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Original Research Article

Clinico-hematological manifestations of malaria in children in Western Uttar Pradesh, India

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ABSTRACT

Background: Globally, malaria is one of the important causes of mortality in pediatric age group. We describe here the clinico-hematological manifestations of malaria in children in Western Uttar Pradesh.
Methods: A Retrospective study was done over 8 months in pediatric ward and pediatric intensive care unit of a tertiary care centre in Greater Noida. Children below 18 years admitted with acute febrile illness with peripheral smear and / or rapid malaria antigen test positive were included in the study. Detailed clinical, biochemical and hematological characteristics of children hospitalized with severe malaria were recorded and patients were managed according to National Vector Born Disease Control Programme Guidelines for malaria treatment.
Results: Out of 115 children admitted with malaria, majority of cases were due to *P. vivax* (88.7%) compared to P. falciparum (5%) and Mixed infection (6%). Malaria was more common in males and in 1 to 5 years age group. Out of 115 patients, severe malaria was present in 27 (23.4%) patients, all infected with *P. vivax*. Among them, bleeding was present in 13.04 %, shock in 9.56%, acidosis in 9.56%, jaundice in 5.21%, seizures in 3.47%, severe anemia in 5.21%, renal impairment in 3.47%, impaired sensorium in 1.73% and pulmonary edema was present in 0.86% patients respectively. Case fatality Rate was 1.73%, all due to severe vivax malaria.
Conclusions: The study highlights that *P. vivax* is a common cause of malaria in Western UP and can result in a severe disease with potential mortality.

Keywords: Clinico-hematological manifestations, Severe vivax malaria, Thrombocytopenia

INTRODUCTION

Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bite of anopheles mosquito.[1] Malaria is endemic in the tropics and subtropics with highest prevalence in Africa followed by South East Asia. India contributes to 80% of South East Asia malaria burden (24 million cases per year).[2] Malaria is causing significant morbidity and mortality in children. Childhood mortality is accounted in about 27% of all deaths per year due to malaria in India.[3] Traditionally, *Plasmodium falciparum* (*P. falciparum*) was considered to be the main cause of 'severe malaria' while Plasmodium vivax (P. vivax) was considered to result in 'benign tertian malaria'. P. vivax is being increasingly recognized as one of the etiological factors for severe malaria in children and adults. In a large study from Delhi, it was found that children with severe malaria infected with *P. vivax* had more hepatic, renal, respiratory and bleeding complications with less overall mortality when compared to *P. falciparum* malaria.[4] Hence, this study was carried out to outline the clinico-hematological profile and outcome in children with malaria admitted to a tertiary care hospital in Western Uttar Pradesh (UP).

METHODS

Setting of the study

A retrospective hospital based clinical observational study was done between the months of April and November in the year 2017 in pediatric ward and pediatric intensive care unit in School of Medical Sciences and Research, Sharda Hospital, a tertiary care centre in Greater Noida. The hospital had patients referred from various places of Western UP. A total of 115 cases of malaria under 18 years were enrolled in the study.

Inclusion criteria

- Children in age group 1month-18 years
- Any Acute Febrile Illness lasting for 2-7 days and
- Peripheral blood smear or rapid malaria antigen test positive for *P.vivax* and/or *P. falciparum* malaria.

Exclusion criteria

- Patients presenting with fever with peripheral smear (PS) and / or rapid malaria antigen test negative for malaria but treated empirically like malaria.
- Co-infection with dengue (dengue antigen or dengue serology positive).
- Chronic illnesses, bleeding disorders, renal disorders, progressive neurological diseases.

Diagnosis

Diagnosis and confirmation of species of *P. falciparum* and *P.vivax* malaria were established by thick and thin film of peripheral smear (PS) examination under oil immersion with Giemsa stain and Malaria Rapid Card Test which is a chromatographic immunoassay for qualitative determination of malarial parasite (*P.vivax*/*P.falciparum*), pLDH and aldolase. Analysis of severity of malaria was done on the basis of WHO guidelines for severe malaria.[4]

Data collection and analysis

Records of all the patients who were discharged with the diagnosis of malaria were retrieved. Data regarding patient's age, sex, clinical presentation, investigation and outcome was recorded. The clinical features and lab reports were analyzed to label severity based on WHO guidelines for classification of severe malaria and were categorized into 2 groups-severe malaria and non-severe malaria. The qualitative variables were expressed in terms of percentages and analysed using Chi-square test. A p- value of < 0.05 was considered as statistically significant. SPSS (Statistical Package for Social Sciences) version 16.0 was used for data analysis.

Treatment

Patients were treated according to National Vector Borne Disease Control Programme (NVBDCP) guidelines for malarial treatment.

Outcome

Out of total of 115 patients admitted with malaria, 113 patients had recovered and discharged while 2 patients died due to severe vivax malaria.

RESULTS

Out of 115 children admitted with malaria, majority of cases, 102 (89%) were found to have *P. vivax* infection, while 6 (5%) and 7 (6%) patients had *P. falciparum* and Mixed infections respectively. In present study, malaria cases were observed to be at their peak in August and September.

Incidence of malaria was found to be more in males (66.1%) than females (33.9%). Male to female ratio was 1.94. Out of 115 patients, majority of patients with P. vivax malaria were in the age group (1-5) years while those with *P. falciparum* and mixed infection were in the age group (>5) years (Table 1).

Table 1: Age and gender distribution of malaria

Types of Malaria	*P. vivax*		*P. falciparum*		Mixed		Total	
Age (years)	N	%	N	%	N	%	n	%
< 1 year	4	3.92	0	0.00	0	0.00	4	3.4
1-5 year	58	56.86	1	16.67	0	0.00	59	51
> 5 years	40	39.22	5	83.33	7	100.00	52	45.2
Total	102	100	6	100	7	100.00	115	100
Gender								
Male	68	66.67	3	50.00	5	71.43	76	66.1
Female	34	33.33	3	50.00	2	28.57	39	33.9
Total	102	100	6	100	7	100	115	100

Among 115 malaria cases, pallor was the commonest clinical feature present in 99 (86.08%) patients. Hepatosplenomegaly was the next common clinical sign observed in 74 (64.34%) cases. Other clinical features noted were isolated hepatomegaly 12 (10.43%), isolated splenomegaly 8 (6.95%), respiratory symptoms in the form of cough and respiratory distress 7 (6.08%) and seizures in 4 (3.47%) patients.

Among the laboratory (lab) parameters, 85 (73.91%) patients had hemoglobin between 5-10 gm% while 24 (20.86%) patients had hemoglobin more than 10gm%. 50 (43.48%) patients had platelets < 50,000, 49 (42.60%) patients had platelets between 50,000 to 1 lakh while 3 (2.60%) patients had platelets above 1 lakh. 3 (2.60%) patients had hemoglobinuria that improved on treatment (Table 2).

Table 2: Distribution of clinical features and lab parameters in total cases of malaria (N=115).

Types of Malaria	*P. vivax*, n=102		*P. falciparum*, n=6		Mixed n=7		Total, n=115	
	N	%	N	%	N	%	N	%
Clinical features								
Pallor	88	86.27	6	100.00	5	71.43	99	86.08
Hepatosplenomegaly	65	63.73	5	83.33	4	57.14	74	64.34
Hepatomeglay	12	11.76	0	0.00	0	0.00	12	10.43
Seizures	4	3.92	0	0.00	0	0.00	4	3.47
Cough and respiratory distress	7	6.87	0	0.00	0	0.00	7	6.08
Lab parameters								
Hemoglobin 5-10gm%	76	74.51	6	100	3	42.86	85	73.91
Hemoglobin > 10gm%	20	19.61	0	0.00	4	57.14	24	20.86
Platelet/cmm < 50,000	47	46.08	2	33.33	1	14.29	50	43.48
50,000-1 lakhs	44	43.14	3	50.00	2	28.57	49	42.60
>1 lakhs	11	10.78	1	16.67	4	57.14	3	2.60
Hemoglobinuria	3	2.94	0	0.00	0	0.00	3	2.60

Out of total 115 patients, 27 (23.4%) patients had severe malaria, all of whom were infected with *P. vivax*. None of them had *P. falciparum* or mixed infection. Among them, bleeding was present in 15 (13.04%) cases in the form of upper gastrointestinal bleeds, epistaxis, hemoptysis and bleeding per rectum.

Table 3: Distribution of clinical and laboratory severity parameters in total cases of malaria.

Severity parameters	Malaria cases	
	N	%
Bleeding	15	13.60
Shock	11	10.75
Acidosis	11	10.75
Severe anemia	6	5.88
Jaundice	6	5.88
Renal impairment	4	3.92
Impaired consciousness	2	1.96
Pulmonary edema	1	0.98
Hypoglycemia	0	0.00

Other findings were acidosis 11 (9.56%), shock 11(9.56%), jaundice 6 (5.21%), severe anemia 6 (5.21%), renal impairment 4 (3.47%), impaired consciousness 2 (1.73%) and pulmonary edema 1 (0.86%). Some patients had more than 1 parameter of severe malaria (Table 3).

DISCUSSION

The present study highlights the clinico-hematological profile of malaria in paediatrics age group in Western UP. *P. vivax* was the most common cause of malaria as compared to *P. falciparum* and Mixed infection. A similar finding was seen in other studies from states of Delhi and UP.[5,6]

Interestingly, in present study, 3.4% patients were below 1 year of age while majority of children were between the age of 1-5 years (54.7%). A similar age group distribution was seen in a study by Rao, et al.[7] On the contrary, a study by Kocher, et al, equal incidence of malaria in 0-5 years, 5-10 years and > 10 years was seen.[8] Clinical manifestations of malaria may be severe in infants and young children due to lack of immunity resulting due to repeated malarial infections.

Males 76 (66.1%) were more affected than females 39 (33.9%) in the present study. Similar male preponderance has been reported earlier.[9] This is possibly due to increased outdoor activity and increased exposure to mosquitoes in males as compared to females. This may also be due to sick females not being brought to hospital perhaps due to prevalent gender bias. The results show that transmission of malaria in Western UP is seasonal with peak incidence in months of August and September.

This finding is consistent with previous reports from UP.[10,11] Pallor was the most common symptom present in 99 (86.08%) cases. Severe anemia on blood test was present in 6 (5.2%) cases. Pallor had no significant association with the type of malaria. Similar prevalence of anemia has been noted in another study by Latif, et al.[12] Two common causes of anemia in malaria are increased hemolysis and decreased rate of erythrocyte production from bone marrow whereas the malnutrition and intestinal parasitic infections aggravate this problem in endemic areas. Hepatosplenomegaly 74 (64.34%), isolated hepatomegaly 12 (10.43%) and isolated splenomegaly 8 (6.95%) were present in children admitted with malaria in our hospital. Similar findings have been reported by Saira Merchant, et al.[13] Enlargement of liver and spleen is due to vascular congestion and endothelial proliferation. In present study, hemoglobinuria was found in 2.94% of patients, all infected with *P. vivax*. On the contrary, in a study by Rao, et al, same was found in 8.3% of patients, all infected with *P. falciparum* or mixed infection. Intravascular hemolysis contributed to hemoglobinuria and jaundice.[7]

Seizure was noted in 3.47% of patients all of whom were infected with *P. vivax*. All these patients had cerebral malaria. In a study by Rao, et al, there was a higher incidence of seizures (18.5%) as compared to present study.[7] Rapid rise and higher fever trends are seen in P. vivax malaria due to lower fever threshold giving rise to seizures.

Respiratory symptoms (cough, respiratory distress) were observed in 7 (6.08%) patients of malaria, all being *P. vivax* positive. Sequestration of *P. vivax* infested RBC and greater inflammatory response to parasite leading to capillary alveolar dysfunction is noted in *P. vivax* malaria.[14] This might perhaps explain respiratory manifestations observed in present study.

Out of total 115 patients, 27 (23.4%) were classified as severe malaria. All our cases of severe malaria were infected with *P. vivax*. These data on severe malaria are in line with those reported by Geleta, et al.[15] Interestingly, none of the severe vivax malaria cases in present study had hypoglycaemia. This trend was also observed in other studies which is in contrast to severe falciparum malaria wherein hypoglycaemia is one of the important causes of morbidity.[16] Two patients died due to severe vivax malaria. Case fatality rate was 1.73%. Both patients had severe anemia, thrombocytopenia, multi-organ dysfunction and shock contributing to an unusually high case fatality rate due to *P. vivax* infection.

CONCLUSION

The present study thus reflects the epidemiology of malaria in pediatric age group in Western UP, India. The study highlights that *P. vivax* is common in Western UP, India and can result in a severe disease with potential mortality. It can no longer be considered a benign condition. However, there is a need for further studies to establish mortality and severity predictors specific to *P. vivax* malaria.

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