case of the latter, Bar-On cites the Encyclopedia of Applied Psychology which identifies the following conceptual layouts:

The Goleman model classifies EQ as a sequence with varied competencies that enhances managerial performance; defining it as "the abilities to recognize and regulate emotions in ourselves and in others." (Goleman & Cherniss, 2001 p.2).

According to Bar-On (2006) EQ is measured through multi-rates assessment methods.

The Bar-on model, defined as a model that describes "a cross-section of interrelated emotional and social competencies, skills and facilitators that impact intelligent behaviour, measured by self-report within a potentially expandable multi-modal approach including interview and multi-ratter assessment" (Bar-On, 2006, p.2)

2).The Ability Model

The other definition of EQ which is supported by Salovey and Mayer is defined as "the ability to monitor ones and other's feelings and emotions, to discriminate among them and to use this information to guide one's thinking and action" (Salovey and Mayer, 1990, p.189). This is the definition which is supported and accepted by most academicians, even Goleman and Bar-on, since it does not get in the way with their model.

F. Critiques to Emotional Intelligence and Due Diligence

EQ is an excellent tool which can be applied to any sort of business solutions to attain much maximum benefits. To apply it meticulously in reality we should also know about the critics of EQ.There are many criticisms to EQ.

Some of the sceptics do not believe in the conceptualization of EQ as a valid form of intelligence because there is no term which clearly defines EQ as a valid form of intelligence.

Not even scientific evidence is provided by the authors supporting the idea of EQ as a form of intelligence.

Generally we use self report and 360 degree test for measuring. Because of the nature of EQ it is measured on self descriptions, where the individual has a chance of giving over positive description which may lead to wrong interpretations. Even then this can be avoided by giving sufficient anonymous testing and confidentiality to test subjects.

From the above discussion it is clear that the EQ has significant amount of criticism.

III. Review of Literature

G. Studies conducted Abroad

Farooq in 2003 studied the effect of emotional intelligence on academic performance of 246 adolescent students. His analysis reports reveal that the students with high level of emotional intelligence perform well comparatively with that of the students having low level of emotional intelligence.

Drago in 2004 investigated the relationship between emotional intelligence and academic achievement in non-traditional college students. As the students have different cognitive abilities, the role of emotional intelligence can be better understood in their academic achievement. His analysed that emotional intelligence was significantly related with the students GPA, cognitive abilities and age.

Parker and others in 2005 examined the impact of emotional intelligence on the successful transition from high school level to university level. The results of their study revealed that academically successful students had tremendous higher levels of several different emotional and social competencies. From this study they identified the importance of emotional intelligence in the successful transition of students from high school to university.

Mestre and others in 2006 conducted a survey on 127 Spanish adolescents, the ability to understand and manage emotions, analysed by a performance measure of emotional intelligence (the MSCEIT), and correlated positively with teacher ratings of academic achievement and adaptation for both males and females. The study revealed that the emotional abilities are positively correlated among the females with peer friendship nominations and also found that EI is positively associated with teacher ratings of academic adaptation among boys and peer friendship nominations among girls.

Tamannaifar and others in 2010 examined 6,050 students at the University of Kashan to identify the relationship between emotional intelligence, self-concept and self esteem with academic achievement. The sample of students was randomly chosen. The result of the study was that emotional intelligence, self concept and esteem of the students was positively associated with their academic achievement.

Yahaya and others in 2011 studied the relationship between the five dimensions of emotional intelligence i.e., self awareness, emotional management, self-motivation, empathy, interpersonal skills and academic performance. The report revealed that there is significant relationship between self-awareness, emotional management and empathy with academic performance.

Studies conducted in India:

Malekari and Mohanty, in 2011 has conducted a study and viewed that how Emotional intelligence have important clinical and therapeutic implications as it is emerged from an amalgamation of research findings on how people appraise, communicate and use emotions.

Zeidner and others in 2004 has pointed out that there hasn't been sufficient research to clearly know the impact of Emotional intelligence on the academic success.

Kattekar (2010) conducted a survey on 500 IX standard students of Kannada language to know the impact of emotional intelligence on the academic achievement. His interpretations revealed that a positive relationship exist between emotional intelligence and academic achievement of students.

Bai in 2011 examined the anxiety proneness and emotional intelligence in relation to the academic achievement of pre-university students. The study is exploratory, the performance of the students in the examination was considered very seriously to study the influence of anxiety proneness and emotional intelligence on their academic achievement. He involved 500 students belonging to Bangalore urban and rural areas from various education streams like science, arts and commerce. His analysis reported that there was significant difference in academic achievement and emotional intelligence.

IV. Statement of the Research Problem

An exhaustive review of related literature on emotional intelligence and academic achievement of students has been conducted in order to evolve a research study. The problem for research was based on the following research questions:

(i) Does emotional intelligence affect academic performance of?

(ii)Do the students from different backgrounds differ significantly in their emotional intelligence and academic achievement?

The major objectives of the study are as follows:

- To study the emotional intelligence levels of urban & rural students.
- To study the relationship between emotional intelligence and academic performance.
- To study the implications & recommend for developing the emotional intelligence in students at PG level

V. Research Methodology

Research in common parlance refers to a search for knowledge. Once can also define research as a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation.

A. Population and Sample Characteristics

The target population for the present study is the students in **Sree Vidyanikethan Institute of Management** having rural & urban students. From the target population a sample of 78 students is being selected (34 rural & 44 Urban).

B. The parameters used for evaluating the EI levels of students are

- Emotionality
- Well- being
- Self-control
- Sociability

The criteria for measuring the academic performance of students is being calculated by using the percentage secured in 10^{th}, 12^{th} & UG.

C. The following hypothesis is framed:

Hypothesis$_o$ 1 -There is no significant difference between urban and rural students on the scores of Emotional Intelligence.

Hypothesis$_o$ 2 – Emotional Intelligence is positively associated with academic performance of students measured with the percentages secured in 10th, 12th & UG.

VI. Data Analysis And Discussion

For this study, I used the survey method for the collection of data. The questionnaire is designed and data is collected from SVIM students of I year MBA. Simple Random sampling technique is used. After the collection the data, data was filtered from typo errors and missing values. After the analysis, the conclusion remarks and recommendations are given.

The study analysis has been done by using the SPSS. The questionnaire has been tested for Cronbach's alpha reliability test. Cronbach's alpha is the most commonly used measure the internal consistency ("reliability") of the questionnaire. It is most commonly used when when we apply multiple Likert questions in the survey.The questionnaire has been found to be reliable.

TABLE I
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.486	.766	36

TABLE II
Item Statistics

	Mean	Std. Deviation	N
Region	1.5641	.49908	78
GPA	70.7587	8.31973	78
I can express my emotions with words freely	3.7308	.89258	78
I don't find difficulty in showing my affection to those who are close to me	4.1795	.90802	78
I can understand things from others point of view	4.0256	.82138	78
I am empathetic in nature	3.9359	.79511	78
I am self motive person	4.3974	.82713	78
I can acquaintance well with those who are close to me	4.3718	.82350	78
I usually stop and sense about my feelings	3.9359	.82713	78
I am familiar with the situations that elicit, my own emotions	3.5513	.84742	78
I Know how own feelings blow own act	4.1538	.83863	78
I regularly alter my life according to the conditions	4.1410	.73369	78
It is simple for me to keep myself stimulated	4.2436	.91433	78
I am active, I can admit new environment	4.3462	.77000	78
I trust I am full of personal potentiality	4.0000	.93974	78
I have a dim perception on many of the aspects	3.4872	.90802	78
I don't find life is pleasurable	3.3974	1.26224	78
I feel certain to work without the need for direct regulation	3.5128	.84889	78
I consider myself to be one among the most competent for a job and likely to be successful	4.2821	.71890	78
I speak out for a course of deeds I suppose in even when others disagree	3.8077	.89816	78
I act tranquilly in traumatic situations	3.8590	1.22447	78
I come across difficulty to control my opinions	2.3846	1.13081	78
I'm typically able to find ways to manage my emotions when I want to emotions when I want to	3.9744	.86751	78
I have a propensity to change my mind often	2.2436	1.05911	78
I would like to get out of effects which I have caught up in them earlier	2.3718	.99491	78
Finally I am talented to pact with the tension	3.7564	.92842	78
Others think highly of me for being cool and tranquil	3.8590	.94970	78
I forecast obstacles to a purpose in order to conquer them	3.9872	.91869	78
I have a tendency to step back in many situations even I know that I am true	2.6410	1.28906	78
ultimately I am a good diplomat	3.8462	.95451	78
I can knob successfully with the people	4.1538	.79081	78
I repeatedly stand up for my privileges	4.2179	.78372	78
I frequently sway the other people	3.5513	.98887	78
I articulate optimistic expectations about others potential	4.3077	.81077	78
I give instructions or demonstrations to grow others	4.0256	.75549	78
I distinguish specific strengths or development chances in others	4.1154	.78923	78

TABLE III
Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Region	199.5536	184.71	.068	.414	.484
GPA	130.3590	106.20	.061	.424	.750
I can express my emotions with words freely	197.3869	182.91	.090	.413	.482
I don't find difficulty in showing my affection to those who are close to me	196.9382	182.78	.093	.485	.482
I can understand things from others point of view	197.0921	183.68	.068	.639	.484
I am empathetic in nature	197.1818	183.09	.100	.636	.482
I am self motive person	196.7203	175.92	.423	.616	.460
I can acquaintance well with those who are close to me	196.7459	177.52	.350	.551	.465
I usually stop and sense about my feelings	197.1818	181.93	.146	.621	.478
I am familiar with the situations that	197.5664	182.40	.121	.537	.480
I Know how own feelings blow own act	196.9638	179.52	.252	.541	.471
I regularly alter my life according to the conditions	196.9767	179.07	.319	.561	.469
It is simple for me to keep myself stimulated	196.8741	172.26	.533	.759	.448
I am active, I can admit new environment	196.7715	177.47	.381	.722	.464
I trust I am full of personal potentiality	197.1177	174.67	.416	.603	.457
I have a dim perception on many of the	197.6305	183.50	.063	.583	.484
I don't find life is pleasurable	197.7203	175.04	.277	.692	.462
I feel certain to work without the need for direct	197.6049	187.08	-.083	.539	.494
I consider myself to be one among the most competent for a job and likely to be successful	196.8356	178.25	.371	.554	.466
I speak out for a course of deeds I suppose in even when others	197.3100	173.54	.487	.628	.453
I act tranquilly in traumatic situations	197.2587	179.676	.143	.541	.476
I come across difficulty to control my opinions	198.7331	178.83	.191	.502	.472
I'm typically able to find ways to manage my emotions when I want to emotions when I want to	197.1433	184.20	.039	.463	.486
I have a propensity to change my mind often	198.8741	183.86	.031	.645	.487
I would like to get out of effects which I have caught up in them earlier	198.7459	188.35	-.127	.556	.499
Finally I am talented to pact with the tension	197.3613	182.60	.096	.539	.481
Others think highly of me for being cool and tranquil	197.2587	182.36	.102	.489	.481
I forecast obstacles to a purpose in order to conquer them	197.1305	173.78	.465	.670	.454
I have a tendency to step back in many situations even I know that I am true	198.4767	184.87	-.019	.513	.493
ultimately I am a good diplomat	197.2715	183.15	.070	.550	.483
I can knob successfully with the people	196.9638	178.18	.335	.583	.466
I repeatedly stand up for my privileges	196.8997	174.93	.499	.645	.456

I frequently sway the other people	197.5664	177.48	.282	.595	.466
I articulate optimistic expectations about others potential	196.8100	182.98	.102	.465	.481
I give instructions or demonstrations to grow others	197.0921	182.94	.116	.561	.481
I distinguish specific strengths or development chances in others	197.0023	178.28	.331	.683	.467

From above table the cronbach's alpha value is 0.486 and the standard value is 0.766. Just observe the column values of Cronbach's alpha if deleted. All the item variables i.e., 36 seem to be reliable that is they are very nearer to the specified values.

Normality Test

The **normality test** has been conducted. The normality test is required to consider for validation of data presented in the literature as it shows whether correct statistical tests have been used. The following are the results. The items very found to be normally distributed. The sample of one question related to skewness and kurtosis is given below:

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TABLE IV
Descriptives

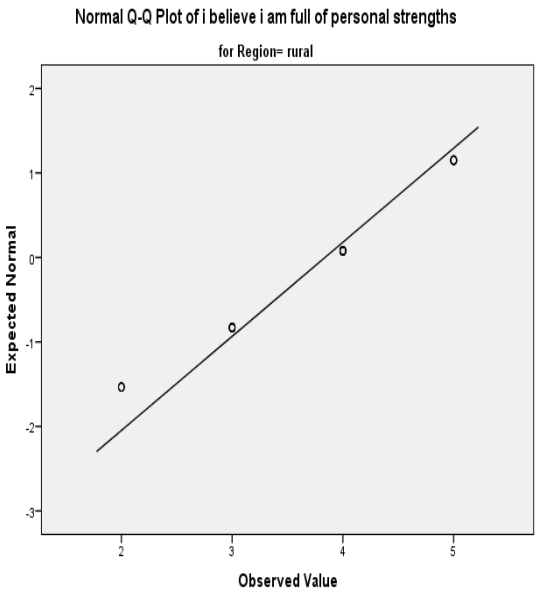
	Region			Statistic	Std. Error
I can express my emotions with words freely	rural	Mean		3.6129	.16512
		95% Confidence Interval for Mean	Lower Bound	3.2757	
			Upper Bound	3.9501	
		5% Trimmed Mean		3.6254	
		Median		4.0000	
		Variance		.845	
		Std. Deviation		.91933	
		Minimum		2.00	
		Maximum		5.00	
		Range		3.00	
		Interquartile Range		1.00	
		Skewness		-.218	.421
		Kurtosis		-.638	.821
I can express my emotions with words freely	urban	Mean		3.7727	.12950
		95% Confidence Interval for Mean	Lower Bound	3.5116	
			Upper Bound	4.0339	
		5% Trimmed Mean		3.8030	
		Median		4.0000	
		Variance		.738	
		Std. Deviation		.85898	
		Minimum		2.00	
		Maximum		5.00	
		Range		3.00	
		Interquartile Range		1.00	
		Skewness		-.456	.357
		Kurtosis		-.212	.702

TABLE V
Tests Of Normality

	Region	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
I can express my emotions with words freely	rural	.244	31	.000	.879	31	.002
	urban	.286	44	.000	.856	44	.000
I don't find difficulty in showing my affection to those who are close to me	rural	.316	31	.000	.774	31	.000
	urban	.265	44	.000	.787	44	.000
I can understand things from others point of view	rural	.415	31	.000	.675	31	.000
	urban	.295	44	.000	.817	44	.000
I am empathetic in nature	rural	.211	31	.001	.809	31	.000
	urban	.283	44	.000	.819	44	.000
I am self motive person	rural	.294	31	.000	.768	31	.000
	urban	.353	44	.000	.692	44	.000
I can acquaintance well with those who are close to me	rural	.311	31	.000	.777	31	.000
	urban	.364	44	.000	.710	44	.000
I usually stop and sense about my feelings	rural	.354	31	.000	.764	31	.000
	urban	.269	44	.000	.852	44	.000
I am familiar with the situations that elicit, my own emotions	rural	.305	31	.000	.837	31	.000
	urban	.249	44	.000	.875	44	.000
I Know how own feelings blow own act	rural	.257	31	.000	.816	31	.000
	urban	.245	44	.000	.816	44	.000
I regularly alter my life according to the conditions	rural	.274	31	.000	.841	31	.000
	urban	.256	44	.000	.787	44	.000
It is simple for me to keep myself stimulated	rural	.251	31	.000	.796	31	.000
	urban	.293	44	.000	.748	44	.000
I am active, I can	rural	.234	31	.000	.824	31	.000

admit new environment	urban	.341	44	.000	.708	44	.000
I trust I am full of personal potentiality	rural	.281	31	.000	.854	31	.001
	urban	.259	44	.000	.792	44	.000
I have a dim perception on many of the aspects	rural	.283	31	.000	.863	31	.001
	urban	.279	44	.000	.843	44	.000
I don't find life is pleasurable	rural	.218	31	.001	.899	31	.007
	urban	.256	44	.000	.866	44	.000
I feel certain to work without the need for direct regulation	rural	.293	31	.000	.827	31	.000
	urban	.235	44	.000	.877	44	.000
I consider myself to be one among the most competent for a job and likely to be successful	rural	.251	31	.000	.806	31	.000
	urban	.278	44	.000	.764	44	.000
I speak out for a course of deeds I suppose in even when others disagree	rural	.279	31	.000	.849	31	.000
	urban	.222	44	.000	.863	44	.000
I act tranquilly in traumatic situations	rural	.251	31	.000	.803	31	.000
	urban	.225	44	.000	.827	44	.000
I come across difficulty to control my opinions	rural	.297	31	.000	.852	31	.001
	urban	.233	44	.000	.862	44	.000
I'm typically able to find ways to manage my emotions when I want to	rural	.272	31	.000	.817	31	.000
	urban	.303	44	.000	.824	44	.000
I have a propensity to change my mind often	rural	.209	31	.001	.872	31	.002
	urban	.232	44	.000	.873	44	.000
I would like to get out of effects which I have caught up in them earlier	rural	.339	31	.000	.813	31	.000
	urban	.309	44	.000	.835	44	.000
Finally I am talented to pact with the tension	rural	.324	31	.000	.830	31	.000
	urban	.293	44	.000	.828	44	.000
Others think highly of me for being cool and tranquil	rural	.256	31	.000	.841	31	.000
	urban	.249	44	.000	.878	44	.000
I forecast obstacles to a purpose in order to conquer them	rural	.222	31	.000	.858	31	.001
	urban	.236	44	.000	.834	44	.000
I have a tendency to step back in many situations even I know that I am true	rural	.295	31	.000	.860	31	.001
	urban	.239	44	.000	.855	44	.000
ultimately I am a good diplomat	rural	.274	31	.000	.841	31	.000
	urban	.321	44	.000	.809	44	.000
I can knob successfully with the people	rural	.255	31	.000	.820	31	.000
	urban	.302	44	.000	.770	44	.000
I repeatedly stand up for my privileges	rural	.269	31	.000	.797	31	.000
	urban	.311	44	.000	.722	44	.000
I frequently sway the other people	rural	.232	31	.000	.878	31	.002
	urban	.202	44	.000	.903	44	.001
I articulate optimistic expectations about others potential	rural	.267	31	.000	.773	31	.000
	urban	.315	44	.000	.742	44	.000
I give instructions or demonstrations to grow others	rural	.239	31	.000	.860	31	.001
	urban	.291	44	.000	.794	44	.000
I distinguish specific strengths or development chances in others	rural	.306	31	.000	.831	31	.000
	urban	.250	44	.000	.797	44	.000

Lilliefors Significance Correction



The skewness is calculated by dividing the static value by its standard error which gives the value lying between +/-1.96 (as we have considered the confidence level of 95%). The kurtosis is calculated by dividing the static value by its standard error which again gives the value lying between +/- 1.96 (as we have considered the confidence level of 95%).

From the above Shapiro-Wilk table it is clear that the P value is less than the 0.05 where the null hypothesis should be rejected and Kolmogorov-Smirnov[a] the data is approximately normally distributed. Regarding skewness and kurtosis the data little skewed and kurtotic for both rural and urban students, but it doesn't differ significantly from normality. From this we can assume that the data are approximately normally distributed in terms of skewness and kurtosis.

H_1 has been tested by applying the non parametric test chi-square by considering the significant level of 0.05 i.e, 95% of confidence level.

TABLE VI
Test Statistics

	Region	I express positive expectations about others potential
Chi-Square	1.282[a]	75.590[b]
df	1	4
Asymp. Sig.	.258	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 39.0.
b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.6.

From the above it is clear that the significance value is 0.000 which is less than the 0.05 so the null hypothesis is to be rejected and it is clear that there is significant difference between urban and rural students on the scores of Emotional Intelligence.

H_2 is being tested by using the statistical tool T- test

TABLE VII
Levene's Test for Equality of Variances

		F	Sig.	t	df	Sig.(2-tail
E1	Equal variances assumed	1.895	.173	-.261	76	.795
	Equal variances not assumed			-.291	12.817	.776
E2	Equal variances assumed	.037	.849	-.821	76	.414
	Equal variances not assumed			-.875	12.364	.398
E3	Equal variances assumed	1.479	.228	.516	76	.608
	Equal variances not assumed			.438	10.781	.670
E4	Equal variances assumed	.700	.405	1.005	76	.318
	Equal variances not assumed			.975	11.582	.349
E5	Equal variances assumed	5.302	.024	2.080	76	.041
	Equal variances not assumed			1.292	9.704	.226
E6	Equal variances assumed	1.334	.252	1.120	76	.266
	Equal variances not assumed			1.226	12.629	.242
E7	Equal variances assumed	2.579	.112	.554	76	.581
	Equal variances not assumed			.458	10.647	.656
E8	Equal variances assumed	1.464	.230	-.193	76	.847
	Equal variances not assumed			-.158	10.589	.878
E9	Equal variances assumed	.936	.336	.619	76	.538
	Equal variances not assumed			.508	10.617	.622
E10	Equal variances assumed	1.561	.215	1.114	76	.269
	Equal variances not assumed			.850	10.312	.415
E11	Equal variances assumed	1.933	.168	1.278	76	.205
	Equal variances not assumed			1.003	10.426	.338
E12	Equal variances assumed	.170	.681	-.674	76	.502

	Equal variances not assumed			-.727	12.466	.481
WB1	Equal variances assumed	.477	.492	1.082	76	.282
	Equal variances not assumed			.974	11.095	.351
WB2	Equal variances assumed	.002	.966	.696	76	.489
	Equal variances not assumed			.672	11.548	.515
WB3	Equal variances assumed	.465	.497	1.067	76	.289
	Equal variances not assumed			.922	10.868	.376
WB4	Equal variances assumed	.071	.791	-.745	76	.459
	Equal variances not assumed			-.678	11.161	.512
WB5	Equal variances assumed	1.225	.272	.384	76	.702
	Equal variances not assumed			.430	12.853	.674
WB6	Equal variances assumed	3.452	.067	.781	76	.437
	Equal variances not assumed			.618	10.458	.550
WB7	Equal variances assumed	4.229	.043	1.275	76	.206
	Equal variances not assumed			1.015	10.487	.333
SC1	Equal variances assumed	9.195	.003	.851	76	.397
	Equal variances not assumed			1.194	16.665	.249
SC2	Equal variances assumed	2.644	.108	.678	76	.500
	Equal variances not assumed			.499	10.182	.629
SC3	Equal variances assumed	.930	.338	.139	76	.890
	Equal variances not assumed			.115	10.673	.911
SC4	Equal variances assumed	1.769	.187	1.623	76	.109
	Equal variances not assumed			2.052	14.532	.059
SC5	Equal variances assumed	.134	.715	-1.636	76	.106
	Equal variances not assumed			-1.635	11.804	.128
SC6	Equal variances assumed	.238	.627	.564	76	.574
	Equal variances not assumed			.476	10.742	.644
SC7	Equal variances assumed	.001	.980	.320	76	.750
	Equal variances not assumed			.300	11.353	.770
S1	Equal variances assumed	.188	.666	-1.480	76	.143
	Equal variances not assumed			-1.370	11.264	.197
S2	Equal variances assumed	.074	.786	-.190	76	.850
	Equal variances not assumed			-.184	11.583	.857
S3	Equal variances assumed	.001	.974	.656	76	.514
	Equal variances not assumed			.565	10.846	.584
S4	Equal variances assumed	.192	.663	1.834	76	.071
	Equal variances not assumed			1.800	11.666	.098
S5	Equal variances assumed	.774	.382	.516	76	.608

	Equal variances not assumed			.591	13.138	.564
S6	Equal variances assumed	2.238	.139	-1.657	76	.102
	Equal variances not assumed			-2.455	18.184	.024
S7	Equal variances assumed	.010	.921	-.331	76	.741
	Equal variances not assumed			-.340	12.011	.740
S8	Equal variances assumed	.519	.473	-.361	76	.719
	Equal variances not assumed			-.435	13.795	.670

Observe the values in the column sig (2 tailed). All the values are greater than the 0.05 (confidence level is 95%).so we keep the null hypothesis that is Emotional Intelligence have no significant relationship with academic performance of students measured with the percentages secured in 10th, 12th & UG.

Chi-square test has also been applied to find the significant difference between the EI parameters and the regions (Rural & Urban). The following table represents the result.

TABLE VIII
Sample Table Of Analysis

REGION			
	Observed N	Expected	Residual
Rural	34	39.0	-5.0
Urban	44	39.0	5.0
Total	78		

I articulate optimistic expectations about others potential			
	Observed N	Expected	Residual
strongly disagree	1	15.6	-14.6
disagree	1	15.6	-14.6
neutral	8	15.6	-7.6
agree	31	15.6	15.4
strongly agree	37	15.6	21.4
Total	78		

Test Statistics

	Region	I articulate optimistic expectations about others potential
Chi-Square	1.282[a]	75.590[b]
df	1	4
Asymp. Sig.	.258	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 39.0.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.6.

It is found that the significance at the 0.05 significance level is 0.000 which is less than the specified value. From this it can be interpreted that the there is significant difference in the EI levels of the students who come from rural and urban regions.

The ANNOVA has been applied to find the significance level between the subsets of emotionality and region as well between the subsets of EI and GPA for this purpose Mean EI values of the four parameters have been calculated. The results are depicted in the Table IX and X. The F value for the parameter Emotionality is 0.198. The value of F for the parameter well-being is 0.042. The value of F for the parameter self control is 0.520. The F value for the parameter sociability is 0.723. the results indicate that there exist difference among the rural and urban students on the four dimensions of the EI Parameters, which leads to reject the H_1 i.e., there is no significant difference between the EI levels of Rural and Urban students.

TABLE IX
Anova

		Sum of Squares	df	Mean Square	F	Sig.
emotionality	Between Groups	.234	1	.234	1.685	.198
	Within Groups	10.564	76	.139		
	Total	10.799	77			
wellbeing	Between Groups	.821	1	.821	4.271	.042
	Within Groups	14.601	76	.192		
	Total	15.422	77			
self-control	Between Groups	.058	1	.058	.19	.520
	Within Groups	10.535	76	.139		
	Total	10.593	77			
sociability	Between Groups	.022	1	.022	.127	.723
	Within Groups	13.219	76	.174		
	Total	13.241	77			

TABLE X
Anova

		Sum of Squares	df	Mean Square	F	Sig.
emotionality	Between Groups	10.121	74	.137	.606	.815
	Within Groups	.677	3	.226		
	Total	10.799	77			
wellbeing	Between Groups	14.146	74	.191	.450	.908
	Within Groups	1.276	3	.425		
	Total	15.422	77			
self-control	Between Groups	10.154	74	.137	.938	.631
	Within Groups	.439	3	.146		
	Total	10.593	77			
sociability	Between Groups	12.890	74	.174	1.486	.429
	Within Groups	.352	3	.117		
	Total	13.241	77			

The table XI shows the ANNOVA application to find the Relation between the GPA of students with their EI levels. The GPA Mean of the rural students is 71.21 and the GPA mean of the urban students is 70.40. It is clear that the GPA is high among the rural students than that of the urban students. The table XII reveals the EI levels of the rural and urban students related to the four parameters i.e., emotionality, well-being, self-control, sociability.

TABLE XI

GPA * region			
GPA			
region	Mean	N	Std. Deviation
rural	71.2144	34	6.86711
urban	70.4066	44	9.35237
Total	70.7587	78	8.31973

TABLE XII
Report

region		emotionality	wellbeing	self-control	sociability
rural	Mean	4.0221	3.6471	3.2563	3.8382
	N	34	34	34	34
	Std. Deviation	.39318	.41499	.36511	.48022
urban	Mean	4.1326	3.8539	3.2013	3.8722
	N	44	44	44	44
	Std. Deviation	.35643	.45540	.37774	.36117
Total	Mean	4.0844	3.7637	3.2253	3.8574
	N	78	78	78	78
	Std. Deviation	.37449	.44753	.37090	.41469

From the above it is clear that the emotionality level in rural (4.022) is less than the urban region (4013). The EI parameter well being is also less in the rural (3.64) than the urban (3.85). The EI parameter self-control is greater in the rural region students (3.25) than that of the urban region students (3.20). The EI parameter sociability is less among the rural region students (3.83) than that of the urban region students (3.85). The GPA is high among the rural students when compared to that of the urban students.

VII. Conclusion

From this study it is clear that the EI levels of the urban students is high to that of the rural students and the GPA is high among the rural students than that of the urban students. It can be analysed that there is no impact of EI on the academic performance since the EI levels of urban students is high even though their GPA is less than the rural students. The Faculties teaching to the PG students specifically to management need to have much concentration on the rural students than that of the urban students to develop their EI levels which is much essential for them to compete in the present situations.

Questionnaire

A study on the Emotional Intelligence Levels of the Urban students and Rural students – with special reference to *SVIM*

Name::_____:

:

Region::_____: GPA::_____:

Sl. No.	Labels	SA	A	N	D	SD
1.	I can express my emotions with words freely					
2.	I don't find difficulty in showing my affection to those who are close to me					
3.	I can understand things from others point of view					
4.	I am empathetic in nature					
5.	I am self- motive person					

6.	I can acquaintance well with those who are close to me					
7.	I usually stop and sense about my feelings					
8.	I am familiar with the situations that elicit, my own emotions					
9.	I Know how own feelings blow own act					
10.	I trust I am full of personal potentiality					
11.	I have a dim perception on many of the aspects					
12.	I don't find life is pleasurable					
13.	I feel certain to work without the need for direct regulation					
14.	I consider myself to be one among the most competent for a job and likely to be successful					
15.	I speak out for a course of deeds I suppose in even when others disagree					
16.	I act tranquilly in traumatic situations					
17.	I come across difficulty to control my opinions					
18.	I'm typically able to find ways to manage my emotions when I want to					
19.	I have a propensity to change my mind often					
20.	I would like to get out of effects which I have caught up in them earlier					
21.	Finally I am talented to pact with the tension					
22.	Others think highly of me for being cool and tranquil					
23.	I forecast obstacles to a purpose in order to conquer them					
24.	I have a tendency to step back in many situations even I know that I am true					
25.	ultimately I am a good diplomat					
26.	I can knob successfully with the people					
27.	I repeatedly stand up for my privileges					
28.	I frequently sway the other people					
29.	I articulate optimistic expectations about others potential					
30.	I give instructions or demonstrations to grow others					
31.	I distinguish specific strengths or development chances in others					
32.	I regularly alter my life according to the conditions					
33.	It is simple for me to keep myself stimulated					
34.	I am active, I can admit new environment					

SIGNATURE OF THE RESPONDENT

Likert scale is being used with the values strongly agree, agree neutral, disagree, strongly disagree. They have been rated as 5 for strongly agree, 4 for agree, 3 for neutral, 2 for disagree, 1 for strongly disagree for the positive type of questions and the values are reversed for the negative type of questions. The questions 1, 2, 3, 4, 5, 6, 7, 8, 9, 32, 33, 34 belong to the parameter emotionality, 10 to 16 belong to the parameter well being, 17 to 23 belong to the parameter self-control, and the questions from 24 to 31 belong to sociability.

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Implementation of Routing Protocol for Network and Data Security using Onion Routing with Salt Method

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Abstract: Electronic communication is becoming an important issue now's day. Hiding the details of communication, content, nodes from the adversaries like an eavesdropper, hacker etc is usually not considering before. Encryption is becoming the most important part of all the communication channels. Onion routing is an anonymous connection that can provide support anonymous mail as well as other applications. The nodes include in the network cannot be always trusted, since a valid node may be captured by enemies and becomes malicious. Onion routing with salt is the secure network topology that help to protect the data and the network after the enemy captures the node path. Onion routing with salt make the network more secure and data more protected.To create this and provide main aim of onion routing its uses public key encryption with salting method to put multiple layer of encryption around the original data thus making an onion like structure and each layer between source to destination peel off each layer of encryption.

Index Terms: Onion, Salt, Encryption, Security TOR

I. INTRODUCTION

Onion routing was initiated by Sun Solaris with implementation for web browsing, remote login process and sanitizing the user information from the browser while transmitting information through data packets. Onion routing promises to protect the integrity and confidentiality of data from the theft, eve dropping over the network and internet, onion routing proceed a devised a technique to limit the knowledge of information as possible while high level of anonymity is achievable. Onion routing have ability to work against the traffic analysis attack mainly because of there is no direct communication between sender and receiver. As it initiates a communication with an application specific router called onion routing proxy that was enough to manage TCP and Sock request of the client.

Routing onion is a data structure designed by wrapping a plain text message with the successive layer of encryption such that each layer can be unwrapped by an one intermediary and no other can decrypt it. Onion routing is implemented with the help of encryption in the application layer of network in the communication stack like the layer of an onion. Tor help in encryption of original data including the IP address and send to the destination through a virtual circuit comprising successive, randomly selected. Each relay decrypts the layer of encryption to obtain only the successive relay in order to transmit the data. The final relay decrypts the innermost layer of encryption and sends the original data to its final destination without revealing and hiding the information of sender

TOR is the descendant of the onion routing project work by the project had many concept in it. TOR is a collection of onion routers which may have different functionality and roles in the network and during the network communication they perform their roles. Each router send an information in a secure way to next hop in the TOR network connection whereby if any single nodes is compromised then this been will be not affected anonymity as well as data communication send to and from the sender and receiver is work properly.

TOR main aim is to hide the communication between the initiator and the target host fir which the initiator needs to communicate with the nodes [3]. The Tor network is an network in which each onion router runs as a normal and perform their usual duties without having any special type of privileges. A TLS connection is maintain for every other onion router. Each user can fetch their directories and establish circuit across the network and handle difficulties in handling connection from user application. Each router in the Tor maintain a long term identity key and short term identity key that is use to sign as TLS certification

Salt is not only a single hash function, it is all about using more than one hash function among more the one hash function. Salt is the process of selecting a unique hash function from many hash function that are also known to server. Salt is also be added to make it more difficult from an attacker to break in a system by using password hash matching strategies because adding salt to a password hash prevent an attacker from testing known dictionary words across the entire system. Salt can also be added to make it more difficult for an attacker to break into a system by using password hash-matching strategies because adding salt to a password hash prevents an attacker from testing known dictionary words across the entire system.

Hash = (salt + password)

Verifier = salt + hash (salt + password)

Diffie Hellman Exchange - It is protocol that help to maintain data integrity by exchanging a secret key between two users. Two users may be one is server and one client.

II. PROBLEM STATEMENT

This portion of paper discuss the problem involves in onion. The first problem is Longstanding Connection that means If the longstanding connection between two nodes of onion router in the network is broken down so it will may

result in many destruction of messages one for each anonymous connection that was suppose thorough that longstanding connection . Second problem is Expensive i.e. Onion message packets are in the sequences of cells that must be processed together. This onion processing involves a public key operation which is relatively very expensive in all other cryptographic. The third problem is Data Latency its means that delay in data. Data latency is also the main problem in the onion routing protocol. Message has been transmitted to may circuit and latency may be happen sometimes.

Eve dropping is the forth problem that means an attacker can start monitoring the system when an onion router incoming queues and outgoing queues are empty so that attacker can determine the order in which marker arrives at a onion router Traffic Cost is also include in the problem. Traffic analysis to be cost of brute force attack on the cryptographic algorithms un reasonable [4]. Compromised nodes can cooperate to uncover the rout information to the outsider that was the main problem .Accessing a remote onion router does not really provide a protected anonymous environment because connection between the machine and onion router is not protected.

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III. Related work

A paper is published by Uma Somani, Kanika Lakhani and Manish Mundra in Cloud discussion of that we have problem like security of data, files system, host security etc[1].They have proposed a concept of digital signature with RSA algorithm, to encrypt the data while transferring it over the network. This technique solves the dual problem of authentication and security. The strength of their work is the framework proposed to address security and privacy issue.

Anonymous Connection and onion routing by paul and david specify of onion routing system, vulnerability analysis based on specific and performance result.

G. Jai Arul Jose, C. Sajeev, and Dr. C. Suyambulingom proposed to generate RSA Public keys and Private Keys for public and private access to overcome the problem of data security. Certificate Binary file is used inside control node configuration file to make sure cloud data flow securely. The control node sends data through Secure Socket Layer after certificate activation. Finally AES algorithm is used for encryption .This unique combination makes this solution best to prevent different types of attacks.

Authenticated Anonymous Secure Routing for MANETs in Adversarial Environments by Wei Liu, Member proposed that the route request packets are authenticated by a group signature, to defend against potential active attacks without unveiling the node identities. The key encrypted onion routing with a route secret verification message is designed to prevent intermediate nodes from inferring a real destination.

Onion Routing for Resistance to Traffic Analysis by Paul Syverson proposed that using encryption on a packet-switched network can hide the content of messages, much like placing the messages inside a physical envelope. However, by itself encryption does not hide who is talking to whom, and how often. Onion Routing is a general purpose infrastructure for private communication over a widely shared network such as the internet or the SIPRNET.

IV. Proposed work

All this process is implemented to provide security in avoiding data modification at the end of server side. For the same purpose two different servers are made and maintained one for storage server for storing user data file and second is for rehashing user password.

When a user want to transmit a file to the server of the onion networks firstly key are exchange using our first process diffie Hellman key exchange process at the time of login [2]. Finally user's data file is encrypted using cryptographic algorithm with salt and only then it is going to be transmitted on network.

Steps 1:

Picks nodes from a list of nodes-the chosen nodes are ordered to provide a path that forming a circuit through which the message may be transmitted.

Step 2

Using asymmetries key cryptography with salt, entry node uses public key to sends the encrypted message creating a cell calls create cell.

1-An create cell have-

2-The originator's half a diffie Hellman handshake

3-A circuit id

Diffie Hellman key exchange method allows two parties that have no prior knowledge of each other to jointly establish a shared secret key over an insecure communication channel.

This shared could be a password or a big number or an array of randomly chosen bits.

Step 3:

1-The entry node which just received the handshake, replies to the originators with:

2-The entry nodes' half of the handshake

3-A hash of the shared secret

Step 4:

The originator and the entry node use their shared secret for encrypting everything

Step 5:

1-The originator send s the entry node relay-extend cell for the next nodes using public key with

2-The originator's half of the differ Hellman handshake, a circuit id, a request

Step 6:

-The relay nodes then replies to the handshake

Step 7:

-Similarly the chain is extended further.

V. IMPLEMENATION

All this process is implemented to provide security in avoiding data modification at the end of server side. For the same purpose two different servers are made and maintained one for storage server for storing user data file and second is for rehashing user password.

I: Implementing the encryption algorithms with salt.
II: Connection Establishment.
III: Data transfer

The first step starts with implementation onion routing encryption algorithms adding salt in it. There are many different algorithms are used for connection establishment and data transferring. RSA algorithm is used for establishing connection. It is the standard public key cryptography algorithm and cipher text are not easily decrypted, because the process of decryption is not an inverse process of encryption.. Random prime numbers are generated for encryption and decryption. Using system time onion key is generated. While sending the onion keys are generated that made difficult to predict the keys.
TCP socket connection is used for connection. For anonymous communication and private is to be performing first. So the path that is to be followed by the sender and receiver and the address of the proxies through they pass during connection.
The first layer of onion decrypted at its intermediated proxy and appropriate details such keys, IP address and the function for decrypting the data that will be build into routing table.
As connection is established over the network and data start passing through it in encrypted form of the onion[5]. finally the data is sent to receiver send by the sender by encrypting at each level of intermediate proxies and finally it decrypted at the initiating proxy and serves as plain text the sender.

A. *Execution Steps*:

1. Start Connection
2. Data Encryption with salt
3. Key Exchange – Diffie Hellman
4. Network communication using ToR
5. Files Transferred to router
6. Connection End.

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VI. CONCLUSION

Data security become the most important part in the network building.We shloud need to create such netwrk that provide security in avoiding data mdification and eve dropping in the network.Onion routing with salt make the network more secure and data more protected.To create and provide main aim of onion routing its uses public key encryption with salting method to put multiple layer of encryption around the original data thus making an onion like structure and each layer between source to destination peel off each layer of encryption. As the data reached t the destination it is fully secured as only next router can get address of previous node. So node will ever know the full path of onion.

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