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Effect of Camel Milk Supplementation on Blood Parameters and Liver Function of Hepatitis Patients

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ABSTRACT

Camel milk is unique from other ruminant's milk in terms of composition as well as claimed health effects. Camel milk has potential therapeutic characteristics, such as anti-hypertensive, Anti-diabetic and anti-carcinogenic. Moreover, lactoferrin of camel milk has ability to inhibit the HCV entry into hepatic cell line, peripheral blood cells and replication inside the cells system. This study was designed to explore the potential of camel milk in Pakistan to treat hepatitis C virus infected patients. To achieve this aim, half liter pasteurized camel milk, was taken from same herd, with mean values of pH (6.63) and acidity (0.15), after pasteurization was drunk by the volunteer patients (who were not taking any anti-viral injections or medicine) on alternate days for a period of two months. Blood samples of the patients were collected and analyzed for various biological tests (liver function test, serum protein analysis, complete blood count and prothrombine time), at various intervals i.e. 0, 15, 30, 45, 60 and 75 days. Analysis of variance and mean values were calculated for each biological test of all patients and graph was drawn. Result revealed that camel milk is effective in reducing the elevated level of liver enzymes (ALT, AST and ALP). Our findings demonstrated that camel milk improves total protein, albumin, platelets and lymphocytes level in diseased individuals. On the other hand, camel milk also has ability to reduce the elevated level of bilirubin, globulin and granulocytes. Camel milk failed to show any effect towards improving the level of hemoglobin and leukocytes, and decreasing the erythrocyte sedimentation rate. Patient's epidemiological data revealed that diet play's a critical role during liver disease

and early screening of hepatitis patients is also required to prevent virus transmission to healthy individuals.

Keywords- Hepatitis C virus, camel milk, liver function enzymes, serum proteins, blood count, pasteurization, nutritious.

INTRODUCTION

Worldwide, 2.2 percent of the globe's people are being suffered by hepatitis C virus (HCV).[1] The infection is becoming one of the main health issues of under developed countries, such as Pakistan which has the second top occurrence rate of hepatitis C ranges from 4.5 percent to 8 percent.[2] Researches in Pakistan on little targeted groups such as chronic liver disease patients, medical professionals, blood donors and drug users specify that the occurrence of hepatitis C is as high as 40 percent.[3] The occurrence of HCV in Pakistan is 4 to 6 percent.[4] While a targeted group research in Hafizabad (Punjab) exposed the figure to be 6.5 percent.[5] In another research seroprevalence of hepatitis C was discovered 20 to be 5 to 8 percent.[6]

Several researches demonstrate that positivity rate for HCV is much more in rural population than the peri-urban population of Pakistan.[7] It is troublesome to observe that 66 percent inhabitants of Pakistan is living in the non-urban places where common person either faces the problem of the disease or they are at a danger of acquiring the disease because of several misperceptions and malpractices. It includes inadequate education and poverty, unscreened blood transfusions and unavailability of appropriate health care distribution system. Thus, such escalating scenario has intense implications on sufferers, family members, medical experts and the whole community.[8]

The world's highest HCV prevalence rates are reported in Egypt.[9] Apart from the presently used medical therapies (IFNα-2a, -2b, 15 pegylated, ribavirin), Egyptian patients are being treated by several traditional medicines. Among those, camel milk is used most widely and considerable improvement in general fatigue has been observed in about 50 percent of the patients.[10] Camel milk plays a significant role in human diet in arid countries and hot regions. Camel milk is just like the bovine milk in terms of its essential nutrients[11] and since ancient times being used for curing a number of diseases.[12] In comparison to bovine varieties, camel milk whey contains a higher amount of anti-microbial factors such as lactoferrin, immunoglobulin's and lysozyme[13] whey basic[14] and whey acidic proteins.[15] To the contrary, camel milk whey lacks beta lactoglobulin which is a main serum protein present in milk of other ruminants. Some other whey proteins which have been recognized in camel milk are α lactalbumin, serum albumin, peptidoglycan recognition protein and lactophorin.[16] Camel milk is unique from other ruminant milk in terms of composition as well as functionality as it contains high concentration of immunoglobulin's and insulin. It is high in vitamins (A, B-2, C and E) and minerals (sodium, potassium, iron, copper, zinc and magnesium) and low in protein, sugar and cholesterol.[17,18] Vitamins present in camel milk have antioxidant activity and helpful in controlling tissue damage caused by harmful substances.[19]

In present study, camel milk was used for the treatment of hepatitis C.

Chronic hepatitis C patients were provided camel milk for a period of two months on alternate days. Then improvements in liver enzymes and blood parameters were observed by taking and analyzing patient's blood samples.

MATERIAL AND METHODS

Procurement of milk and pasteurization

Fresh raw bulk camel milk was collected from the same herd from a village 10 km far from University of Agriculture, Faisalabad for 60 days in a cool airtight container on alternate days. Milk was pasteurized at 72°C for 5 minutes.[20] Milk was studied for its physico-chemical analysis in Dairy laboratory of National Institute of Food Science and Technology, University of Agriculture, Faisalabad.

pH

The pH of milk was measured with digital pH meter (model No. wtw82362 Wellheim) 4 and 7 pH buffers were used for the calibration of pH meter. After calibration, 20 mL of milk was taken in a beaker and then electrode was immersed in the milk until constant reading attained.[21]

Acidity

Acidity of milk was determined by titration method given in AOAC (2000). Acidity was determined by taking 10 mL of milk in 100 mL Erlenmeyer flask and after adding 2-3 drops of phenolphthalein, it was titrated against 0.1N NaOH until development of pink color. The percent acidity was calculated by following formula;

$$\text{Acidity (\%)} = \frac{0.009 \times \text{Vol. of NaOH used (mL)}}{\text{Wt. of Sample}} \times 100$$

Milk administration to HCV patients:

Half liter pasteurized camel was provided to each volunteer HCV infected volunteer patients on alternate days for a period of two months.

Epidemiological studies:

All the patients were signed a consent form in which necessary detail about the study was provided. A detailed questionnaire was prepared before carrying out the study. The information obtained from the patients included: age, sex, marital status, disease duration, infection, diet, medication, associated diseases, family history of the disease, awareness among patients about virus transmission, precautionary measures taken by the patients and general observations.

Blood analysis

Blood Samples of selected patients were taken at 0, 15, 30, 45, 60 and 75 days intervals by disposable syringes. Last blood sample after 75 days interval was taken (when patients didn't take camel milk) to check the efficacy of the treatment and sustainability of the obtained results. Collected blood sample of the patients were subjected to analysis in the laboratories of Liver Centre, District Head Quarter Hospital, Faisalabad and in Bahawalpur Victoria Hospital.

Liver function test (LFT)

LFT was carried out by using Microlab 300 for the following parameters:

- Aspartate aminotransferase (AST)
- Alanine aminotransferase (ALT)
- Alkaline phosphatase (ALP)
- Bilrubin

Prothrombin time (PT):

Prothrombin time was performed using PT analyzer.

Serum proteins:

Blood serum proteins were measured by using Microlab 300. Serum proteins were determined at 0, 60 and 75 day

intervals. In serum proteins following parameters were observed:

- Total Protein
- Albumin
- Globulin

Complete blood count (CBC):

Complete Blood Count (CBC) was performed by using Hematology Analyzer (also called as CBC Analyzer). Complete blood count was examined at 0, 60 and 75 days intervals. In CBC following parameters were observed:

- HB (Hemoglobin)
- Total leukocyte count (TLC)
- Platelets count
- Erythrocyte sedimentation rate (ESR)
- Granulocytes
- Lymphocytes

RESULTS AND DISCUSSION

Hepatitis C virus (HCV) is the major etiologic agent that causes severe damage to liver. Apart from medical therapies, several traditional medicines are being used worldwide for the treatment of hepatitis C. Among them camel milk is of immense importance which is attracting a large community due to its nutritional value and medicinal properties. Recently in vitro studies conducted to check the potential of camel milk lactoferrin against hepatitis C Virus and it was observed that camel milk lactoferrin remarkably inhibit the virus entry into hepatocytes and significantly effect its proliferation. In our study we used camel milk to check its effect on liver function of chronically infected hepatitis C patients. Volunteer patients were selected from the city of Faisalabad. The data describing disease history, dietary habits and awareness about the severity of disease was collected for all the selected patients. Each Patient was provided half liter of fresh pasteurized camel milk on alternate days filled in airtight bottles. The milking was performed in our presence to ensure the purity of milk as well as to minimize the chances of any type of contamination. After pasteurization, milk filled in bottles was kept in ice cold container for the delivery to patients. Physico-chemical as well as compositional analysis was also done for the collected raw milk on weekly basis. Blood samples of patients were collected fortnightly at 0, 15, 30, 45, 60 and 75 days. After 60 days, none of patients took milk and again blood sample was taken after 75 days to check the individual response towards disease without camel milk administration. All the collected samples were subjected to analysis (LFT, PT, Serum Proteins and CBC) in the Laboratories of Bahawalpur Victoria Hospital and Liver Centre, District Head Quarter Hospital, Faisalabad.

Physico-chemical analysis of camel milk

pH is the negative log of the hydrogen ion concentration and thus is a very crucial factor to determine the activity of enzymes, dissociation of acid and also the structural conformation of protein. The acidic and bitter taste is also caused due to the pH that is the non-dissociation of the acids. In the manufacturing of dairy products pH plays a significant role to determine the end product quality. Fresh camel milk pH is ranges from 6.5 to 6.7.[22] Table 1.1 shows that pH of fresh camel milk varied from 6.60 to 6.67. The grand mean value of pH was 6.63 with a standard deviation of 0.04. The titrateable acidity of camel milk is the measure of lactic acid formed in camel milk. Titratable acidity is between equivalents of 0.13-0.16% lactic acid in fresh camel milk.[23] Table 1.1 also shows that camel milk acidity varied from 0.13 to 0.17%, for a period of nine weeks. The grand mean value of acidity was 0.15% with a standard deviation of 0.007.

Epidemiological findings

Patients selected for the study were neither taking anti-viral injections nor any kind of medication. Some patients were taking medicines but they left before the beginning of the treatment. Selected patients were belonged to different aged groups from 25 years to 60 years. Similarly, the disease duration of patients also varied from one month to eight years.

Most of the selected patients were females. None of the patient clearly knew the onset of hepatitis. All the patients were came to know about the disease on clinical observations when symptoms of disease began to appear. It indicates that people hardly knew about the infection and the virus.

Data collected about diet of the patients demonstrated that about 40 percent of patients were malnourished as they were taking just one meal per day. About all those malnourished patients were taking vitamin complex syrups and mineral supplementations, as they were deficient for several vitamins and minerals. On further investigation, we came to know that those patients had poor economic status, and there family and income issues did not allow them to use fruits and vegetables extensively.

Data collected after interviewing the patients revealed that patient's blood relatives (sisters, brothers and mothers) also suffered from hepatitis. About 50 percent of patients told, that this disease is present in their other family members as well. About 40 percent of patients didn't have any idea about the transmission of disease. Date obtained also illustrated that none of the patients were alcoholics or drug abusers.

Analysis for liver function test (LFT)

Liver function/biochemical tests figure out different enzymes launched by the liver into blood stream. The level of these liver enzymes may be higher when liver is damaged by certain agents like viruses.

Alanine aminotransferase (ALT)

Alanine aminotransferase (ALT) formerly known as glutamate pyruvate transaminase (GPT or SGPT), is an enzyme formed in hepatocytes (liver cells). It is also present in pancreatic and heart cells. Viruses, toxins, alcohol use, drugs and other substances can harm hepatocytes. ALT level may be relevant to the quantity of liver cells that die. It may also be attached to swelling in the liver. A normal value ranges between 9-43 U.L-1.[24, 25]

Figure 1.1 shows the elevated level of ALT in all the patients except one patient at the beginning of the treatment due to chronic liver infection. After a treatment of 75 days, grand mean of ALT for each patient was found lower than the mean level of ALT at the beginning, except for one patient. Our study reflects the results of Al-Fartosiet al. (2011) that used camel milk to reduce the elevated level of ALT in paracetamol induced hepatotoxic rats.[26]

Alkaline phosphatase (ALP)

It is discovered in nearly every body tissue. Liver, kidneys, intestines, bones and the placentas of pregnant females contain the highest level of ALP. A large part of the alkaline phosphatase in blood comes from bones and liver in case of adult male and female. Examining the blood for ALP is one way to discover the normal working of hepatic bile ducts. Levels of ALP are greater in people with liver disease, cirrhosis and other diseases. Some medicines may also be the cause of elevated ALP levels. Its normal value ranges from 90 to 306 U.L-1.[24,25]

Figure 1.2 demonstrates the action of camel milk in controlling the alkaline phosphatase level. It is indicated that our results were highly significant. It explains that during first 15 days of treatment, ALP level is reduced in four patients and increased at a very low rate in two patients and remained constant in one patient. While for 15 to 30 days period, ALP level was

increased in four patients and decreased in three patients. But from 30 to 45 days period, a significant decrease in ALP level of all the patients was recorded. Then after 60 days, it again raised in about five patients but at a reduced rate. But for last 15 days when patients were not taking camel milk, ALP level increased at a very high rate. Thus, we can conclude that camel milk is capable of reducing ALP level in the liver disease or at least reduces the rate of elevation of ALP.

Aspartate aminotransferase (AST)

Aspartate Aminotransferase (AST) formerly known as glutamate oxaloacetate transaminase (GOT or SGOT), is an enzyme present in hepatocytes (liver cells). Other cells like those of muscles and heart also contain significant amount of this enzyme. Level of AST in the blood increased upon the death of liver cells.

Figure 1.3 clearly demonstrates the level of AST for all the patients at different intervals. It can be seen in the figure that the level of AST of all the patients varied on different time intervals. A gradual decrease in AST of 7th patient was observed till 60 days of treatment, then for last 15 days minute increase was observed. A dramatic rise in the AST level of 1stpatient was observed after 75 days showed that when patient left taking milk, the level of AST increased at a higher rate. For the same patient the level of AST was lower at 60 days, as compared to the initial level at the start of the treatment.

Total bilirubin

Bilirubin is the major compound produced when aged red blood cells are split up. Initially, some other substances are produced by the breakdown of red blood cells. Hemoglobin is one of these substances. Bilirubin levels are generally normal in HCV patients until a lot of liver is damaged. Its normal value ranges between 0-1 mg.dL-1.[24,25]

Figure 1.4 shows the total bilirubin level in all the hepatitis patients before and after the treatment of camel milk. It is shown that there is significant fluctuation in total bilirubin level of most of the patients. In some patients it was decreased, while increased in others during the study period.

Analysis for prothrombin time (PT)

Prothrombin time (PT) also known as International Normalized Ratio (INR), is a test for blood clotting. Prothrombin time (PT) is a test which is performed to observe how swiftly the blood is capable to produce a clot. Many proteins required for the formation of clot are produced by the liver. Normal amounts of proteins required for clot formation may not be produced by the individuals suffering from hepatitis and cirrhosis. The Prothrombin time is a sign of the liver's capability to generate proteins. In chronic liver infection, the PT is usually not raised until the individual has much damaged liver and cirrhosis. Its normal value is 14 sec.[24,25]

Figure 2.1 shows the changes in the PT at different time intervals during the disease treatment. The figure shows, that PT of all the patients remained almost normal. However, a slight increase in the patient's PT was recorded after 30 days, which again come to normal in proceeding days of treatment.

Analysis for serum proteins

Total protein

Total protein is the measurement of all proteins in the blood serum. Many of the proteins that are found in the blood are produced by the liver. By calculating the total amount of protein in the blood, we can understand that how good a liver is performing its function of generating proteins. Total protein produced by the liver

include mainly globulin and albumin are hardly raised and low with kidney disease, malnutrition, poor functionality of liver and other unusual conditions. Its normal value ranges between 6.2-8 g.dL-1.25

Figure 3.1 demonstrates the same results that mentioned above. It was observed that a slight increase in protein level of all the patients occurred after 60 days of camel milk treatment then it again decreased when patient were not drinking milk.

Albumin

In chronic liver disease, levels of albumin are usually normal until a lot of liver is damaged. Its normal value ranges from 3.5 to 4.8 g.dL-1.[24, 25]

It was observed that a slight increase in protein level of all the patients occurred after 60 days of camel milk treatment then it again decreased when patient were not drinking milk.

Globulin

Globulin is a part of total protein and its raised level is noticed during chronic infection and liver disease such as liver necrosis. Elevated levels of globulin are also associated with ulcerative colitis, kidney disease, leukemia, multiple myelomas, rheumatoid arthritis and autoimmune problems such as systemic lupus and collagen diseases. Its normal value ranges from 1.8 to 3.2g.dL-1**.**

It was observed that by drinking camel milk globulin level was reduced in some patients. It means camel milk does have the ability to lower the level of globulin in the blood of hepatitis patients.

Complete blood count analysis

Complete blood count is a list of assessments showing the amount and features of cells flowing in the blood. The CBC is used to show a common picture of overall health. It is also used to help identify illnesses, when individuals are not feeling good and to observe treatment of many disease states such as leukemia or anemia.

Hemoglobin

Calculating hemoglobin provides a precise picture for the capacity of blood to hold and carry oxygen. The cells use that oxygen for the production of energy. Generally, women have lower hemoglobin and red blood cells values than men. Its normal value ranges from 11.9-17.1 g.dL-1.[25,27]

During the treatment of 75 days hemoglobin level was increased in only one patient, while decreased in all other patients. Results showed that there was not a considerable change in hemoglobin level throughout the treatment.

Total leukocyte count (TLC)

Body's ability to battle against illnesses can be evaluated using total leukocyte count information. Leukocytes (white blood cells) are integral part of body's defense system. They are produced by stem cells present in the bone marrow and are numerous and larger in size as compare to red blood cells. Leukocytes function includes the reaction to an inflammation or injury. There are several different types of WBC such as macrophages, lymphocytes and granulocytes. A high level of total leukocyte count indicates that our body is effectively battling against diseases. A low level of total leukocyte count indicates that our body is not able to battle against diseases effectively. Low level of total leukocyte count may be caused by progressive HCV infection or from HCV medicines. Its normal value ranges from 4000-11000 counts.mm-3.[24, 25, 27]

It shows that TLC was significantly decreased in one patient during the whole treatment, while no considerable increase or decrease was observed for other patients.

Platelets (PLT) count

A low level of platelets is an indication of increased threat of bleeding. Thrombocytopenia can be caused by advanced liver damage and HCV medicines. Its normal value ranges from 150000-400000 counts.mm-3.[24, 25, 27]

Grand mean values of platelets were increased in three patients and decreased in four patients. It was observed that after the treatment of 60 days, platelets level increased significantly in three patients and decreased in four patients. For last 15 days of the treatment, platelets level was increased in just one patient and decreased in rest of patients. During last 15 days patients were not provided with camel milk, so platelets level was decreased (in six patients out of seven) due to the effect of HCV. Here, we can conclude that camel milk is somehow effective for the improvement of platelets which are depleted due to the liver disease.

Erythrocyte sedimentation rate (ESR)

The erythrocyte sedimentation rate (ESR) measurement is an affordable and easy laboratory test for chronic inflammatory activity.[28]The test determines the distance fallen by the erythrocytes after one hour in a vertical column of anti coagulated blood under the action of gravity. ESR is affected by wide range of factors. Any situation that raises fibrinogen (e.g. inflammation, infection, malignancy, heart disease, diabetes and pregnancy) may also increase the ESR.[29]Other aspects that cause the elevation of ESR are age, sex and anemia. ESR is a non sensitive and non specific test of inflammation and there is no proof to support the use of the ESR in asymptomatic patients. Its normal value ranges from 2-18 mm.1sthr-1**.**

ESR of some patients increased and of some patients decreased during the study as shown in figure 4.4. At the beginning of the treatment, ESR of all the patients was high and at the end of the study, ESR of just one patient moved down to normal.

Granulocytes count

Granulocytes (neutrophils) count is used to figure out an individual's capability to fight against common infections. Being most populated of the circulating leukocytes, they are also the shortest resided in circulation. After formation and launch by the marrow, they only flow for about eight hours before going to the tissues, where they stay for about seven days. The purpose of granulocytes is to demolish and eliminate bacteria. Granulocytes appear first at the site where inflammation occurs. Therefore, their figures elevate significantly soon after a damage or inflammation. In addition to swelling, granulocytes levels raised with such circumstances as heart attack, stress and necrosis. Low levels of granulocytes (neutropenia) means the body is unable to fight against an infection. Chemotherapy and HCV medicines can cause neutropenia. Its normal value ranges from 40-75 %.[27]

Fig. 4.5 Granulocytes in the blood before and after the treatment with camel milk

It is shown that by using camel milk granulocytes level decreased in five patients. Decreased granulocyte is an indication of reduction in infection. But when patients didn’t take camel milk, granulocytes level again raised.

Lymphocytes count

Lymphocytes have complex and wide range of functions. Lymphocytes are the most populous of the circulating leukocytes after neutrophils. T cells and B cells are two main types of leukocytes that fight against viral infect ions. Lymphocytes provide immunity to the cells and also play a significant role in the production of immunoglobulins. Levels of lymphocytes are raised during infections caused by viruses, but usually low level of

lymphocytes is observed in such diseases as lymphoma, hepatitis and AIDS. Its normal value ranges from 20-45 %.[27]

Lymphocytes level fluctuated considerably in the whole period of study. After 60 days of treatment, lymphocytes level was found lower in three patients, higher in three patients and constant in one patient. Here, it can be predicted that camel milk improved lymphocytes level in some patients, but when patients didn't use camel milk, the lymphocytes level was reduced.

CONCLUSION

Hepatitis C is a major global issue, which needs to be considered with intense care to get maximum applicable solutions to manipulate this disease. Awareness among people and early screening of diseased individuals is required for the effective manipulation of HCV. Diet plays a critical role during liver disease, so it must include extensive use of fruits and vegetables to build body's immunity and defense system against the diseases. Poor economic status of people is a hurdle to achieve that goal, which needs to be focused. Moreover, oily and junk foods should also be avoided during the disease to protect the body organs from free radical damage. We found that camel milk is very effective in decreasing the elevated level of liver enzymes. It also slows down the elevation rate of liver enzymes which is a sign of improvement.Camel milk also has ability to reduce the elevated globulin level and to increase the total protein and albumin levels that are depleted during liver disease. Camel milk is also found effective in improving the platelets and lymphocytes level that are reduced during the infection. It also has ability to reduce granulocytes level depicting the reduction in infection. Camel milk didn't prove itself to play some role in improving the level of hemoglobin and total leukocyte count, and in decreasing erythrocyte sedimentation rate. Camel milk is claimed to have medicinal value, but its standardization (quantity to be taken by an individual) is required to avoid any health problems. Taste profile of camel milk is an issue, which needs to be focused. Awareness among people should be created about the health benefits of camel milk.

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Table 1.1. Physico-chemical analysis of raw camel milk

Weeks	pH	Acidity %
1	6.61±0.03	0.16±0.008
2	6.63±0.04	0.15±0.007
3	6.61±0.03	0.16±0.008
4	6.66±0.06	0.14±0.007
5	6.62±0.03	0.16±0.008
6	6.67±0.06	0.13±0.006
7	6.6±0.03	0.17±0.008
8	6.63±0.04	0.15±0.007
9	6.61±0.03	0.16±0.008
Mean	6.63±0.03	0.15±0.007

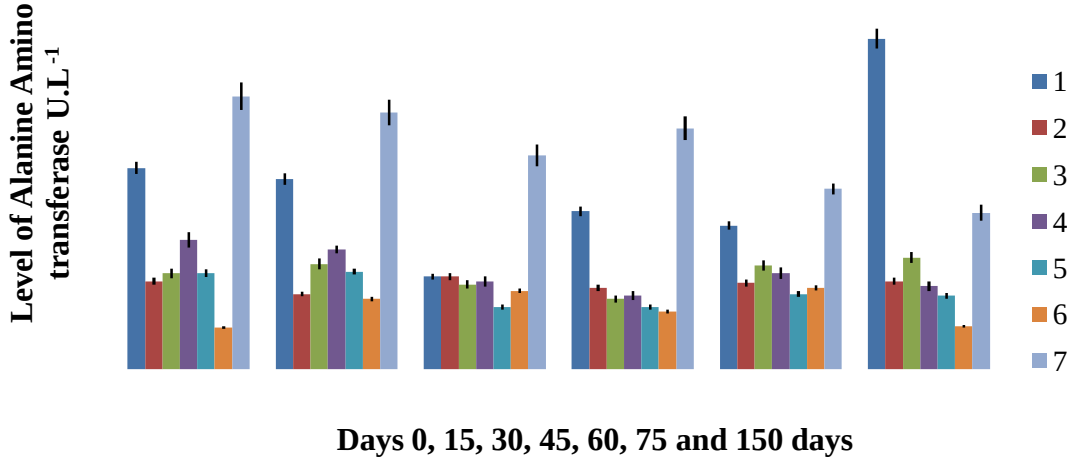


Fig. 1.1 Alanine aminotransferase level in the blood before and after the treatment with camel milk

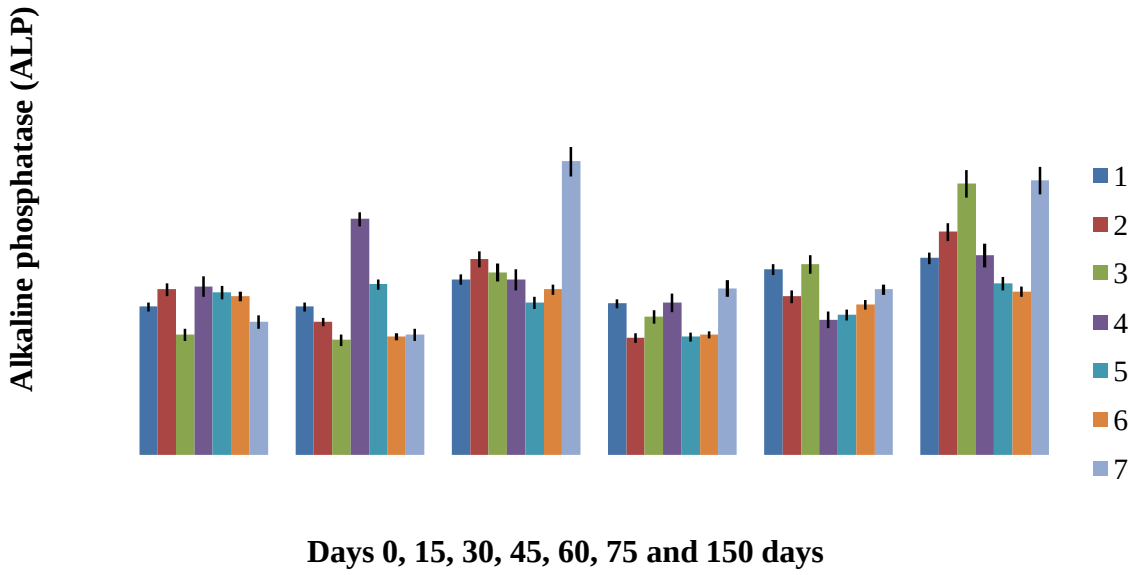


Fig. 1.2 Alkaline phosphatase level in the blood before and after the treatment with camel milk

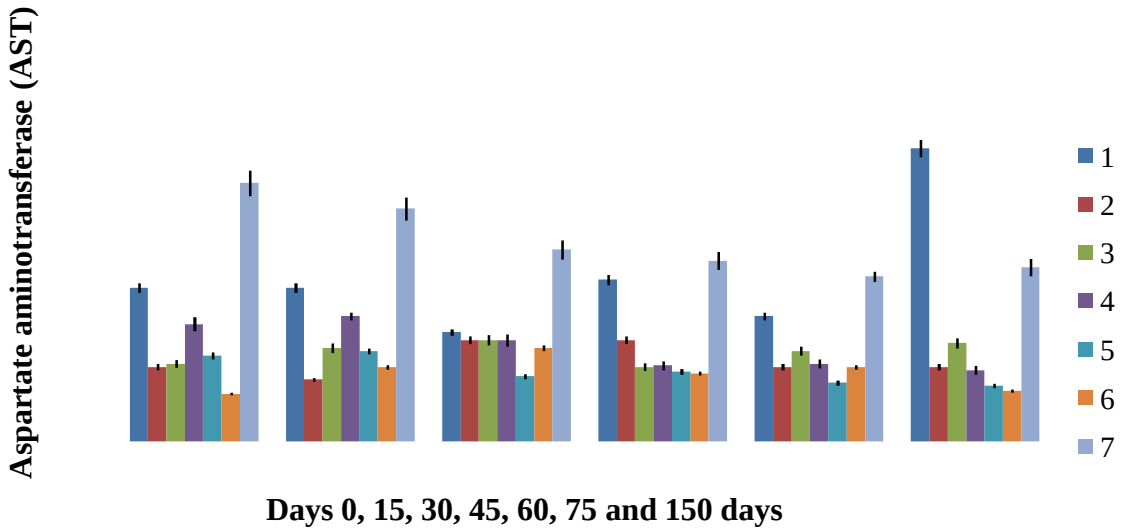


Fig. 1.3 Aspartate aminotransferase level in the blood before and after the treatment with camel milk

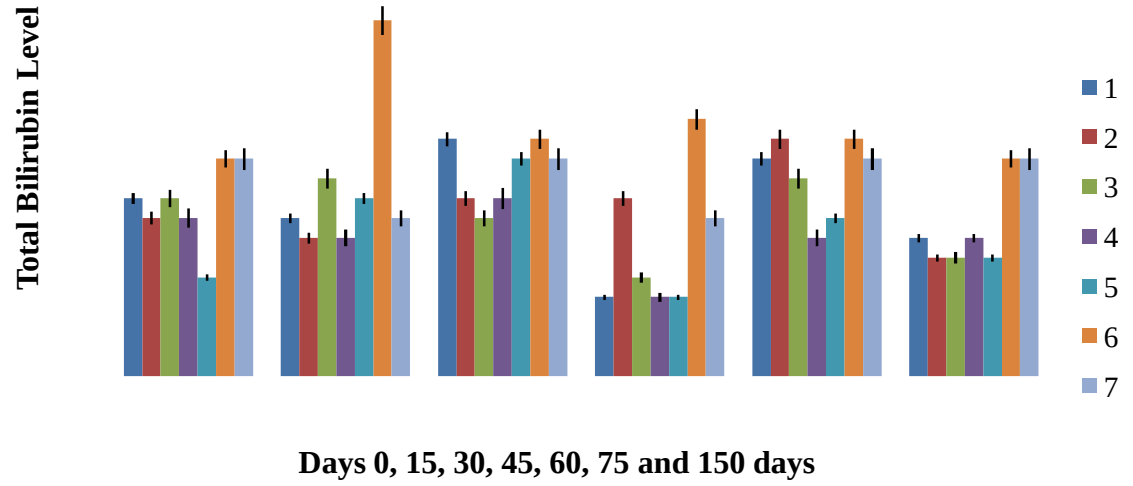


Fig. 1.4 Total bilirubin level in the blood before and after the treatment with camel milk

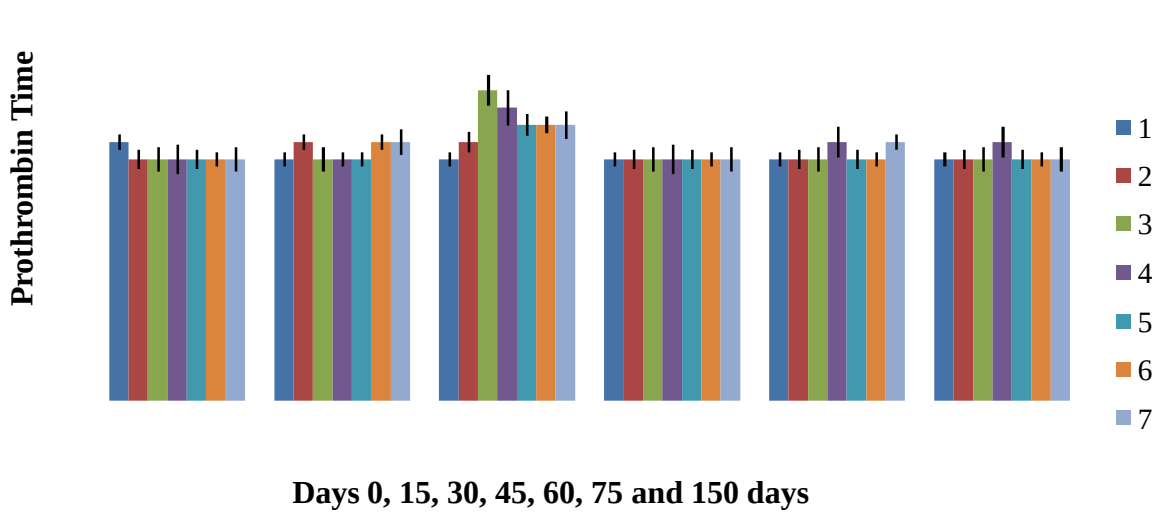
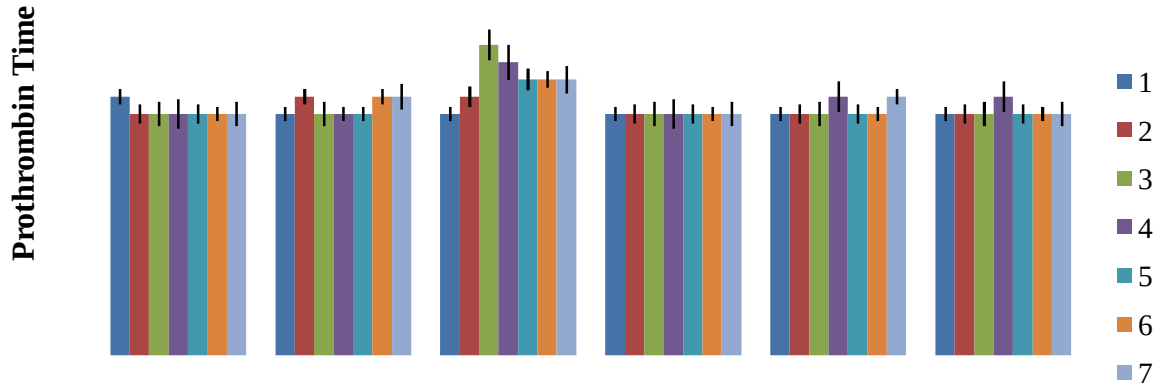
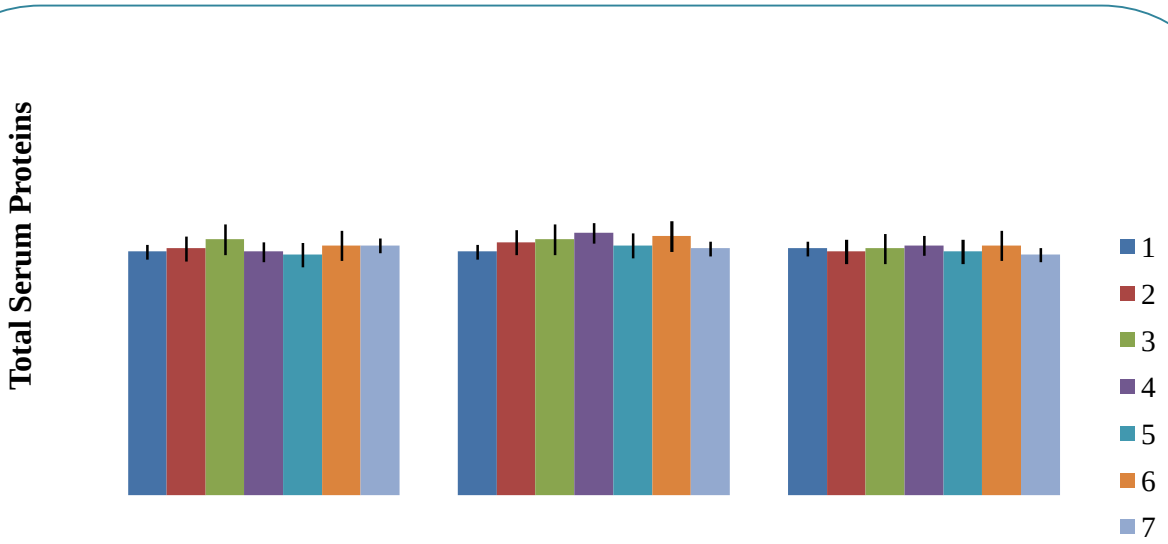


Fig. 2.1 Prothrombin time of patients before and after the treatment with camel milk



Days 0, 15, 30, 45, 60, 75 and 150 days

Fig. 2.1 Prothrombin time of patients before and after the treatment with camel milk



Days 0, 15, 30, 45, 60, 75 and 150

Fig. 3.1 Total protein in the blood before and after the treatment with camel milk

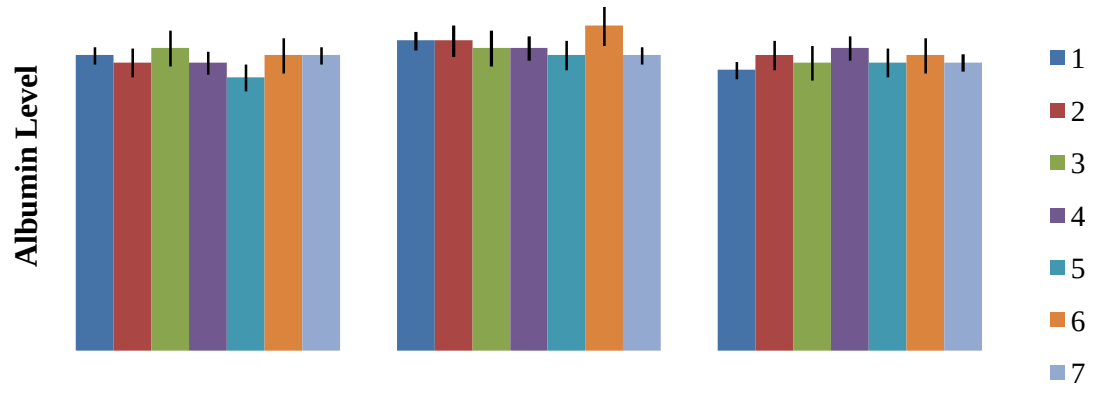


Fig. 3.2 Albumin level in the blood before and after the treatment with camel milk

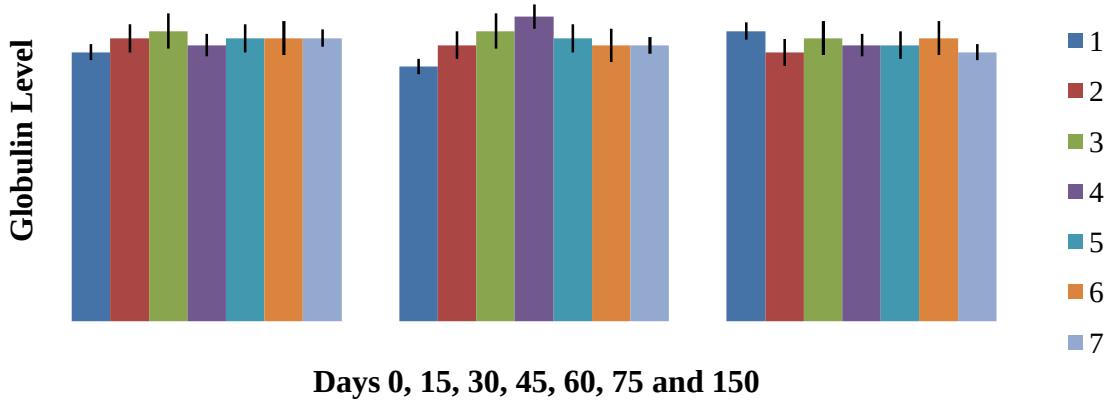


Fig. 3.3 Globulin level in the blood before and after the treatment with camel milk

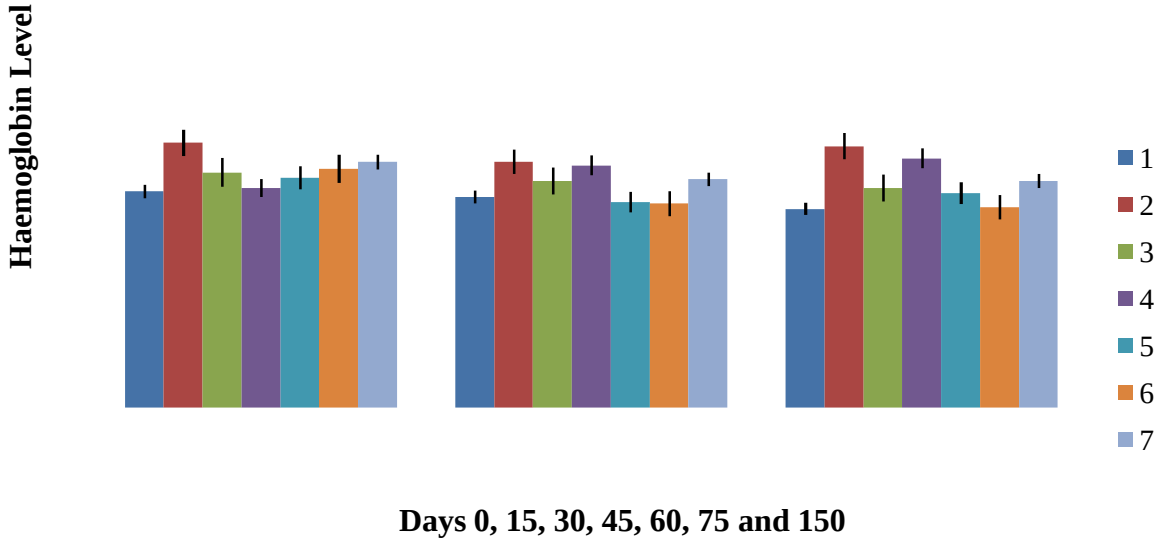


Fig. 4.1 Hemoglobin level in the blood before and after the treatment with camel milk

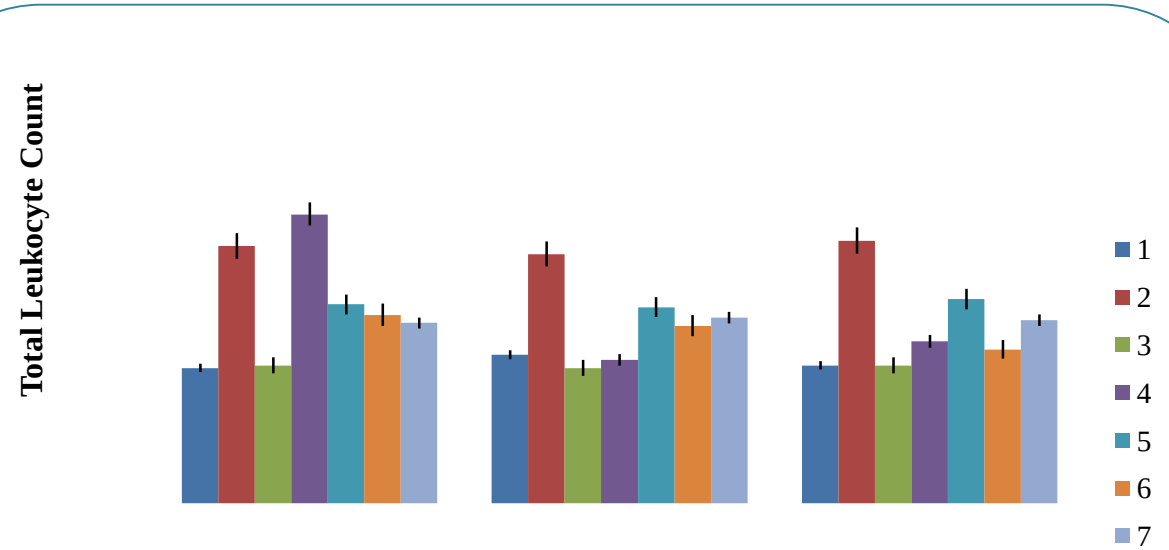


Fig. 4.2 Total leukocyte count in the blood before and after the treatment with camel milk

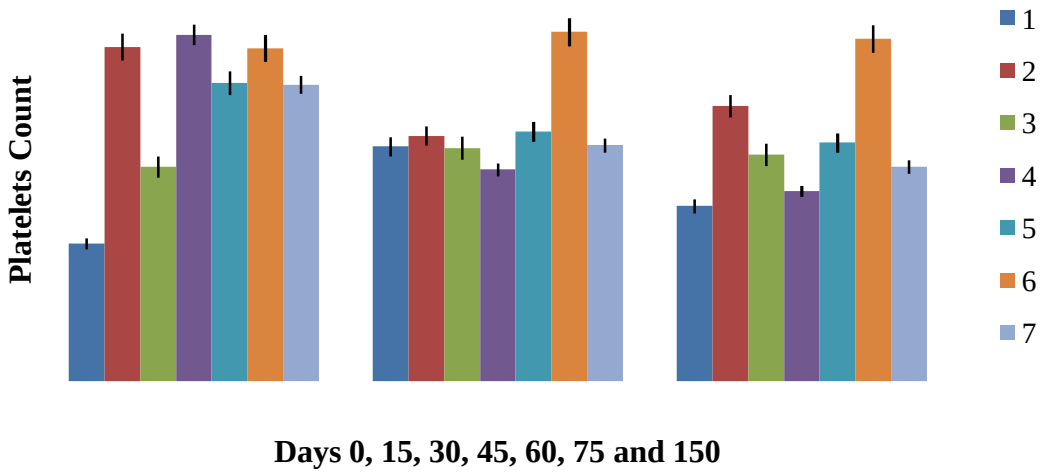


Fig. 4.3 Platelets count in the blood before and after the treatment with camel milk

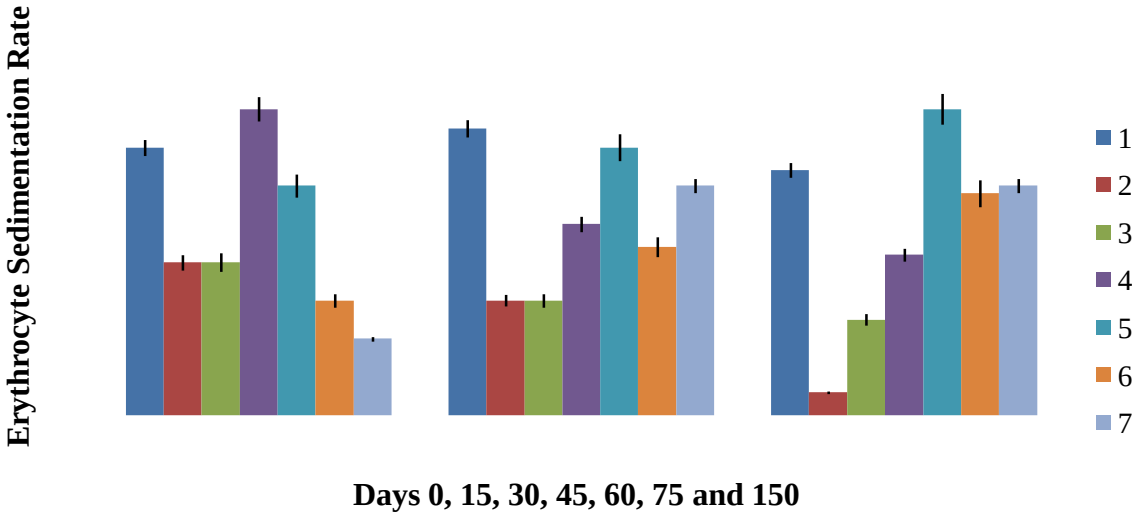


Fig. 4.4 Erythrocyte sedimentation rate of the blood before and after the treatment with camel milk

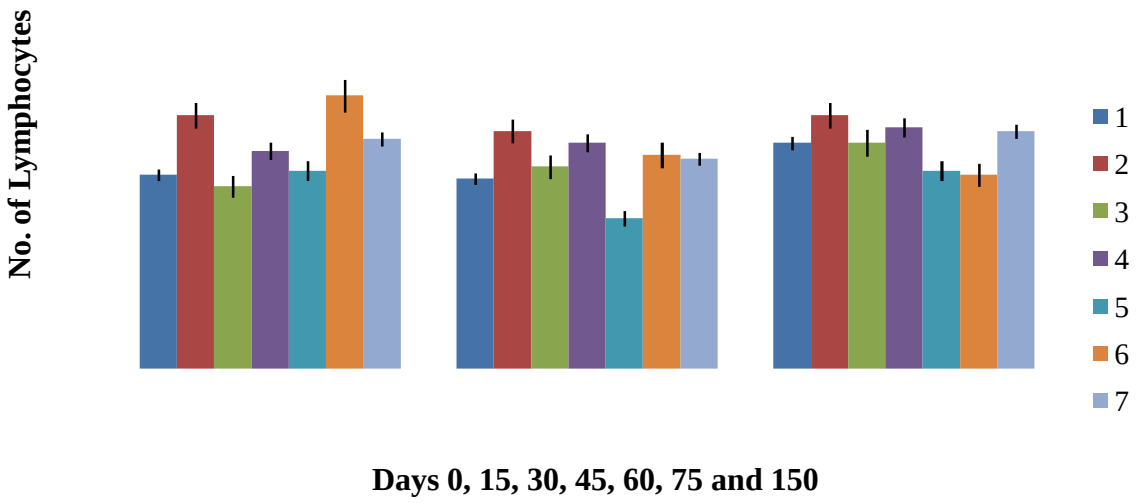


Fig. 4.6 Lymphocytes level in the blood before and after the treatment with camel milk