STUDY OF LIPID PROFILE IN MALARIA- A PROGNOSTIC FACTOR

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ABSTRACT

BACKGROUND

Malaria is one of the most important parasitic infections human beings have ever known. Malaria is endemic in 91 countries with about 40% of world's population at risk of acquiring the infection. Severe malaria is a medical emergency requiring immediate hospitalization and needs prompt treatment at the earliest. Transitory changes in the plasma levels of lipids, cholesterol and triglycerides have been observed and are related to the severity of malaria.

The objectives of the study are- 1. to find out incidence of lipid abnormalities in malaria, pyrexia other than malaria and controls. 2. to collect a detailed lipid profile in malaria with objective of noting its abnormalities and correlation if any with clinical severity and prognosis.

MATERIALS AND METHODS

The study is a prospective study done in the department of medicine SVS medical college, Mahbubnagar. A total of 100 Malaria positive cases, 50 cases of Pyrexia other than malaria cases, 50 healthy controls were included. All information pertaining to history, clinical examination, complications, relevant investigations, treatment modalities were noted, analysed and tabulated; especially with reference to lipid profile. Appropriate statistical methods were used to find the statistically significant observations.

RESULTS

Out of 100 cases there were 59 males (59%), and 41 females (41%).The mean age of entire study group was 37.48. The most common clinical presentation was fever (100%), followed by nausea and vomiting. The most common clinical signs were pallor (42%), splenomegaly (46%), hepatomegaly (44%) and CNS manifestations (16%).Thrombocytopenia (78%) and anaemia (42%) were the most common haematological findings. At presentation, the total cholesterol (mean total cholesterol 106.92mg/dl) and HDL (mean HDL20.31) were significantly reduced. Though LDL (mean LDL 57.71) and VLDL (mean VLDL 28.96 mg/dl) were also reduced, statistically significant difference was not observed. There was no significant change in triglyceride levels

CONCLUSION

All patients with severe malaria were found to be associated with lipid abnormalities especially of total cholesterol, HDL and LDL levels and values revert to normal once parasitaemia is cleared. This finding suggests the importance of estimating the lipid abnormalities as a diagnostic and prognostic factor in severe malaria cases.

KEYWORDS

Lipid Profile, Malaria, Fever.

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BACKGROUND

Malaria is a major public health problem in tropical areas, and it is estimated that malaria is responsible for 1 to 3 million deaths and 300–500 million infections annually. In Asia maximum incidence is from India.[1] Malaria is endemic in 91 countries with about 40% of world's population at risk of acquiring the infection. The vast majority of morbidity and mortality from malaria is caused by infection with P. falciparum, although P. vivax, P. ovale, and P. malariae also are responsible for human infections. Severe malaria is a medical emergency requiring immediate hospitalization with prompt initiation of appropriate parenteral therapy to rapidly reduce and eliminate parasitaemia. Despite its already enormous toll of suffering, deaths due to malaria are increasing as a consequence of drug resistance.[2]

Transitory changes in the plasma levels of lipids, cholesterol and triglycerides have been observed since a long time by many authors in different acute infections.[3] Hypocholesterolaemia, hypertriglyceridemia and extreme decrease in HDL and LDL fractions were observed in complicated and uncomplicated malaria.[4] The magnitude of these changes seems related to the severity of malaria. Hence a systematic approach has been made in the present study to focus on the lipid profile in cases with malarial infection.

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Aims and Objectives

1) To find out incidence of lipid abnormalities in malaria, pyrexia other than malaria and controls.
2) To collect a detailed lipid profile in malaria with objective of noting its abnormalities and correlation if any with clinical severity and prognosis.

MATERIALS AND METHODS

The study is a prospective study done in the department of medicine, SVS medical college, Mahbubnagar. A total of 100 Malaria positive cases, 50 cases of Pyrexia other than malaria cases, 50 healthy controls cases were included. All the patients were aged between 15 to 72 years

Inclusion Criteria

Patients presenting with symptoms of malaria who are laboratory confirmed diagnosis for malaria by Malaria parasite card test /MPQBC/MP Smear positive

Exclusion Criteria

Fever cases with malaria test negative and those with known lipid disorders and who are already on drugs altering the lipid profile were excluded.

Analysis

All information pertaining to history, clinical examination, complications, relevant investigations, treatment modalities were analysed and tabulated. Appropriate statistical methods were used to find the statistically significant observations (P<0.05).

RESULTS

A total of 100 cases of blood test positive for malaria were registered for the study. Out of 100 cases there were 59 males (59%), and 41 females (41%). The mean age in males was 35.7 years and in females was 40 years. The mean age of entire study group was 37.48, the minimum age being 15 years and the maximum age being 72 years. Maximum number of male patients was in the age group of 20-30 years and maximum number of female patients was in the age group of 30-40 years. The mean age in male was 35.7 years and female was 40.0 years.

The mean time from symptom onset until physician contact was 7.3 days, while the median time was 5 days. The most common clinical presentation was fever (100%), followed by nausea and vomiting. Abdominal pain was present in sixteen patients. Nine patients had diarrhoea. CNS manifestations were present in 24 patients. Eight patients had urinary symptoms in the form of oliguria and anuria. Three patients had bleeding manifestations

Symptoms	No. of Patients	Percentage (%)
Fever	100	100%
Chills	68	68.0%
Nausea	30	30.0%
Vomiting	50	50.0%
Headache	28	28.0%
Myalgia	37	37.0%
Abdominal Pain	16	16.0%
Diarrhoea	9	9.0%
Urinary Symptoms	8	8%
Alt. Sensorium	24	24%
Bleeding Symptoms	3	3.0%

Table 1. Symptoms of Malaria Patients

Fever was the most common presenting complaint. It was present in 100% of cases, but only 75% had a fever on the day of presentation. The mean temperature was 100.9. The fever was associated with chills in 68% of cases.

The most common clinical signs were pallor (42%), splenomegaly (46%), hepatomegaly (44%) and CNS manifestations (16%).

Clinical Signs	Percentage (%)
Anaemia	42.0%
Hepatomegaly	44.0%
Splenomegaly	46.0%
Confusion, drowsiness & Convulsions	16.0%

Table 2. Clinical Signs of the Patients

Haematological Parameters in Severe Malaria

Thrombocytopenia (78%) and anaemia (42%) were the most common haematological findings. Leucopenia was noted in 30% of cases, while 7% of cases showed leucocytosis. Pancytopenia was seen in 32 cases.

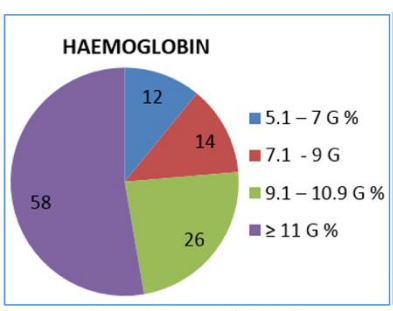

Figure 1. Haemoglobin Levels

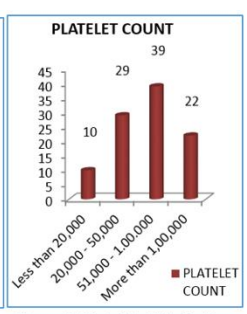

Figure 2. Platelets Distribution

Population Group	Malarial Cases (100)	Other Pyrexia (50)	Control (50)
Haemoglobin (gm)	9.3 (±2.3)	8.6 (±2.1)	11.2 (±1.2)

Table 3. Comparison of Hb with Other Groups

Type of Parasite

52 patients were infected with P. falciparum; 24 showed evidence of both P. falciparum and P. vivax whereas in another 24 cases only P. vivax.

Parameter	Malarial Cases (100)	Other Pyrexia (50)	Control (50)
S. Creatinine (mg %)	1.6(±0.8)	1.4(±0.2)	0.9(±0.3)
SGPT(U/l)	38.2(±6.8)	36.8(±4.6)	26.2(±2.8)
Serum bilirubin (mg %)	1.8(±2.2)	1.6(±1.8)	1.0(±0.3)

Table 4. Renal and Liver Parameters in Study and Control Population

Blood transfusion was given in 32 cases. Signs of haemolysis were noted in 32 cases. 28 patients developed acute renal failure while only 6 of them required haemodialysis.

Lipid Profile	Day 0	Day 45	P Value
Total Cholesterol	106.92	156.94	<0.001
HDL-C (mg/dl)	20.31	38.86	<0.05
LDL-C (mg/dl)	57.71	80.43	0.2
VLDL-C (mg/dl)	28.96	38.28	0.6
Triglycerides (mg/dl)	154.2	156.5	0.26

Table 5. Mean Lipid Parameters in Malaria Cases (100)

Lipid Parameter	Day 0	Day 45	P Value
Total cholesterol (mg/dl)	156.4(±3.26)	168.6(±3.08)	0.91
HDL-C (mg/dl)	28.4(±2.02)	32.6(±1.86)	0.89
LDL-C (mg/dl)	108(±1.88)	118(±2.08)	0.78
VLDL-C (mg/dl)	36.84(±2.08)	39.62(±1.79)	0.86
Triglycerides (mg/dl)	158(±2.16)	174(±2.08)	0.92

Table 6. Mean Lipid Parameters in Pyrexia Cases other than Malaria (50)

Lipid Parameter	Day 0	Day 45	P Value
Total cholesterol (mg/dl)	166.62 (± 2.86)	176.85 (2.34)	0.92
HDL-C (mg/dl)	36.2 (±1.97)	37.26 (±2.66)	0.94
LDL-C (mg/dl)	108.2 (±2.34)	112.4 (±2.06)	0.96
VLDL-C (mg/dl)	38.48 (±2.84)	39.52 (±1.99)	0.76
Triglycerides (mg/dl)	146.88 (±2.11)	154.22 (±2.14)	0.82

Table 7. Mean Lipid Parameters in Control Individuals (50)

DISCUSSION

This study was a clinical and biochemical observational study done to study the common clinical presentations and complications of severe malaria and to collect a detailed haematological and biochemical, especially lipid parameters with objective of noting its abnormalities and correlation if any with clinical severity and prognosis.

A total 100 cases of fever positive for malarial parasite by LDH specific card test and confirmed for malarial parasite by slide positive for asexual stage of malarial parasite who were admitted in medical ward and ICU at department of medicine, SVS medical college, Mahabubnagar, were taken. The mean age of presentation was 37.48 years (SD 14.18). In males the mean age was 35.7 years (SD 12.9) and in females the mean age of presentation was 40.0 years (SD 15.7). Majority of cases were males 59% and females 41%. In Faucher et al it was also predominantly male population (54%).[3]

The most frequently encountered complication is thrombocytopenia (78%). In other studies like U M Jadhav et al, Sharma et al, the incidence of thrombocytopenia were 78.4% and 90% of cases respectively which are very similar to our study and also highlights the fact that a persistent normal platelet count is unlikely in the laboratory findings of malaria.[5,6]

The thrombocytopenia was rarely accompanied by clinical bleeding or biochemical evidence of disseminated intravascular coagulation. 10% of patients has platelet count below 25, 000/µl and platelet count raised rapidly with recovery.[6]

The incidence of anaemia in our study is 39%. The mean haemoglobin as per our study is 9.3 gm%. Similar observation was made by Faucher et al, in which the mean haemoglobin was 10.2 gm%.[3]

In our study, we assessed the impact of malarial infection on common lipid parameters and we have compared similar studies done by others.

Maurosis P, et al[7] noted transient changes in serum lipoproteins during anti-malarial therapy and malaria in 1978. Oxidative stress has been demonstrated in malaria. These oxidized lipids may have role in pathogenesis of malaria. The role of plasma membrane cholesterol in pathogenesis of immune evasion and clinical manifestation was stressed by Sein and Aikawa, 1997.[8] Human serum high density lipoproteins(HDL) is necessary for the short term maintenance of P.falciparum in vitro culture (Imrie et al 2003).[9]

Previous studies compared during active infection with apparently healthy subjects include Davis et al 1993, Mohanty et al 1992, Das et al 1996, Ogbodo et al. 2008, Sibmooh et al 2004),[10,11,12] while Faucher et al[3] did investigated in Gabonese children attending school with low parasitaemia count.

We had a step further in comparing the lipid parameters in 50 cases of pyrexia due to other causes, and 50 age matched normal individuals.

At presentation the Total cholesterol (mean total cholesterol 106.92mg/dl) and HDL (mean HDL20.31) were significantly reduced while LDL (mean LDL57.71) and VLDL (mean VLDL 28.96 mg/dl) also reduced but statistically not significant while there was no change in triglyceride levels. Similar changes were observed by Faucher et al study, mean Total cholesterol 134.95, mean HDL 24.36, mean LDL 62.25 mg/dl.[3]

In a study conducted by Ogbodo et al 2008, in patients with severe malaria parasitaemia, the mean total cholesterol is 84.17 mg/dl, mean HDL 23.8, mean LDL 43 mg/dl. VLDL 17.3 mg/dl. There was similar decrease in all 4 parameters, but the decrease in total cholesterol, LDL, VLDL is much greater than our study.[13]

In a study made by Djoumessi S et al 1997 in malaria infected patients, the mean total cholesterol is 123 mg/dl,

mean HDL 46 mg/dl, mean LDL 77 mg/dl. The values are comparable with regard to cholesterol and LDL, but there was no significant decrease with respect to HDL values.[14]

After treatment with antimalarial drugs, the values got to normal levels we have compared lipid values at 45 days. Our values are comparable with those of J F Faucher at 35 days. In a meta-analysis by Vissar et al[15] it has been showed that total cholesterol, HDL and LDL were lower in malaria patients compared to healthy controls and triglyceride levels were higher in malaria patients. Similar findings were observed in our study population. On day 0 total cholesterol, HDL, and LDL levels of the malaria patients was significantly lower than healthy population whereas triglyceride levels were slightly higher. With the completion of the treatment (Majority were given injection artesunate and doxycycline tablets as treatment regimen) the levels of total cholesterol, HDL and LDL have increased to normal values and there was a statistically significant difference observed in the levels on day 0 and on day 45. Lambrecht et al. noticed transient changes in the lipid profile in malaria patients and he hypothesized that the malaria parasite uses cholesterol and phospholipids from its host, resulting in a decrease of the levels.

The duration of the lipid profile changes varied in various studies done in different contexts. In Kim JS[16] study levels of cholesterol, HDL and LDL were significantly lower in the malaria patients than in the control group at one month after treatment. And the lipid levels had normalized at six months after treatment. Whereas in Nilsson Ehle et al study within two weeks the parameters have come back to normalized values. Multiple variables exist to delineate the causality of malaria to lipid profile including ethnicity, life style, socioeconomic status, food habitats, other associated infections, or underlying metabolic diseases etc. all of which may play a role in the disproportionate lipid levels. Our study included small population which is ethnically similar and living in the same geographical area, because of which our results probably can be attributable to the causality of malaria which may need further workup. And statistically significant difference between pre and post treatment lipid profiles may be useful as prognostic factors along with the other variables if considered together.

CONCLUSION

In our study, we have attempted to clarify the role of lipid abnormalities in malaria. All patients of severe malaria had significant lipid abnormalities compared to non-malarial pyrexia and controls. The most common feature regarding lipid abnormalities was decrease in Total Cholesterol, HDL and LDL, while Triglycerides were not affected. All lipid abnormalities noted during infection with severe malaria reverted back to normal when checked after 45 days of follow-up, probably correlating with clearance of parasitaemia from blood. There are constant lipid abnormalities in severe malaria, hence this can be used as one of the diagnostic and prognostic parameters to label it as severe malaria but this needs further studies with larger sample size.

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