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CLINICAL MANIFESTATIONS AND COMPLICATIONS OF MALARIA IN PEDIATRIC AGE GROUP (LESS THAN 12 YEARS) IN A TERTIARY CARE HOSPITAL – A CROSS SECTIONAL STUDY.

Paediatrics

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ABSTRACT

Objectives: To determine the clinical features, complications and outcome of malaria in children hospitalized in a tertiary care centre of Maharashtra.

Method: This retrospective cross-sectional hospital based study included malaria patients admitted in Pediatric ward of a tertiary care hospital of western India between January 2015 and December 2015.Presence of malaria parasite on thick and thin smears was considered diagnostic for malaria. Information was recorded pertaining to clinical symptoms, examination findings, biochemical and hematological investigations, complications of malaria and outcome of patients. Based on etiology, children were categorized into three groups: Plasmodium vivax (P.vivax), Plasmodium falciparum (P.falciparum) and mixed infection.

Results: A total of 233 children diagnosed as malaria on thick/thin blood smears were included in the study. It consisted of P.vivax (30.9%),P.falciparum(63.9%)and mixed infections (5.2%).55% were males and 45% were females.The clinical features on admission were similar in all three groups.There was no statistical significant difference found between complications such as severe anemia, thrombocytopenia, jaundice, renal dysfunction and cerebral malaria between P.vivax and P.falciparum.Four patients of P.falciparum and one of P.vivax expired.

Conclusion: We conclude that P.vivax infection tends to have a similar course and complication as compared to malaria due to P.falciparum.

KEYWORDS

INTRODUCTION

Malaria is estimated to be directly responsible for around one million deaths annually worldwide (1).The morbidity and mortality burden cause by malaria is nearly 3%(2).India contributes to 75-77% of the total malaria in south east Asia (3).The spectrum of clinical presentation of malaria varies from asymptomatic parasitaemia, febrile illness to severe potentially fatal disease (4).The clinical presentation of severe malaria caused by P. falciparum and P. vivax were similar among children from Papau New Guinea except for higher incidence of respiratory diseases among the the later(5).In a large prospective study from Bikaner district of North India, it was found that children infected with P. vivax had a greater propensity for development of complications including severe anemia, thrombocytopenia, cerebral malaria, acute respiratory distress syndrome, hepatic dysfunction, renal dysfunction and abnormal bleeding(6).Hence the present study was undertaken to determine the clinical features, complications and outcome of malaria among hospitalized children in a government hospital in Maharashtra state.

METHOD

This retrospective cross-sectional hospital based study included malaria patients admitted in Pediatric ward of a tertiary care hospital of western India between January 2015 and December 2015.The diagnosis of malaria was based on detection of parasites (P.falciparum, P.vivax and mixed infections) in 10% giemsa stained blood smears ; thick for parasite detection and thin for count.

Inclusion criteria: All slide positive confirmed cases of malaria (P. vivax, P. falciparum and mixed infection) admitted and treated in government medical college, Dhule with age group upto 12 years were included.

Exclusion criteria: 1) Patients presented with fever (smear negative for Plasmodium) but empirically treated for malaria.2) those who stayed in hospital for less than 6 hours were also excluded.

Demographic data including the name, age, gender and residential address was collected. Relevant symptoms like fever, vomiting, headache, abdominal pain, convulsions, altered sensorium, hemetemesis, involuntary movements etc were noted. Relevant clinical signs like pallor, edema, jaundice, petechiae, splenomegaly and altered sensorium were noted. Hematological data (Hemoglobin, total count and platelet count) and biochemical data (glucose, urea, creatinine, bilirubin, cerebrospinal fluid etc) were recorded. Patients were classified as severe malaria according to WHO definition (7) i.e. presence of asexual parasitemia plus atleast one of the followings:

Clinical features: cerebral malaria (impaired consciousness or unarousable coma), prostration (weakness with inability to walk or sit up without assistance), failure to feed, multiple convulsions (>2 episodes in 24 hours), deep breathing or respiratory distress (acidotic breathing), circulatory collapse or shock (systolic blood pressure <50mmHg), clinical jaundice plus evidence of other vital organ dysfunction.

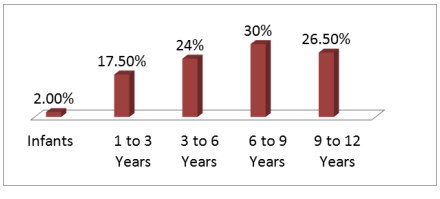
Laboratory features: hemoglobinuria, abnormal spontaneous bleeding, pulmonary edema (radiological), hypoglycemia (blood glucose < 2.2 mmol/l or < 40mg/dl). Metabolic acidosis (plasma bicarbonate < 15 mmol/l), severe malaria anemia (Hb < 5 g/dl, PCV <15%), hyperparasitaemia (>2% or 1,00, 000/µl in low intensity transmission area or >5 % or 2,50,000/µl in high stable malaria transmission intensity), hyperlactatemia(lactate> 5mmol/l), renal impairment (serum creatinine > 265µmol/l).

Clearance was obtained from the institutional ethics committee. Data were entered in an MS excel spreadsheet and results were analysed. Statistical analysis was done. The results were obtained in percentages and proportions and the chi-square test was applied. Statistical significance was defined as $P < 0.05$.

RESULTS

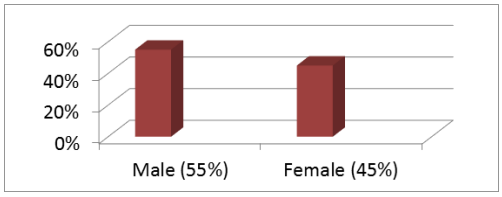
The study included 233 children with malaria. Total admissions in pediatric ward in the year 2015 were 2,475. Thus the incidence of malaria was 9.4%.

AGE DISTRIBUTION



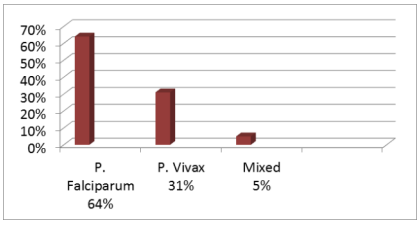
Peak incidence was in age group of 6-9 years (30%). None was a neonate. Lowest age affected was a 4 months infant who had mixed infection.

GENDER DISTRIBUTION



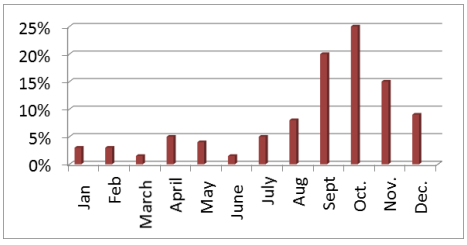
55% were males and 45% were females.

CAUSATIVE AGENTS FOR MALARIA



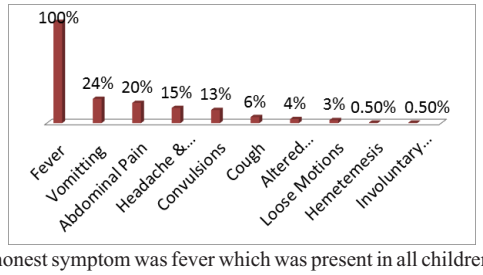
It consisted of P.vivax (30.9%),P.falciparum(63.9%)and mixed infections (5.2%).Thus P. falciparum was more common as the cause for admission.

SEASONAL VARIATION.



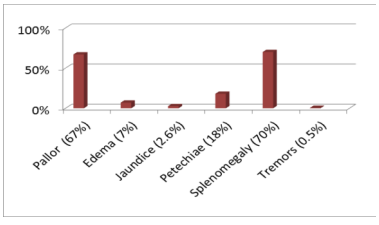
As expected peak incidence was post monsoon. 25% in month of October,20% in month of September. Lowest incidence was in March & June (1.5%)

CLINICAL SYMPTOMS:



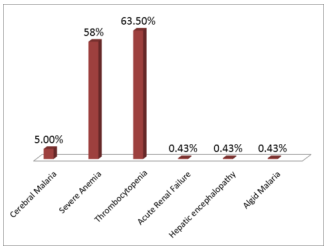
Commonest symptom was fever which was present in all children with malaria. Other common symptoms were vomiting, abdominal pain, headache, bodyache, convulsions, cough, altered sensorium, loose motions, hemetemesis and involuntary movement. Convulsions were present in 30 children (13%) out of which 7 children (3%) had multiple episodes of convulsions (>2episodes in 24 hours). 9 children (4%) had altered sensorium (Glasgow coma scale <11).

CLINICAL SIGNS



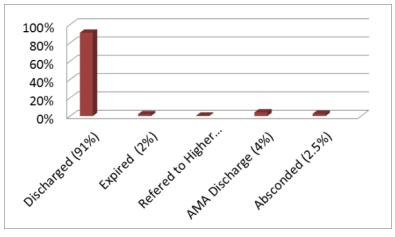
Commonest clinical finding in these children were pallor and splenomegaly. Others were edema, jaundice, petechiae and tremors.

COMPLICATIONS OF MALARIA



Severe anemia and thrombocytopenia were the commonest complications noted in these children. They were seen in both i.e. children with P. falciparum and P. vivax malaria. Some of the children with severe anemia required transfusion with packed cell volume but none of the children with thrombocytopenia required platelet transfusion. Other complication like cerebral malaria, acute renal injury, hepatic encephalopathy and shock were found only in children with P. falciparum malaria.

OUTCOME OF PATIENTS



Total of 5 patients expired.4 had P.falciparum malaria (2 expired due to cerebral malaria and 2 due to severe anemia) while 1 was P.vivax positive (expired due to severe anemia). Thus mortality in patients with malaria was 2%, while malaria attributed to 3% of the total ward mortality.

Comparison of clinical characteristics of severe malaria (WHO definition) cause by plasmodium falciparum, plasmodium vivax and mixed infection.

Clinical characteristics Total n=233	Plasmodium falciparum n = 149	Plasmodium vivax n = 72	Mixed infection n = 12	Plasmodium value
Severe anemic (Hb < 5gm/dl)	129(86.6%)	23(31.9%)	04(33.3%)	0.313
Multiple seizure (>2episodes in 24hours)	7(4.7%)	0	0	0.423
Altered sensorium (GCS < 11)	9(6%)	0	0	0.423
Prostration	74(49.6%)	30(41.6%)	04(33.3%)	0.220
Shock (systolic Bp < 50mmHg)	01(0.7%)	0	0	0.432
Jaundice	04(2.7%)	02(2.7%)	0	0.225
DIC	00(00%)	01(1.4%)	0(0%)	0.432
Acute kidney injury	01(0.7%)	00(00%)	0(0%)	0.432

Thus as shown above ,severe anemia and prostration was present in all three groups ,while jaundice was seen in children with P.falciparum and P.vivax .Cerebral malaria, shock and acute renal injury was found only in children with P.falciparum .Although the difference was not statistically significant.

DISCUSSION

Severe disease in infancy is less frequent in areas where transmission is the greatest (8). One explanation for this is that infants experience increased exposure to infection while they are protected from disease possibly by maternal antibodies. They therefore emerge from this period of clinical protection with considerably more immunity than those who experience lower transmission intensities. Contrary to our

finding where peak incidence was in age group of 6-9 years one study showed highest prevalence of malaria in children of age group of 2-5 years (9).This may be due to the fact that at that age their immunity to parasitic infection has not been fully developed.

Incidence of malaria was found to be slightly higher in males than in females. May be in India, female children were less in number to seek medical advice when compared to male children.

There is dominant role of temperature & relative humidity in malarial transmission (10). In this study too seasonal variation was seen in the incidence of malaria, i.e. Peak incidence was noted in the month of September & October (post monsoon).

Anemia has been widely observed in both P.vivax and P.falciparum malaria. In our study, severe anemia was significantly more common in the falciparum group (86.6%) than the vivax group (31.9%). This has been also observed in a study done in Maulana Azad medical college, Delhi (11). Cause of anemia in malaria is multifactorial. It is due to increased destruction of parasitized red blood cell, erythrophagocytosis, and inhibitition of reticulocyte release, depressed erythropoiesis and immune mechanism (12).

Thrombocytopenia is a well known complication of malaria. This is probably due to immune mediated lysis, sequestration in the spleen (13).We observed thrombocytopenia in 63.5% of malarial children, but none of these children required platelet transfusion. One study from Delhi also showed thrombocytopenia in 70% of malarial children (14).

In our study 2.6% of children had jaundice. Incidence was equal in both P. falciparum and P.vivax. One child with P.falciparum had developed hepatic encephalopathy. Similar findings were noticed in a study by Kocher (15). The possible explanation for hepatic involvement is direct injury to liver by parasite leading to malarial hepatitis (16).

Cerebral malaria is a very severe complication & leading cause of malarial mortality. In our study 5% of the children were diagnosed as cerebral malaria, all had P. falciparum malaria. In our study Cerebral malaria was responsible for majority of the deaths (1.3%), similar to other Indian studies (17).

Prostration was unique feature found in 46.3% of the cases. It was significantly present in all three types of malaria and was an important cause of admission. A. Kumar at al.(18) reported prostration in 49.3% of the cases. Though the exact pathogenesis is not known but it is considered as sign of central nervous system disease, the mechanism by which malaria leads to inability to sit, stand or feed are poorly understood (19).

Renal manifestation of malaria may range from prerenal azotemia to acute renal failure, nephrotic syndrome and acute glomerulonephritis(20,21). In a study from Rajkot (22), renal failure was observed commonly in P. falciparum. In the present study, one child of falciparum group had renal failure.

Overall mortality in our study was 2%. Out of this 80% was due to P. falciparum malaria (cerebral malaria is severe anemia) while 20% was due to P.vivax malaria (severe anemia).

CONCLUSIONS

Malaria is a potentially severe disease and tends to have a severe course and complications. In present study, there was no statistically significant difference found between complications such as severe anemia, thrombocytopenia, jaundice, renal dysfunction and cerebral malaria in all three groups. Thus we conclude that P.vivax malaria tends to have a similar course and complication as P.falciparum malaria.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this paper.

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