



Hematological and Some Liver Function Tests In Patients with Malaria

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Abstract

Malaria is a major health problem in India. Pathogenesis of malaria is based mainly on extensive changes in hematological and biochemical parameters. Malaria is the most dangerous parasite disease mostly caused by the parasite of genus Plasmodium.

We have estimated the Hemoglobin and total WBC count and serum bilirubin and serum enzymes such aspartate aminotransferase and alanine aminotransferase in malaria patients and healthy control. We found significantly decreased hemoglobin and total WBC count and significantly increased bilirubin, aspartate aminotransferase and alanine aminotransferase in patients with malaria as compared to control. Our study indicates that liver enzymes AST and ALT were significantly increases in malaria patients as compared to control subjects. Therefore these enzymes may be useful in diagnosis of malaria subjects.

Keywords: Bilirubin, Aspartate aminotransferase, Alanine aminotransferase.

Introduction

In India, malaria is a major health problem; it is one of the main burdens in terms of morbidity and mortality. Pathogenesis of malaria is based mainly on extensive changes in hematological and biochemical parameters⁽¹⁾.

Malaria is the most dangerous parasite disease transmitted through insect vector such as Anopheles mosquitoes to human. It is mostly caused by the parasite of genus Plasmodium. Various parasite are known to cause malaria are Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae and plasmodium ovale. Out of these Plasmodium falciparum mostly cause dreadful cerebral malaria to attack in brain⁽²⁾.

In India, 70% infections are reported due to Plasmodium vivax, 20 to 30 % due to Plasmodium falciparum, 4 to 8% due to mixed and less than 1% due to Plasmodium malariae. This disease in human is attributable to the direct effect of red blood cell invasion and destruction⁽³⁾.

Hence this research attempts to evaluate the changes in both hematological parameters and some liver function test in patients with malaria.

Materials and Methods

The present study was carried out in the Department of Biochemistry, Government Medical College and Hospital, Miraj, P.V.P.G.H Sangli and District Malaria Centre, Sangli (Maharashtra,

India). Study protocol was approved by ethical committee, Government Medical College, Miraj.

Sample size: The study group includes total 60 subjects. This includes patients as well as control.

Patients: Total 30 patients attending at Out Patient Department and admitted at the In Patient Department infected by *P. vivax*, *P. falciparum* and mixed infected by both *P. vivax* and *P. falciparum*.

Control: The 30 healthy controls were taken in all age group with both genders attending the OPD of Government Medical College and Hospital, Miraj during the same period.

Inclusion Criteria: The symptomatic patients both male and female belonging to age group between 5 to 50 years were included in the study. Detailed history was taken and complete physical examination was performed by the physician.

Exclusion Criteria

1. Those patients who were having fever with or without rigors but were negative for malaria parasite,
2. Those having jaundice of other causes than malaria,
3. Those who were taking hepatotoxic drugs,
4. Serological positive patients of hepatitis and
5. Pregnant women were excluded from the study.

Blood Collection

Informed consent was obtained from the participants. About 3 ml blood was drawn from an antecubital vein through disposable syringe with all aseptic precautions. 1ml blood was collected in EDTA bulb for hematological investigations and remaining blood was collected in plain bulb and were allowed to clot. After two hours, serum was separated by centrifugation at 3000 rpm for 5 minutes at room temperature and pipette out, labeled and stored at 20⁰c in freezer for later analysis. Serum sample was used for determination of serum bilirubin, AST and ALT. Hemoglobin level was measured by Cyanmethemoglobin method ⁽⁴⁾ and values were expressed as gm%. Total W. B. C. count (TLC) estimated by hemocytometer method (4) and levels were expressed as cumm. Serum bilirubin estimated by DMSO ⁽⁵⁾ and expressed in mg/dl. Serum AST and ALT by IFFC kinetic methods ^(6, 7) and the levels were expressed as IU/l. The data were evaluated statistically by using student 't' and 'F' test, 'F' value was calculated by Minitab and SPSS software.

Result

We observed significant ($p < 0.001$) decrease in the levels of hemoglobin and total leucocyte count in malaria patients as compared to control. Whereas, we found significant ($p < 0.001$) increase in serum bilirubin, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in patients with malaria as compared to control.

Table no 1: Hematological and some liver function tests in malaria patients and control

	Patients (n=30)	Control (n= 30)	F value
Hb (gm%)	10.07 ± 1.86*	11.23 ± 0.79	8.347
TLC/cmm	6363 ± 1294.1*	8430 ± 739.13	7.83
Serum Bilirubin (mg/dl)	2.4 ± 1.98*	0.8 ± 0.10	43.15
AST (IU/L)	55.96 ± 18.83*	28.10 ± 6.90	13.96
ALT (IU/L)	52.40 ± 19.45*	28.90 ± 5.7	35.64

* $p < 0.001$, highly significant

Discussion

We observed significant ($p < 0.001$) reduction in hemoglobin concentration in malaria patients as compared to control. Hemoglobin may be the major food source of malaria parasite. After

breakdown of hemoglobin, amino acids are liberated which may be used by parasite. This may be the possible mechanism of reduction of hemoglobin level in malaria patients⁽⁸⁾. Hemoglobin was significantly reduced in malaria may be due

to reduced synthesis of red blood cells (RBCs) and increased breakdown of red cells by parasites (9,1,10).

Anemia is one of the most common complications of malaria, occurring as a direct and indirect consequence of the infection and destruction of erythrocytes by Plasmodium parasites. Apart from nonstop destruction of infected erythrocytes, higher turnover of non-infected RBCs, dys-erythropoiesis and other mechanisms have been implicated to cause anemia in malaria (11).

We found significantly decreased total leucocyte count in malaria patients as compared to control. This may be due to decreased RBC synthesis. WHO reported that low leukocyte count may be used as probable indicator for malaria in endemic countries. The decrease in lymphocyte counts associated with malaria may be due to reflecting redistribution of lymphocytes with sequestration in the spleen (10).

In our study we found increased serum bilirubin, AST and ALT activities in patients suffering from malaria as compared to control. The cause of elevated bilirubin may be due to intravascular hemolysis and hepatic dysfunction (12). Impairment of hepatic function is common in severe malaria, acute malaria also badly affects the function of cytochrome P450 microsomal enzymes involved in detoxification reaction (13). Intravascular hemolysis of parasitized and non-parasitized red blood cells may be considered as an important factor in the development of mild to moderate jaundice (14).

AST and ALT are synthesized in the liver hence; it is possible that initial inflammation of the liver may increase their production due to infection of plasmodium to the liver. Symptoms of these infections associated with vomiting could have caused increased hemo-concentration and lead to initial increase in serum AST and ALT due to the breakdown of liver cells after the infection (1).

Malarial spread to the human host is established by sporozoites infection to the liver. The malarial sporozoite once injected into the blood by the bite of female anopheles mosquitoes is attached to the

hepatocytes through the receptor for thrombospondin and properdin. Here these sporozoites become mature to form tissue schizonts or become dormant hypnozoites. Tissue schizonts amplify the infection by producing large number of merozoites. Merozoites infect and ruptures the liver cells and escape back into the circulation and continues the infection. These changes in hepatocytes may lead to the leakage of parenchymal (transaminases) and membranous (alkaline phosphatase) enzymes of the liver to the circulation. Hence increase in liver enzymes AST, ALT and ALP observed in malaria infected patients (15). The elevation in serum activities of hepatic enzymes; transaminases and alkaline phosphatase are the markers of liver damage. SGPT is a specific enzyme of liver (15,10,16).

The earlier studies reported a significant reduction in hemoglobin concentration and significant elevation in serum bilirubin, AST and ALT in patients with malaria as compared to control (1,15, 10, 17).

Our study indicates that liver enzymes AST and ALT were significantly increases in malaria patients as compared to control subjects. Therefore these enzymes may be useful in diagnosis of malaria patients.

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