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

Najia Hassan*, Sonam Chalotra, Satinder Aneja

Department of Pediatrics, School of Medical Sciences and Research, Sharda University, Greater Noida, Uttar Pradesh, India

Received: 09 June 2018
Accepted: 02 July 2018

*Correspondence:
Dr. Najia Hassan,
E-mail: najiahassan.hassan@gmail.com

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. 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). 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. 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. 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 10 gm%. 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   | %    | N   | %    |
| **Clinical features**    |     |      |     |      |     |      |     |      |     |      |
| Pallor                   | 88  | 86.27| 6   | 100.00| 5   | 71.43| 99  | 86.08|
| Hepatosplonomegaly       | 65  | 63.73| 5   | 83.33 | 4   | 57.14| 74  | 64.34|
| Hepatomegaly             | 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 | 7   | 6.08 |
| 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   | 100.00| 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.4-11 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.1 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 infected 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.

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

**REFERENCES**

1. World Health Organisation, Regional office of South East Region Health topics: Malaria:World Malaria report 2014. Available at http://www.searo.who.int/entity/malaria/en/.

2. Dhingra N, Jha P, Sharma VP, Cohen AA, Jotkar RM, Rodriguez PS, et al. Adult and child malaria mortality in india:-A nationally representative mortality survey. Lancet. 2010;376:1768-74.

3. Yadav D, Chandra J, Aneja S, Kumar V, Kumar P, Dutta AK. Changing profile of severe malaria in North Indian children. Indian J Pediatr. 2012;79:483-7.

4. World Health Organisation Regional office of SEAR 2016. Available at (www.searo.who.int/india/topics/malaria/en/).

5. Kaushik JS, Gomber S, Dewan P. Clinical and epidemiological profiles of severe malaria in children from Delhi, India, J Health Popul Nutr. 2012;30(1):113-6.

6. Singh DP, Verma RK, Singh A, Kumari S, Siddiqui ME. A retrospective study of malaria from western part of Uttar Pradesh, India. Int J Pharm Sci Res. 2016;7(8):3493-6.

7. Rao PT, Krishna P. Clinical Profile of admitted children with malarial fever: a retrospective study. Int J Ped Res. 2016;3(9):678-82.

8. Kochar DK, Tanwar GS, Khatri PC, Kochar SK, Sengar GS, Gupta A. et al. Clinical features of children hospitalized with malaria-a study from Bikaner, Northwest India. Am J Trop Med Hyg. 2010;83(5):981-9.

9. Kumari M, Ghildiyal R. Clinical Profile of Plasmodium vivax Malaria in Children and Study of Severity Parameters in relation to Mortality: Tertiary Care Centre Perspective in Mumbai, India. Malaria Res Treat. 2014;7656-57.

10. Rizvi I, Tripathi D K, Chughtai A M, Beg M, Zaman S, Zaidi N. Complications associated with Plasmaldium vivax malaria: A retrospective study from a tertiary care hospital based in western Uttar Pradesh, India. Ann African Med. 2013;12:155-9

11. Savargaonkar D, Nagpal BN, Srivastava B, Anvikar AR, Valecha N. The footprints of relapsing malaria in southwest Delhi, India. J Vector Borne Dis. 2015;52(4):287-92.

12. Latif N, Ejaiz M, Hanif S, Memon H., Clinical and hematological pattern in patients with Plasmodium vivax. Med Chan. 2012;18(1):48-51.
13. Saira M, Rajkumar MM, Mohammad MT. Clinical manifestations and predictors of mortality in severe malaria in children. Sch J App Med Sci. 2016;4(6A):1931-35.

14. Anstey NM, Handjojo T, Pain MC, Kenangalem E, Tjitra E, Price RN. Lung injury in vivax malaria: pathophysiological evidence for pulmonary vascular sequestration and posttreatmentalveolarcapillary inflammation. J Infect Dis. 2007;195(4):589-96.

15. Geleta G, Ketema T. Severe malaria associated with Plasmodium falciparum and P. vivax among children in Pawe Hospital, Northwest Ethiopia. Malaria research and treatment. 2016;2016.

16. Osunuga OA, Derkyi KL. Prevalence of hypoglycaemia among severe malaria children in a rural African population. Asian Pacific J Trop Dis. 2011;1(3):192-4.

Cite this article as: Hassan N, Chalotra S, Aneja S. Clinico-hematological manifestations of malaria in children in Western Uttar Pradesh, India. Int J Contemp Pediatr 2018;5:1904-8.