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Nutrient requirement and safe dietary intake for Indians

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International organizations like FAO, WHO (now also UNU) took up the task of defining human nutrient requirements through consultation of Expert Groups periodically since 1950. The latest FAO/WHO/UNU recommendations on human requirements of nutrients and their application were published in 2004.

In 1944, the Nutrition Advisory Committee of the Indian Research Fund Association (now the Indian Council of Medical Research - ICMR) made recommendations regarding nutrient requirements, dietary allowances and balanced Indian habitual diets to meet the Recommended Daily Allowance (RDA) of nutrients for Indians[1], based on the recommendations of the League of Nations' Health Committee in 1935[2]. The RDA for Indians was revised by the ICMR in 1958[3], 1968[4], 1978[5] and 1989[6]. The ICMR Expert Group on "nutrient requirement and safe dietary intake" for Indians met from April 27th-29th, 2009, and again on November 3rd 2009 to carry out further revisions.

This Expert Group took into consideration the following facts while revising the nutrient requirement and safe dietary intake for Indians:

- newer technologies have provided more accurate estimates of the equirements of several nutrients such as energy, protein, fat, calcium, and some micronutrients like vitamin C, iron, and zinc
- low dietary intake of macro and micronutrients is common and undernutrition and micronutrient deficiencies continue to be major public health problems in India
- changes in socio-economic conditions and life styles during the last two decades have resulted in reduction in physical activity and reduction in energy requirements
- overnutrition, with the associated risks of diabetes and cardiovascular diseases, is emerging as a major public health problem in India .

This article is based on the draft considered by the Expert Group during its meeting in November 2009 and the discussions during the meeting.

Energy requirements

The Expert Group used data on energy requirements of adults and children computed by using doubly labeled water, i.e. $^{2}H_{2}$ O^{18} turnover because this technology measures energy requirements more directly and accurately under normal living conditions[7]. Energy requirements computed by this method are lower than those computed using the dietary intake and factorial method. For computation of energy requirements, the reference body weight of Indians was taken as the 95th percentile of the body weights of Indians (Table 1) and the physical activity pattern (Table 2) as reported in the National Nutrition Monitoring Bureau[8], (NNMB)-rural survey. Energy requirements of Indians, as recommended by the ICMR Expert Group of 2009, are given in Table 3.

Protein requirements

Earlier, protein requirement was assessed in terms of nitrogen (N) requirement for maintaining N balance or minimal N loss through urine and sweat on a N-free diet. Protein requirement (N x 6.25) was assessed on the basis of minimal N loss and absorption of dietary protein. Instead of determining protein requirement in terms of N needs, the FAO/WHO/UNU consultative group in 2007[9] estimated human protein requirements in terms of total amino acid requirement. Recent studies have shown that the requirement of essential amino acids is 2 to 3 times higher than the earlier estimations[9]. The recommended protein intake in terms of egg or animal protein is 0-6 mg/kg for adults. Vegetable proteins have a lower digestibility and content of the essential amino acids; therefore a higher level of vegetable protein has to be consumed to

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Table 1 Reference body weight of Indians (NNMB)		
Group	Age (years)	Weigh
Infants	0-6 months	5
	6-12 months	8
Children	1-3 years	12
	4-6 years	18
	7-9 years	25
Boys	10-12 years	34
	13-15 years	47
	16-18 years	55.5
Girls	10-12 years	35.0
	13-15 years	46.6
	16-18 years	52.1
	Adults	
Men	18-30 years	60.0 Height 172 cm BMI 20.3
Women	18-30 years	55.0 Height 161 cm BMI 22.2

Table 2: Activity status in rural India (NNMB)						
Activity status	Men		Women		Total	
	n	%	n	%	n	%
Sedentary	1349	33.3	2705	62.7	4114	48.6
Moderate	2650	66.5	4282	37	4282	50.6
Heavy	48	1.2	14	0.3	62	0.8
Pooled	4047	100	4411	100	8458	100
n = sample size						

meet the daily amino acid requirement. Dietary protein requirements for Indians were computed for a predominantly vegetarian diets based on cereal, legume and milk intake in the ratio 8:2.4:1 (Table 4). Since the nutritive values of these proteins are lower than those of egg protein, a higher amount of this combination has to be consumed to meet the daily protein need.

Protein requirements of children, adolescents, and pregnant and lactating women were also derived using the same principle of amino acid needs for maintenance and for providing for tissue deposition during growth. Protein requirements of the mother during lactation have been revised taking into account the fact that part of the N secreted in milk is urea N and not protein.

Fat requirements

Fat is an essential component of the diet, which provides energy and essential fatty acids (EFAs) to meet the body's metabolic requirements and facilitates the absorption of fat-soluble vitamins. For an adult, not more than 30% of the total calorie intake should be from fats. Excessive intake of fats, especially saturated fats, adversely affects the lipid profile and increases the risk of cardiovascular disease. There are two types of EFAs: those derived from n-6 fatty acids (which are essential for the integrity of cell membranes) and those derived from n-3 fatty acids (which are essential for certain metabolic functions and protection against cardiovascular diseases). Fish oil is an important source of long-chain n-3 fatty acids. Certain vegetable oils like soya, mustard, linseed and canola are also rich in linolenic acid, which gets converted into long-chain n-3 fatty acid in the body. The daily fat intake recommended by the ICMR Expert Group (2009) for Indians of different age groups is given in Table 5.

Mineral requirements

Calcium is an essential mineral for bone formation, the deficiency of which leads to reduced bone formation, osteoporosis and proneness to bone fracture. The

Table 3 Recommended energy requirement			
Age groups	Category	Requirements Kcal/day	Difference from 1989 RDA Kcal/ day
Man	Sedentary work	2318	-107
	Moderate work	2727	- 148
	Heavy work	3485	-315
Woman	Sedentary work	1899	+24
	Moderate work	2234	-9
	Heavy work	2854	-71
	Pregnant woman	+ 350	+50
	Lactating woman		
	0-6 months	+ 600	+ 50
	6-12 months	+ 520	+ 120
Infants	0-6 months	92 kcal/kg/day	-16 kcal/kg/day
	6-12 months	79 kcal/kg/day	-19 kcal/kg/day
Children	1-3 years	1036	-204
	4-6 years	1350	-340
	7-9 years	1691	-259
Boys	10-12 years	2189	-
	13-15 years	2748	+298
	16-18 years	3017	+377
Girls	10-12 years	2008	+48
	13-15 years	2328	+268
	16-18 years	2070	+10
*For weight gain of 10 kg in pregnant women			

Table 4 Safe dietary intakes of protein	
Age groups	**Safe Protein allowance (g/d)**
Infants	
0-6 months	1.16 g/kg/d
6-12 months	1.69 g/kg/d
Children	
1-3 years	15.7
4-6 years	20.3
7-9 years	29 6
10-12 yrs - boys	39.3
10-12 yrs - girls	40.4
13-15 yrs - boys	54.2
13-15 yrs - girls	51.9
16 - 18 yrs - boys	61.5
16 - 18 yrs - girls	52.1
Adults	
Men	60 0
Women	55.0
Pregnant Women*	82.2 (55 + 27.2)
Lactating women	
0-6 months	77.9 (55 + 22.9)
6-12 months	70.2 (55 + 15.2)
*For weight gain of 10 kg in pregnant women	

Table 5 Recommendations for dietary fat intake in Indians

Groups		Minimum level of Total fat (%E)	Fat from foods other than visible fats[d] (%E)	Visible fat[e]	
				%E	g/p/d
Adult Man	Sedentary	20	10	10	25
	Moderate				30
	Heavy				40
Adult Woman	Sedentary				20
	Moderate				25
	Heavy				30
	Pregnant woman				30
	Lactating woman				30
Infants	0 – 6 months	40-60	Human milk[f]	25	
	7- 24 months	35[a]	10[b]		
Children	3-6 years	25[c]	10	15	25
	7-9 years				30
Boys	10 – 12 years				35
	13 – 15 years				45
	16 – 18 years				50
Girls	10 – 12 years				35
	13 – 15 years				40
	16 – 18 years				35

[a] gradually reduce depending on physical activity, [b]Human milk /infant formula+ complementary foods, [c]depending on physical activity, [d]if higher than 10%E, visible fat requirement proportionately reduces, [e]cooking oils, butter, ghee and margarine, [f]infant formulae/milk substitutes should mimic contents of fat and fatty acids in human milk including arachidonic and docosahexaenoic acid.

calcium intake of people in developed countries is high (~1 g/day) because of their high intake of milk and milk products. However, fracture rates are also high in this population. Nordein[10] has reported that this paradoxical situation is due to the fact that the high intake of animal protein and sodium increases calcium loss in urine and raises the calcium requirement. Calcium intake in the diets of adults in developing countries ranges between 300 mg-600 mg/day and is derived mainly from cereals and vegetables, especially green leafy vegetables. There is evidence that the body can adapt to different levels of calcium intake; thus calcium balance has been observed to be maintained both on high levels of calcium intake (developed countries) as well. The daily calcium intake recommended by the ICMR Expert Group (2009) for Indians of different age groups is given in Table 6.

Micronutrient requirements

Iron is an important trace mineral whose deficiency is widespread in developing countries; the majority of Indians are iron-deficient and anaemic. Recent reports have shown that about one-third of the iron from grains is from surface contaminant iron, which is not absorbed in the body; the bioavailability of iron in Indian diets is estimated to be about 5-8%. An intake of 20 mg iron from plant food-based diets without contaminant iron may meet the iron requirement of an adult man. Hallberg[12] had shown that the inclusion of 100 mg ascorbic acid in diets based on plant foods would improve the absorption of iron significantly. An attempt to promote vitamin C intake of 100 mg/day and reduce the dietary components rich in inhibitors of iron absorbtion such as tannin may further enhance the bioavailability of iron. The current recommendations regarding iron intake from diets free from contaminant iron in different physiological groups are given in Table 7.

Anaemia is a major public health problem in India. Available data indicate that anaemia cannot be fully corrected by treatment with iron alone; coexisting folate vitamin B_{12}, vitamin A, riboflavin and vitamin B_6 deficiencies have to be corrected for optimum improvement in haemoglobin levels. The interaction between iron deficiency and other micronutrient deficiencies in anaemia needs to be studied further so that appropriate recommendations for management of anaemia can be drawn up.

Zinc is an essential trace element, being a component of a large number of enzymes. Zinc deficiency has been reported among different population groups of the world[13,14]. Although not much work has been done on Zn deficiency and its health consequences in India, it is believed that zinc deficiency may be contributing to poor growth in Indian children[14].

The zinc content of Indian food and diets[15] and the zinc balance on a typical Indian diet have been determined at

Table 6 Calcium requirements for Indians

Groups			Calcium (mg/d)
Adults	Man		600
	Woman		600
	Pregnant Woman		1200
	Lactating Woman		1200
Infants	0-12 months		500
Children	1-9 years		600
Adolescents	10-12 years	Boys	600
		Girls	700
	13-15 years	Boys	800
		Girls	700
	16-18 years	Boys	600
		Girls	600

Table 7 Requirements for Iron & Zinc for Indians

Groups			Iron (mg/d)	Zinc (mg/d)
Adults	Man		17	12
	Woman		21	10
	Pregnant woman		35	12
	Lactating woman		25	12
Children	1-3 years		9	5
	4-6 years		13	7
	7-9 years		16	8
Adolescents	10-12 years	Boys	21	9
		Girls	27	9
	13-15 years	Boys	32	11
		Girls	27	11
	16-18 years	Boys	28	12
		Girls	26	12

Table 8 Recommended intake of Vitamin A			
Groups		RDA 2009 (Retinol Equivalents mcg/d)	
		Retinol	β carotene*
Adults	Man	600	4800
	Woman	600	4800
	Pregnant woman	800	6400
	Lactating woman	950	7600
Infants	0-6 months	350	-
	6-12 months		2100
Children	1-3 years	400	3200
	4-6 years	600	4800
	7-9 years	600	4800
Adolescents	10-12 years	600	4800
	13-15 years	600	4800
	16-18 years	600	4800
* β Carotene=1/8 retinol			

Table 10 Recommended intake of Folic acid and Vitamin B_{12}			
Groups		Folic acid (mcg/d)	Vitamin B_{12} (mcg/d)
Adults	Man	-	
	Woman	250	1.0
	Pregnant woman	500	1.2
	Lactating woman	350	1.4
Infants	0-12 months	25	0.4
Children	1-6 years	80-100	0.6
	7-9 years	120-140	0.8
Adolescents	10-12 years	120-140	0.8
	13-15 years	150-250	0.8
	16-18 years	150-250	1.0

National Institute of Nutrition, Hyderabad (NIN)[15]; the minimal zinc intake for equilibrium for an adult was found to be 7.7 mg/day with a mean absorption of 34.5% and with endogenous fecal loss of 1.7 mg. Taking into account the reported daily loss of zinc to the extent of 1.26 mg through sweat, the daily intake of dietary zinc should be 10.8 - 11.0mg assuming a mean absorption of 35%. The nutrient requirement and safe dietary intake of zinc for Indians by different groups is given in Table 7.

Zinc deficiency, if any, may have been masked by other nutrient deficiencies, which, in turn, may also mask manifestations of zinc deficiency; the correction of other deficiencies may unmask latent zinc deficiency. There is a need for more systematic research in the area of zinc nutrition and zinc deficiency in India.

Vitamin requirements

Vitamin A and provitamin A : Although retinol is the chemical form of vitamin A, it is the provitamin A, beta-carotene and some other carotenoids meet the vitamin A requirement in the diets in developing countries like India. The conversion of plant beta-carotene to retinol in the human intestine is very important in defining vitamin A requirement in terms of beta-carotene. When FAO/WHO made recommendations relating to vitamin A in terms of beta-carotene, assuming a beta-carotene:retinol conversion ratio of 6:1[17], based on observations of Wilson *et al*.[18] on absorption of carotene from carrots in human subjects. The Expert Group of the ICMR, on the basis of the observation of beta-carotene absorption from amaranthus, a green leafy vegetable (GLV) at NIN[6], recommended a conversion ratio of 4:1. On the basis of a critical re-evaluation by Sivakumar at NIN[19] of studies, which reported high conversion factors, and on the basis of more recent studies on carotene absorption and of blood levels of retinol following the feeding of carotene to human volunteers, a more reasonable carotene:retinol conversion factor of 8:1 has been assumed. The current ICMR Expert Group has also recommended that this conversion factor be adopted. The nutrient requirement and safe dietary intake of vitamin A, in terms of Retinol and beta-carotene, is given in Table 8.

Table 9 Recommended allowances of B - Complex vitamins for Indians				
Groups	Category	B_1 (mg/d)	B_2 (mg/d)	B_6 (mg/d)
Man	Sedentary Work	1.2	1.4	1.9
	Moderate Work	1.4	1.6	2.2
	Heavy Work	1.7	2.1	2.8
Woman	Sedentary Work	1.0	1.1	1.5
	Moderate Work	1.1	1.3	1.8
	Heavy Work	1.4	1.7	2.3
	Pregnant woman	+0.2	+0.2	2.5
	Lactating woman 0-12 months	+0.3	+0.4	2.5
Infants	0-6 months	0.3	0.3	0.4
	6-12 months	0.3	0.4	0.5
Children	1-3 years	0.5	0.6	0.8
	4-6 years	0.7	0.8	1.1
	7-9 years	0.8	1.0	1.4
Boys	10-12 years	1.1	1.3	1.8
Girls		1.0	1.2	1.6
Boys	13-15 years	1.4	1.6	2.2
Girls		1.2	1.4	1.9
Boys	16-18 years	1.5	1.8	2.4
Girls		1.0	1.2	1.7

B-Complex Vitamins

The current Expert Group endorsed Recommedations of the ICMR EXPERT GROUP on the required levels of B-complex vitamins like Thiamine (B_1), Riboflavin (B_2), and Niacin for humans[6]. However, the current Expert Group worked out the requirements of pyridoxine (vitamin B_6) by different groups of Indians in detail. The RDAs of vitamins B_1, B_2, and B_6 are shown in Table 9.

Vitamin C: Metabolic studies have shown that the human requirement of ascorbic acid is only ~20 mg/d. Ascorbic acid is an antioxidant and promotes iron absorption from plant foods. The amount of ascorbic acid that should be present in the diet to promote iron absorption may depend upon the type of diet, i.e. the quantity of inhibitors of iron absorption like phytate, tannins and other polyphenols. This has to be determined for each type of traditional diet. The current Expert Group recommended that diets deriving iron from plant sources should contain, at the time of absorption, at least 50 mg ascorbic acid to promote dietary iron absorption; this amount may also meet the requirements for antioxidant function.

Folate plays an important role in single carbon metabolism and haemoglobin synthesis. The biomarker, plasma homocystein is a very sensitive indicator of folate status and can be used as an indicator of folate adequacy and also as a risk indicator for cardiovascular disease. Folate in foods is not very stable and food folate bioavailability may range from 25-50 %.

In view of the uncertainities of intestinal absorption of polyglutamates, the ICMR Expert Group 1989 recommended RDA for folate in terms of free folate. On the basis of the normal requirement of 75µg in Indian subjects, 180µg of free folate for an adult was recommended. A higher level is needed during pregnancy and lactation. As this cannot be met from dietary sources, medicinal supplementation of folate during these periods was recommended. For other age groups such as for infants and children, a daily intake of free folate 25µg to 100µg was recommended (Table 10). Since all Indian foods contain both free and total folate[20] it is suggested that folate intake may be recommended in terms of total folate; assuming ~50 % absorption of food folate, the recommended intake varies from 80µg for an infant to 500µg for a pregnant woman.

Vitamin B_{12} : As a component of several coenzymes, vitamin B_{12} has an important role in the synthesis of nucleic acids. Its metabolism is closely interrelated with that of folic acid. Deficiencies of vitamin B_{12} lead to abnormal haemopoesis, resulting in megaloblastic anaemia. In addition, vitamin B_{12} deficiency may result in neurological manifestations such as sub-acute combined degeneration of the spinal cord.

Vitamin B_{12} is present in foods only of animal origin like liver, meat, fish, eggs and milk. Bacteria can synthesize vitamin B_{12}; bacterial contamination of foods and water can contribute small quantities of vitamin B_{12}. When vitamin B_{12} is present in foods of plant origin, it is an indication of bacterial contamination. Microflora present in the human large intestine can synthesize vitamin B_{12} but it is not known whether the vitamin so synthesized is absorbed. Since the liver can store enough vitamin B_{12}, it is rather difficult to establish daily vitamin B_{12} requirement in humans.

Depending upon the method employed, the daily requirement of the vitamin has been shown to be as low as 0.1µg to as high as 1.0µg. Diet survey data collected by NNMB indicate that B_{12} intakes are low (0.7µg). Very large segments of the Indian population subsisting on vegetarian diets do not consume significant vitamin B_{12} through their diets.

Due to the limited access to vitamin B_{12} in Indian diets, the ICMR Expert Group (1990) recommended a moderate level of 1.0µg per day for an adult as the required intake of vitamin B_{12}[6]. It is suggested that the foetus during pregnancy needs 0.3µg of vitamin B_{12} and the quantity excreted in breast milk is about 0.3µg. On the basis of this evidence, an additional requirement of 0.5µg/day is recommended during pregnancy and lactation. In infants and children also, the RDA has been placed at 0.5µg/day. In view of the limited resources of vitamin B_{12} in Indian diets and in the absence of any widespread vitamin B_{12} deficiency among Indian populations, the above nutrient requirement and safe dietary intake appears reasonable (Table 10). Research studies in India have to be carried out for establishing the requirement of vitamin B_{12} for Indian population.

Summary

India has entered the era of dual nutrition burden when undernutrition and micronutrient deficiencies remain as major public health problems , obesity is emerging as a major problem. The Expert Committee took these factors into account while working out the nutrient requirements and safe dietary intake of Indians. It is expected that the recommendations discussed by the Expert Committee in November 2009 will be finalized and report will be submitted shortly.

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References

1. Indian Research Fund Association. Report of the Nutrition Advisory Committee, 1944.

2. Technical Committee of the Health Committee Report on the Physiological Basis of Nutrition. League of Nations, Geneva, 1936.

3. Patwardhan VN. Dietary Allowances for Indians.Calories and proteins (Special Report Series No. 35, ICMR), 1960.

4. Gopalan C and Narasinga Rao BS. Dietary allowances for Indians. (Special Report Series No. 60, ICMR),1968.

5. Indian Council of Medical Research Recommended Dietary Intakes for Indians, 1978.

6. Indian Council of Medical Research Nutrient Requirements and Recommended Dietary Allowances : A Report of the Expert Group of the ICMR, 1999.

7. Coward *et al* Measurement of Co_2 and H_2O production rate in man using $^2HO^{18}$ labelled H_2O a comparison between caloriemeter and isotopic values : In Human energy metabolism, physiological activity and energy expenditure in epidemealogical research based on direct and indirect calorimetry. Euronut Report 5, 126-128, 1984.

8. NNMB Report of the second repeat survey , NIN Hyderabad 1996-97.

9. FAO/WHO/UNU Report of Expert consultation group on human protein requirements, 2007.

10. Nordin BEC Calcium requirement in a sliding scale ? Am.J.Clin. Nutr. 71 1382-83, 2000.

11. Shatrugna V. Bone status of Indian Women from low income groups and its relationship to the nutritional status. Osteoporosis Intl 76 1823-35, 2005.

12. Hallberg L, Brune M, Rossander L. Effect of Ascorbic acid on iron absorption from different types of meals. Studies with ascorbic acid rich foods and synthetic ascorbic acid given in different amounts with different meals. Human Nutr.Appe Nutr 40:97.113, 1986.

13. Hambidge KM. Zinc in trace elements in human and animal nutrition. Mertz "W.Ed. 5th Vol", P1-137 Orlando. Florida academic press inc, 1987.

14. Shankar AH, Prasad AS. Zinc and immune function. The biological basis of altered resistance and infection. Am.J.Clin Nutr. 68 (Suppl) 4475-4635,1998.

15. Nageswara Rao C, Narasinga Rao BS. Trace element content of Indian Foods and dietaries. Ind. J. Med Res. 73, 904-909,1981.

16. Nageswara Rao C, Narasinga Rao BS. Zinc Balances in Men and the Zn requirement of Indians. Nutr. Rep. Inter. 26, 915-922 1982.

17. FAO requirements of vitamin A, iron folate and vitamin B_{12} (FAO Food and Nutrition series Vol no. 32, Rome: FAO 1988-16-31) 1985.

18. Wilson HEC, Das Gupta SM, Ahamed B. Studies on the absorpotion of carotene and vitamin A in Human subjects Indian J. Med 24, 807, 1937.

19. Sivakumar B. Current controversies in carotene nutrition. Indian J Med Res 108, 157-166.

20. Nutritive value of Indian Foods. Gopalan C, Ramasastry BV, and Balasubramanian. Revised and updated by Narasinga Rao BS, Doesthale, YG and Pant KC. Revised Edition 1989, Reprinted in 2002, 1998.

Reviews and Comments

Health and nutrition programmes in India: inter-state differences and the way forward

C Gopalan

In recent years, the Government of India's financial allocations for health and nutrition programmes have shown a substantial increase. Apart from the health care programmes instituted in earlier years, the Central Government has put on the ground some flagship programmes such as the Integrated Child Development Services (ICDS) which now covers the entire country and, more recently, the National Rural Health Mission, which seeks to promote the outreach of health services to rural areas. The Mid-day Meal Programme for school children in government schools all over the country is another unique initiative of the Government of India. There are also several anti-poverty programmes, of which the most important is the National Rural Employment Guarantee Scheme (NREGS), which aims to provide gainful employment to at least one person from each poor family for 100 days in the year. If these programmes are implemented efficiently, it would be reasonable to expect a significant dent in the problem of poverty and undernutrition in the country within the next few years.

According to the Constitution of India, the responsibility for implementing health and nutrition programmes rests with State governments; the Central Government has no role to play in the actual implementation of the schemes at the grassroots level. At present there are 38 States in India, some of them small (like Pondicherry and Goa) and others large and very populous (like Uttar Pradesh and Madhya Pradesh).

Inter-state differences:

In order to assess the relative performances of the various States in implementing health and nutrition programmes, the parameters that are useful to look at are:

i) birth rates;
ii) infant mortality rates;
iii) immunization coverage percentages;
iv) prevalence of stunting and underweight in early childhood; and
v) female literacy.

The Table shows the most recently available data relating to these parameters in some of the populous States of the country.

It will be seen from these data that there are very glaring differences in these parameters among various States. While some have been showing a fair level of performance, others have lagged behind. All the surveys carried out by various agencies over the years have shown that this situation has been continuing over a long period of time, with the same set of States continuing to turn in dismal performances. It must be kept in mind that the financial allocations made by the Central Government to the States for the various schemes is in proportion to the population that is to be covered. When making comparisons, one must certainly keep in mind that there are wide inter-State variations in crucial determinants of performance such as geographical terrain, the composition of the population, and its rural/urban distribution patterns. Even allowing for these variations, the main reason for the sub-average performance parameters revealed in some of the States can reasonably and logically be attributed to sub-standard implementation of health and nutrition schemes.

Ideally, the Central Government's responsibility should not stop with drawing up good plans and allocating generous funding for them, or even with collecting data on the performances. The statistical data are like the symptoms of an illness. They tell us that something is wrong and needs to be fixed. The next step is to diagnose the illness, to find out, which systems are not functioning. Only then can 'treatment' or remedial action be initiated. Therefore the Central Government should ensure efficient utilization of the funds and monitor the outcomes. Unless the problem areas are identified and imaginative steps are taken at the grassroots level, these disparities in performance parameters will continue to grow. Precious resources will continue to be poured into leaky pots. Identifying these leaks and plugging them should receive the highest priority from the Central Government.

Identifying the problems

In a vast country like India, with its geographical, ethnic and cultural diversity, there are obviously many factors that impinge on the performance of health and nutrition services. Surveys and studies can serve as snapshots of a situation in a given State, and can often give useful leads for further action.

- For example, in a carefully structured study carried out under the leadership of Mr.K.R.Venugopal to assess the functioning of the ICDS in Andhra Pradesh, several striking shortcomings were revealed regarding recruitment and training of anganwadi workers, regularity of attendance of the personnel and overall efficiency. Venugopal's study was not a fault-finding exercise but to record a true and faithful picture of the programme as it is actually being implemented at the grassroots. It is a somewhat depressing picture that emerges[1].

Differences in various parameters in states implementing health and nutrition programmes

States	Birth Rate*	Infant Mortality Rate (IMR)#	Immunization#	Stunting#	Female literacy@
Uttar Pradesh[a]	29.5	69	23.9	56.8	42.98
Bihar[a]	29.4	58	32.8	55.6	33.57
Madhya Pradesh[a]	28.5	72	40.3	50	50.28
All India Average	**23.1**	**55**	**43.5**	**48.0**	**54.16**
Punjab[b]	17.6	43	60.1	36.7	63.55
Tamil Nadu[b]	15.8	35	80.9	30.9	64.55
Kerala[b]	14.7	13	75.3	24.5	87.86

All figures in percentages; * SRS October 2008; # NFHS 3; @Census 2001;
[a] poor performers; [b] fair performers

• Again, with regard to the NREGS, the glaring deficiencies in the implementation of the scheme in Jharkhand have been brought out by Prof Jean Dreze. Quite contrary to the main aim of the programme, it was found that, in some areas, the workers were not being compensated for their labour. This was in addition to other deficiencies in implementation. Prof Dreze wonders, in one of his articles whether, in the absence of accountability, the NREGS is in danger of degenerating into a slave labour programme in some areas of the country.

• The Mid-day Meal Programme was initiated to promote wholesome dietary habits in children and to improve school enrolment and retention. Here too, the implementation has been found to be uneven, with some States faring less well than others due to a variety of reasons. Recently, there have been attempts by some vested interests, perhaps with backing from some political forces, to hijack the programme. Instead of being a hot meal cooked using locally available foods, the Mid-day Meal is sought to be converted into a vehicle for promoting the use of synthetic nutrients (sprinklers). Such distortions that hit at the very rationale of these important programmes should be strenuously resisted, instead of being apathetically accepted.

Most of the problems, it would seem, fall under three main heads:

(i) lack of **inbuilt quality controls**;
(ii) lack of a **monitoring system** to ensure accountability and fix responsibility; and
(iii) lack of **community participation**….indeed, often lack of **community awareness** itself.

So what is the way forward?

The Way Forward

Many of the problems and shortfalls in the implementation of health and nutrition schemes have been continuing for a very long time, with no signs of being resolved. Obviously, different things have to be done with regard to these programmes, or things have to be done differently, preferably both.

Quality upgradation

In a very useful presentation, Mr P.S. Appu, who has had several years of experience in administration, has suggested some important steps that would help to strengthen health and nutrition services at the grassroots level. His suggestions include the induction of Block Development Officers of a higher calibre, who can enforce accountability and monitor the performance of all the service providers throughout the Block. Another suggestion is that the District Officer should be the Chief Executive of the District Panchayat, so that decision making can be co-ordinated and made more efficient. These are some examples of practical steps that can result in quantum improvements in the medium term.

Monitoring systems

Steps such as these to improve the quality of the service providers would certainly be expected to strengthen the programmes. But even more important would be steps to ensure proper implementation by monitoring the performance on a continual basis, and putting in place a system of incentives/rewards and disincentives/reprimands to fix responsibility and ensure accountability. A valuable monitoring tool is Social Audit, and its use should be encouraged and promoted by governments, non-governmental organisations and the community at large…indeed all the stakeholders in these programmes. The members of such social audit teams should be persons of impeccable integrity and high calibre. But they can succeed in their task only with the full backing of the local authorities and the State governments. Some States have shown the way.

For example, the Andhra Pradesh Government must be congratulated on its initiative in setting up a Social Audit Department to improve the functioning of the NREGS. Also, an ambitious and well-conceived social audit programme for the same scheme has recently been put in place in Rajasthan with the full support of government agencies. According to reports, the exercise has generated tremendous enthusiasm and promoted community awareness. It would be a progressive step if the Central Government, in consultation with State Governments, sets up such social audit teams at least in the districts or States, which are lagging behind in performance outcomes. The recommendations of such social audit teams must receive wide publicity and should be made available to the government agencies as well as to the ministers concerned up to and including Chief Ministers. Prompt action must be instituted to correct the deficiencies pointed out by the audit teams.

Community participation

Initiatives such as social audits of existing schemes and programmes are more than just a monitoring tool. They often help to raise community awareness about these programmes, and promote community participation. But here too there are hurdles. As the Table above shows, the States that are lagging behind in health and nutrition parameters are precisely those who are also lagging behind in the key parameter of **female literacy**. By now it is a well-accepted fact that levels of female literacy are directly linked to health and nutrition status of a community, and the efficiency of immunisation coverage. In this chicken-and-egg scenario, it is challenging to stimulate community participation. Yet it has to be achieved if the laggard States are to break away from the endless cycle of backwardness in all key parameters that measure the well-being of a community. To the extent that social audit schemes can make a dent in this situation, they should be encouraged to do so.

There are some well-thought-out and well-targeted new schemes that are worth emulating. These will not only raise health performance but also increase awareness in the community. For example, Tamil Nadu, which already has a good record in delivering health services in rural areas, has drawn up the blueprint for a series of awareness programmes for underprivileged girls, with an emphasis on hygiene and nutrition.

Adolescent girls represent a crucial segment of the population. They are the future mothers and homemakers who will usher in the next generation. Most of the adolescent girls in rural areas are outside the school system and can be reached only by innovative, nonformal outreach programmes. The Nutrition Foundation of India had undertaken such a programme on a pilot basis in Rajasthan, with notable success, and brought out training modules for adolescent girls[2].

To summarize, as far as health and nutrition services in India are concerned,

there are often glaring lacunae between plans and performance, in some States more than in others. The challenge lies in upgrading the quality of the delivery systems overall, and in helping the laggard States to catch up with the others. This entails correcting deficiencies in the system, monitoring the performance, and ensuring accountability. The service providers should possess not only the necessary skills, but also the commitment and empathy that are very necessary to make a success of community-based programmes such as these. What is required at every level is to attempt to build efficiencies directly into the various programmes, so that internal checks and balances operate efficiently under the watchful eyes of a vigilant and informed community, which is fully aware of its rights and responsibilities.

The author is President, Nutrition Foundation of India.

References

1. Venugopal KR. Presentation made in the workshop of Council for Social Development (CSD) to discuss the report of the Social Audit of ICDS programme in Anantapur District (Andhra Pradesh). July 2009.

2. NFI. Mathai ST, Jain S, Shivpuri V. Education for better living of rural adolescent girls: Training modules, Vol. 1 (1992). Health and Nutrition. English version. * Education for better living of rural adolescent girls: Training modules, Vol. 2 (1993). Social Awareness.

FOUNDATION NEWS

- **C Ramachandran memorial lecture**

The Annual Foundation Day of NFI was celebrated on 25th November 2009. On this occasion, Dr A V Kurpad will delivered the C Ramachandran Memorial Lecture on "The small Indian infant: food for thought".

- **Workshop**

It is widely accepted that climate change is primarily the result of global warming which, in turn, is attributable mainly to the large-scale combustion of fossil fuels by the developed countries over the past few decades. The adverse impact of climate change is likely to be greater in the countries and segments of population which had not contributed substantially to fossil fuel related green house gas emission…. namely, the developing countries. Climate change has the potential to become yet another factor that will lead to an increase in the number food-insecure persons in the world, aggravate global hunger and further widen the gap between rich and poor countries.

Countries of the populous South East Asian region are striving to accelerate economic growth and improve the quality of the life of their citizens, and climate change is emerging as a new threat to these aspirations. NFI and WHO (SEARO) organized a two-day inter-country workshop on "Climate change and its impact on food and nutrition security and food safety in south east Asia". The workshop was held on 26th and 27th November 2009 at India International Centre, New Delhi.

The countries, which participated in the workshop were Bhutan, Maldives, Nepal, Sri Lanka, Thailand and India. Some of the important areas for information sharing included:

Current status

- national assessment of magnitude of climate change
- impact of climate change on food and nutrition security
- impact of climate change on nutritional status

National plans

- national plans to monitor adverse consequences of climate change on food production, storage and food safety
- national plans to mitigate the adverse consequences on food and nutrition security
- national plans to reduce carbon emissions in agriculture and related fields

- **Study Circle**

"Ethics in nutrition and epidemiological research" by Prof Ranjit Roy Chaudhury, 26th October 2009.

"Does maternal strenuous work increase risks for adverse pregnancy outcome?" by Dr Sushma Kashyup, on 23rd December 2009.

- **Engagements**

Dr Prema Ramachandran (Director, NFI)

- attended the meeting of Indian Council of Medical Research Expert Committee on Recommended Dietary Allowances for Indians in November 2009. The Draft approved by the Expert Committee is now being finalized
- participated in the 19th International Congress of Nutrition, Bangkok (4-9 October 2009) and made a presentation on "Nutrition Programmes in India: evolution and current status" in the Asia Highlight Symposium on 'Achievements and Challenges of Nutrition Programme'.
- attended the Asia Pacific Nutrition Congress at Makassar (10-13 October 2009) and made the Plenary presentation on "History of Nutrition Programmes in India: Evolution and Current Status".
- delivered the Academy Oration on "Dual Nutrition Burden challenges and opportunities" in the Annual conference of National Academy of Medical Sciences in Lucknow on November 1, 2009.
- attended the Executive Committee meeting of the Nutrition Society of India and presided over the 21st Srikantia Memorial Lecture at 41st Annual Conference of Nutrition Society of India (20 21 November, 2009) at Hyderabad.

Dr Sarath Gopalan (Deputy Director, NFI) participated as a Moderator in the Panel Discussion on "Probiotics in Health and Disease" in the 3rd India Probiotics Symposium organized by NICED (National Institute of Cholera and Enteric Diseases). Kolkatta and ICMR (Indian Council of Medical Research), New Delhi on 21st - 22nd November, 2009.

NUTRITION NEWS

The 41st National Conference of the Nutrition Society of India (NSI) was held at the National Institute of Nutrition, Hyderabad, on 20th and 21st November 2009. The theme of the conference is "Chronic Diseases the New Pandemic"

Gopalan Oration was delivered by Prof K Srinath Reddy on "Public Health Nutrition in India: Moving from Science to Policy" and Dr HPS Sachdev delivered the Srikantia Memorial Lecture on "Improving Nutrition through Relevant Evidence: Transforming an Indian Dream into Reality".

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