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Original Article

Comparison of Clinical Profile and Severity of P. falciparum and P. vivax Malaria in a Tertiary Care Hospital of NaviMumbai, India: A Descriptive Study

Authors
Vijay Baburao Sonawane[1], V. Kotrashetti[2], Rahul Malhotra[3]
[1]Assistant Professor, [2]Professor And Unit Head, [3]Sr. Resident
[1,2,3]Dept of Pediatrics, Dr.D.Y.Patil Medical College and Hospital, Navi Mumbai, Maharashtra India
Corresponding Author
Vijay Baburao Sonawane
A-801/Sky Avenue Apartment/Plotno- 7,8,16,18, Sector-34, Kamothe,
Navi mumbai, Maharashtra, India Pincode-410209
Email: *vijay_ltm@yahoo.co.in, Contact—09324008749*

Abstract

Introduction: *Navi Mumbai is an endemic area for Malaria which is one of the most common parasitic infectionsand major public health problem in India.The clinical features of malaria in children are nonspecific and vary significantly. The aim of our study was to find out the spectrum of clinical manifestations, infecting species, age distribution and mortality in admitted patients of malaria in our hospital andto compare the clinical profile with severity of P.vivax and P. falciparum malaria in pediatrics age group in a tertiary care hospital.*

Methods: *This was a one year retrospective and one year prospective study.Children below 14 years of age who were smear positive for plasmodium species or malarial antigen positive were included in the study. Statistical analysis was done using chi square test for comparing proportions. P value < 0.05 was considered significant.*

Results: *The data was analyzed by the appropriate statistical methodsand laboratory parameters were recorded carefully . A total of 106 patients were studied of 67 patients of Plasmodium vivax, 22 patients of Plasmodium falciparum and 02 patients of Mixed malaria. Complications observed were severe anemia, thrombocytopenia, renal dysfunction, jaundice, metabolic acidosis and acute respiratory distress syndrome (ARDS). Thrombocytopenia and severe anaemia were the most frequent complications in the severe cases. 05 of106 patients (4.7%) were expired. 2/5 patients who expired had four or more organ dysfunction.*

Conclusion: *Severe Anemia and Thrombocytopenia has the significant correlation with mortality. Other significant factors contributing to death were jaundice and renal failure. Severe form of malaria is seen in vivax malaria and the age group affected by vivax also is younger.Plasmodiumvivax infection is common infecting species. Multi organ involvement and severe manifestations commonly observed in vivax infection.*

Key words: *Severe Malaria, Vivax, Falciparum, Mortality.*

Introduction

India contributes to about 2/3 rd of Malaria in the South East Asia region.[1] There exists heterogeneity and variability in the transmission between and within the states of the country as many ecotypes of Malaria have been recognized. Among the four species of Plasmodium, Plasmodium falciparum and vivax are commonly found in India. Disease caused by Plasmodium-vivax Malaria used to be called benign tertian. In contrast Plasmodium falciparum causes severe Malaria and often produces multi-organ failure unless treated early with multiple drugs. Kochar et al in a study reported several cases of vivax Malaria with multi-organ dysfunction syndrome [2]. Profound thrombocytopenia is a common complication of falciparum malaria but recently there have been several reports of vivax malaria with thrombocytopenia[3,4]. Acute respiratory distress syndrome, hepatic involvement and renal involvement are common in Plasmodium falciparum Malaria; these complications also have been reported in Plasmodium vivax Malaria [5-10]. Morbidity and mortality of Plasmodium vivax have increased recently due to the serious complications associated with it.The classic attack of malaria is recognized by its periodicity and pattern. However, today the classic clinical picture is more of an exception than the rule particularly with falciparum infection, which explains why it can easily be mistaken for other diseases with catastrophic results.In addition to the direct effects it exerts by increasing premature mortality and morbidity, it is responsible for considerable economic wastage owing to lost man power and treatment costs. These constitute a serious impediment to the economic development of countries in which this disease is endemic[1].

Taking this background, we planned a study to document comparison of changing clinical profile and severity of P. falciparum and P. vivax malaria in endemic area likeNaviMumbai of India.The aim of our study is to find out the spectrum of clinical manifestations, infecting species, age distribution and mortality in admitted patients of malaria and to compare the clinical profile with severity of P.vivax and P. falciparum malaria in pediatrics age group in a tertiary care hospital.

Materials and Methods

This was a descriptive study, which was done in the Department of Pediatrics at Dr D. Y. Patil Hospital and Research Center,Nerul, NaviMumbai during the year 2011-2013 over a period of two years (one year prospective and one year retrospective study).

In retrospective study, data was collected from case records of all cases admitted to D.Y.Patil Medical College and Hospital, with diagnosis of Malaria from 1st June2011 to 31th May, 2012 whereas in prospective study (1st June 2012 to 31st May 2013), all patients admitted and diagnosed as Malaria were included.

Diagnostic methods used were conventional thick and thin peripheral smear stained with Leishman stain, examined under oil immersion. The slide was considered negative when there were no parasites in 100 HPF. Rapid diagnostic tests were based on detection of specific plasmodium antigen, LDH (optimal test) for Vivax and HRP2 for falciparum. Parasite index is calculated in all cases.

The mode of presentation, clinical course, treatment history, laboratory investigations ,antimalarials administered, response to therapy and complications were recorded.

Simple malaria was defined as plasmodium vivax or plasmodium falciparum malaria without any complications.

The categorization of severe malaria was according to WHO guidelines (2014)as follows:[11]

- Impaired consciousness/coma
- Repeated generalised convulsions
- Renal failure (serum creatinine >3 mg/dl)
- Jaundice (serum bilirubin >3 mg/dl)
- Severe anaemia (Hb< 40 mg/dl)
- Metabolic acidosis
- Circulatory collapse/shock (systolic BP < 80mm Hg, 106 ^{0}F or >42^{0}C)
- Hyperparasitemia(>5% parasitized RBCs).

The study plan was approved by hospital research and Ethics committee.

Inclusion Criteria

- Children in age group of below 14 years.
- Peripheral smear or rapid malaria antigen test (RMAT) positive for Plasmodium vivax and plasmodium falciparum malaria.

Exclusion Criteria

- Patient presenting with fever (Malarial parasite negative on peripheral smear and/or RMAT negative) but treated empirically like malaria. A total of 108 hospitalized children below 14 yrs of age with positive peripheral smear or RMAT positive fulfilled the inclusion and exclusion criteria and were included in the study.

Statistical Analysis

Statistical analysis was done using chi square test for comparing proportions. P value < 0.05 was considered significant.

Results

This was a descriptive study and following observations were made.

A total number of 106 patients with malaria were included in the study. 74 of 106 (69.81%) were males and 32 of 106 (30.19%) were females. Male: Female ratio was 2.3 :1.

Six children (5.66%) were below the age of 1 year, 43 (40.56%) were between 1 to 5 years and 57 (53.78%) patients were between 5 to 12 years hence maximum cases in more than 5 yrs age group .(Table 1)

Age/Sex	< 1 Yr	1yr-5yrs	5 Yrs-14 Yrs	Total
Male	4	33	37	74
Female	2	10	20	32
Total	6	43	57	106

All the patients in the study had fever (100%) ,66 (62.26%) of patients had vomiting, 9 (8.49%) patients had abdominal pain, 5 (4.71%) had loose stools, 2(1.88%) had breathlessness, 1 (0.94%) had rash, 1(0.94%) had altered sensorium, 3(2.8%) had convulsions.(Table 2)

Hence Fever was the most common presentation whereas Rash and Altered sensorium being least common in our study.

Table 2 : Distribution of Cases According to Clinical Presentation

Clinical Presentation	No.Of Cases	Percentage(%)	P Value
Fever	106	100	<0.05
Vomitting	66	62.6	<0.05
Abdominal Pain	9	8.49	<0.05
Respiratory Difficulty	2	1.88	<0.05
Loose Motions	5	4.71	<0.05
Rash	1	0.94	<0.05
Altered Sensorium	1	0.94	<0.05
Convulsions	3	2.8	<0.05

Eighty four (79.24%) patients had clinical pallor, 8(7.54%) had icterus, lymphadenopathy was present in 3(2.83%), edema and dilated neck vein were seen in 1 (0.94%) each. Petechiae, purpura and ecchymosis were not seen in any of the patients.

Hepatomegaly was seen in 95(89.62%) of patients and all the patients in the study had splenomegaly. Central nervous system abnormality was seen in 1(0.94%) in the form of altered sensorium.

Platelet count was normal (>1.5 lacs) in 25 (23.58%), between 50 K –1.5 lacs in 62 (58.50%) and less than 50 K in 17.92%.

Peripheral smear for malarial parasite (PSMP) was positive in 91 (84.90%); of the 91 patients in whom PSMP was positive, 22 (20.75%) had P.falciparum, 67 (63.20%) had P.vivax and 2(1.88%) had mixed infection for P.falciparum and P. vivax infection.

Malarial antigen test (MAT) was done in 88patients, MAT was negative in 21 patients, positive for P.vivax, P.falciparum and mixed infection in 27, 14 and 26 patients respectively.

Dengue antigen tests were done in patients who had blood pressure (BP) below the 50th Percentile for height. Of the 43 patients in whom dengue antigen test was done 3 had a positive Dengue test and the remaining 40 tested negative.

Serum creatinine was done in 8 patients, only 1 of the 8 patients had a serum creatinine of >3mg/dL.

Prothrombin time and activated partial thrombo-plastin time was done in 2 patients which was normal.

Pallor and thrombocytopenia were seen significantly more in Plasmodium falciparum and Mixed malaria. 34/106 patients had hemoglobin < 5gm/dl and 39/106 (95.92%) had thrombocytopenia .

Severe malaria was observed in 91/106 patients of which 67 were of Plasmodium vivax, 22 were of Plasmodium falciparum and 2 were of Mixed malaria.

Thrombocytopenia and Severe Anemia were the most frequent complications in the severe cases.(Table: 3). 10/67 of plasmodium vivax cases responded to chloroquine alone. 57 patients required artesunate or combinations. 05/106patients (4.7 %) expired. Out of these 3(2.8 %) were of plasmodium vivax, 2 (1.8%) were plasmodium falciparum and none were mixed malaria. 2/5 patients who expired had four or more organ dysfunction.Thrombocytopenia and severe anemia had the most significant correlation with mortality(Table:3).

Table 3- Frequency of Various Complications in Severe Malaria

Severity Indicators	P.Falciparum	P.Vivax	Mixed Malaria	Total
No.Of Cases	22(20.75%)	67(63.20%)	2(1.88%)	91(85.85%)
Severe Anemia	10	16	08	34
Jaundice	2	4	1	7
Thrombocytopenia	10	19	10	39
Metabolic Acidosis		2	2	4
Ards	3	2		5
Cerebral Malaria	1	5		6
Acut Renal Failure	1	1		2
Shock		1	1	2
Hypogycemia			1	1
Hyperparasitemia	3	5	2	10
Mody	6	1	1	8
Mortality	2	3		5

Discussion

P. vivax malaria has been considered to be a benign form of malaria, with low mortality[12] but studies from across the world now have shown that vivax is not benign but has been associated with complications and mortality similar to our study which also shown this trend.

We analyzed patients admitted with proven malaria (blood smear positive or RDT), admitted to our hospital. There were 106 patients admitted , 67 of them had vivax malaria, 22 had falciparum and 02 had mixed parasitemia. The studies across India show a variable incidence of types of malaria, severity and mortality.

In our study the age group most affected was children >5 years of age, prevalence being 62.07% whereas in the study by Manju et al[13] it was commonest between ages of 0 to 5 years (33.9%) which is in contrast to our study. But in study by Kocharet al[14] the age group most affected was between 5 to 10 years (48.1%) similar to our study.

The most common species to cause malaria in our study was P. vivax (63.20%) followed by P. falciparum (20.75%) and mixed parasitemia (1.88%). In the study by Singh R et al[15] the prevalence of vivax was more, 71.8% versus falciparum (28.2 reported %) which is similar to our findings but in study of Verma et al[16] falciparum wasmost common form(53.6%), vivax (27.3%), followed by mixed parasitemia(18.9%). Age stratification study by Verma[16] showed more preponderance of vivax in younger age group (0 to 5 years). Kochar[2,3] also reported preponderance of vivax causing malaria for younger age group. Between 0 to 5 years in their

study vivax was responsible for 42.3% infections, compared to in age group of >10 years where it was 30%.

Fever is the most common presenting symptom (98%), similar observation was been made by studies done by Taksandeet al[17] and Kaushik et al [18].

In present study also vivax was responsible for 43% infections in age group between 0 to 5 years in comparison to 57 % in age group of > 10 years. Male preponderance has been reported in study by Kocher 70.6% versus 29.4%. In present study it was 2.3:1.

Severe form of malaria has been reported in 49.5%, 56.9% and 65.88% in various studies. Kochar et al found the relative frequencies for different species causing severe malaria to be P. falciparum 52.7%, P. vivax 43.3% and mixed parasitemia 4%.[16]

Severe anaemia was observed in 34%of cases especially which is quite similar to that of reported by Chander Vet al [19]&Kunduet al.[20]

In our study most common organism was P. vivax 63.75%, followed by falciparum species in 20.75% and mixed parasitemia in 1.88% as a cause for severe malaria. Ragini et al also found vivax to be the predominant species for severe malaria. P. vivax in their study was responsible for 67.85% and falciparum for 32.15% cases of severe malaria[15].

The most common complication in our study was thrmbocytopenia (39%), followed by severe anemia (34%). The other complications were Acute Renal Failure, ARDS and cerebral malaria .Verma P et al found anemia as the most common complication (65.6%), followed by impaired consciousness (20.5%) and multiple convulsions (17.6%). Hepatic dysfunction was seen in 17.6% of their patients. Ragini et al reported CNS manifestations as the most common complication , followed by severe anemia. Hepatic dysfunction was seen in 16% patients in their study. Kochar et al reported severe anemia in 24.6% patients, cerebral malaria 5.3%, hepatic dysfunction and renal dysfunction alone a common complications.

Serum creatinine was done in 8 patients, only 1 of the 8 patients had a serumcreatinine of >1mg/dL. Prothrombin time and activated partial thromboplastin time was done in 2 patients which was normal. Serum bilirubin was done in 22 patients, 21 out of the 22 patients had aserum bilirubin of >1mg/dL and 1 had a serum bilirubin of <1mg/dL.

There was 4.7% mortality during the study period of which is more common due to vivax malaria .

Conclusion

Although P. vivax malaria is widely considered benign,recent studies have demonstrated that it accounts for a substantial proportion of hospitalized malaria patients in agreement with our study. The observation that a significant proportion of severe malaria morbidity is also caused by P. vivax would have tremendous implications for control of the infection especially as P. vivax invariably increases relative to P. falciparum under effective transmission reduction. Thus,every effort to reduce or eliminate malaria burden must also target P. vivax along with P. falciparum in regions where both of these species coexist.Plasmodium vivax malaria was the commonest type of malaria observed. Severe plasmodium vivax was associated with all the complications described in falciparum malaria and the mortality was the highest in this group.

Severe anaemia,Cerebral malaria are the commonest complications in children.In our study,the thrombocytopenia and severe anaemia were significantly associated with mortality.

In conclusion severe form of malaria is also seen in vivax malaria and the age group affected by vivax also is younger which was thought to be benign type.

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