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Original Research Article

Liver function abnormalities in falciparum malaria

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ABSTRACT

Background: Malaria still continues to be a major killer of mankind especially in developing countries. Almost all deaths and severe disease are due to *Plasmodium falciparum*. It is observed that the patients of falciparum malaria with liver function abnormalities are more vulnerable to the development of complications like cerebral malaria, anemia, renal failure, acute respiratory distress syndrome, etc.
Methods: 50 cases of *Plasmodium falciparum* malaria diagnosed by peripheral smear examination or by immuno-chromatographic test - falci check, pan malaria or by rapid optimal test were included in the study. All these patients were subjected to blood investigations like hemoglobin level, total leukocyte count, differential count, renal function tests, liver function tests and random blood sugar.
Results: Serum bilirubin level was raised in 66% of cases with 28% of cases showing levels above 3.0g/dL. Patients with clinical jaundice showed mean 2-3 fold raise in AST levels along with ALT levels. 64% of cases had normal ALK levels. Serum proteins found to be normal in 92% of cases.
Conclusions: Deranged liver functions are commonly seen as a complication of severe malarial infection. Presence of raised hepatic enzymes with near normal coagulation parameters, in presence of documented malarial infection should suggest presence of malarial hepatopathy.

Keywords: Falciparum malaria, Hepatopathy, Jaundice, Renal failure

INTRODUCTION

Malaria is an important parasitic disease of mankind known to exist for thousands of years. In spite of phenomenal progress in medical science in latter half of the century, malaria still continues to be a major killer of mankind especially in developing countries.[1] Malaria was nearly eradicated from India in the early 1960s but the disease has reemerged as a major public health problem. Malaria has returned in the 1990s with new features not witnessed during the pre-eradication days and malaria control has become a complex enterprise.

Statistical figures shows 1.3 million smear positive cases in 2011 in India (NVBDCP 2011) and 24237 (2011) smear positive cases in Karnataka (department of health and family welfare, 2011).

Areas of Karnataka, especially the North-Karnataka and Malnad foothill area of the Western Ghats has been endemic for malaria. But the change in ecosystem of Malnad has led to disappearance of malaria in that region. The incidence of malaria is increasing in other areas and the malaria at one time a rural disease has diversified into various types like urban malaria, malaria in project areas, etc. Most of the malarial deaths are due to *Plasmodium falciparum* infection because of its severe and complicated clinical presentation. It presents in complicated forms such as cerebral malaria, acute renal failure, hepatitis, anemia, hypoglycemia, etc.[2]

Jaundice is common in adults with severe malaria and there is other evidence of hepatic dysfunction with increase in serum bilirubin. Serum transaminases and 5-nucleotidase fall in serum albumin and prolonged prothrombin time. Jaundice in malaria is caused by hemolysis, hepatocyte injury and cholestasis. Hepatic dysfunction contributes to hypoglycemia, lactic acidosis and impaired drug metabolism.[3,4]

With high prevalence of *Plasmodium falciparum* infection, a large number of cases are presenting with un-classical fever and jaundice posing diagnostic conundrum with acute viral hepatitis on one hand and therapeutic challenge on the other. It is observed that the patients of falciparum malaria with liver function abnormalities are more vulnerable to the development of dreaded complications of plasmodium falciparum infection. Hence, the study was undertaken.

METHODS

The present work is a prospective study conducted in medical college hospital attached to Vijayanagar institute of medical sciences, Bellary during the period between January 2013 to June 2014. This study consists of 50 cases satisfying inclusion and exclusion criteria.

Inclusion criteria

All cases of *Plasmodium falciparum* malaria diagnosed by peripheral smear examination or by immunochromatographic test - falci check, pan malaria with Pf or by rapid optimal test.

Exclusion criteria

- Patients taking hepatotoxic drugs
- Patients having evidence of liver disease prior to illness
- Patients with history of alcoholism.

The clinical data of all case were gathered as per proforma appended. In all cases, a detailed history was taken. Detailed physical and systemic examination done.

Investigations

All these patients were subjected to slide test for thick and thin smear as well as immuno-chromatographic test, ROT, pan malaria or falci check.

Blood investigations like hemoglobin level, total leukocyte count, differential count and serum electrolyte and also renal function tests, liver function tests, random blood sugar were done in all cases. Chest X-ray and cerebrospinal fluid examination were done wherever necessary. Urine examination was done in all the patients. Ultra sonogram of the abdomen and viral markers of hepatitis were done wherever found necessary.

RESULTS

In the present study, the youngest patient is 18 years old and oldest is 75 years old. Total numbers of male patients were 37 and females 13. The maximum numbers of patients (34) were in the age group of 21-40 years.

Table 1: Age and sex distribution.

Age group (years)	Males	Females	Total	Percentage
15-20	4	2	6	12.00
21-30	16	3	19	38.00
31-40	11	4	15	30.00
41-50	3	2	5	10.00
51-60	1	2	3	6.00
61-70	1	-	1	2.00
>70	1	-	1	2.00
Total	**37**	**13**	**50**	**100.00**

In the present study, hepatosplenomegaly was the commonest finding followed by splenomegaly, hepatomegaly, drowsiness and coma.

Serum bilirubin was raised in 33 cases, but only14 cases had serum bilirubin > 3 mg/dL. And maximum total bilirubin noted was 18.4 mg/dl. Out of 14 cases, 9 cases had conjugated hyperbilirubinemia and 5 cases had unconjugated hyperbilirubinemia.

Increased incidence of complications were noted in patients who had significant rise in serum bilirubin

Patients with clinical jaundice showed mean 2-3 fold raise in AST levels, along with ALT levels. Raised AST levels above the reference range are seen in 37 patients however AST levels 3 times of the normal are seen in only 7 patients.

Table 2: Findings in systemic examination.

Clinical findings	No. of cases	Percentage
Hepatomegaly	4	8.00
Splenomegaly	19	38.00
Hepatosplenomegaly	23	46.00
Crepitations	1	2.00
Wheeze	1	2.00
Coma	1	2.00
Altered sensorium	2	4.00
Neck rigidity	1	2.00

Raised ALT values above the reference range are seen in 39 patients, but ALT values 3 times more than normal are seen in 11 patients.

Majority of cases of jaundice had raised ALP level, 6 of them showed modest increase above normal. Serum proteins found to be normal in all cases, 4 cases showed raised prothrombin time.

DISCUSSION

In the study series of Gopinathan VP et al, serum bilirubin 2 mg/dL was seen in 4.43% of patients.[5] In the study series of Bajiya HN et al serum bilirubin >2.5 mg/dL was seen in 30.8% and in the study series of Chawla LS et al serum bilirubin > 2 mg/dL was seen in 100% of patients.[6,7] In the present study serum bilirubin level higher than normal found in 66% of cases however, only 28% of cases had serum bilirubin >3 mg/dL .

In the study of Abro AH, Ustadi AM and others.[1] In comparison to normal bilirubin level, the patient with bilirubin >3 mg/dl had high frequency of raised ALT 87.5% versus 45% (p<0.0001), thrombocytopenia 91.6% versus. 65% (p<0.01), anemia 70.8% versus 25% (p<0.05) and renal impairment 50% versus 20% (p>0.05). In the present study patients with bilirubin >3 mg/dl had high frequency of raised ALT 100% versus 35% (p<0.0001), thrombocytopenia 71% versus 17% (p<0.001), anemia 85% versus 53% (p<0.05) and renal impairment 79% versus 6% (p<0.001). Association of complications was statistically significant.

Table 3: Liver function parameters.

Serum bilirubin (mg/dl)	No. of cases	Percentage
< 1.0	17	34.00
1.1-2.9	19	38.00
> 3.0	14	28.00
SGOT (AST) (IU/L)		
<40	13	26.00
41-119	30	60.00
>120	07	14.00
SGPT (ALT) (IU/L)		
<35	11	22.00
36-104	28	56.00
>105	11	22.00
Alkaline phosphatase		
35-130	32	64.00
> 130	18	36.00
Serum proteins (G/dl)		
6-8	46	92.00
<6	4	8.00
Prothrombin time		
12-16	13	76.47
> 16	4	23.53

Table 4: Levels of serum bilirubin and associated complications.

	Serum bilirubin >3 mg % (n = 14)	Normal Sr. bilirubin (n = 17)	P value
Anemia	12 (85%)	9 (53%)	0.033
Thrombocytopenia	10 (71%)	3(17%)	0.001
ALT >3 times	14 (100%)	6(35%)	0.000
Normal			
Impaired RFT	11 (79%)	1(6%)	0.000

In the study of Mehta VK et al and Mazumder R et al raised AST values were seen in 66% and 78% of patients respectively.[8] In the present study raised values are seen in 74% of patients. AST levels 3 times of the normal are seen in 14% of patients.

In the study series of Nityanand et al and Chawla et al, raised ALT values were seen in 100% and 21.11% of patients respectively.[7,9] In the present study raised ALT values above the reference range are seen in 78% of patients, but ALT values 3 times more than normal are seen in 22% of patients.

In the study of Nityanand et al mortality was 37.5% of these 31.25% died due to renal involvement and 6.25% due to hepatic coma.[9] Bajiya HN et al revealed mortality rate in 33.5% patients.[6] In the study of Dash SC10 et al, mortality rate was 22.2% due to cerebral malaria and multi-organ dysfunction, Deb T et al showed mortality rate of 14.3% due to cerebral malaria.[11] In the present study, 1 patient died due to multi organ dysfunction

CONCLUSION

Patients with malarial hepatopathy are more prone to complications but have a favorable outcome if hepatic involvement is recognized early and managed properly. It is important to meticulously look for and to promptly recognize hepatic dysfunction in patients with falciparum malaria and it should be aggressively treated.

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