Research Article

Clinical profile and prognostic indicators of Plasmodium Falciparum Malaria in children

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Abstract

Introduction: Malaria is one of the oldest recorded diseases of world, it has infected humans since last 50,000 years .Pediatric population is especially vulnerable to this preventable illness. This study has been undertakento ascertain the incidence of common clinical features of falciparum malaria so that to improve the insight into this highly prevalent disease and to evaluate prognostic indicators of falciparum malaria. **Materials and Methods:** The study has been conducted in Department of Pediatrics ,Gandhi Medical College Bhopal (MP),over a period of one year.150 cases of slide positive falciparum malaria were studied thoroughly using a preformed proforma. Clinical features, biochemistry, course during stay, response to treatment and outcome were recorded in all the study patients. **Results:** Majority of our cases were males of more than five years. Fever was presenting symptom in 98% of patients. Vomiting, altered sensorium, convulsions, breathlessness, headache, bleeding were the other symptoms recorded in that order. Pallor was the most common clinical sign (96%) followed by hepatomehaly & splenomegaly(57 & 65%), hypotension(30%), dehydration(25%) and icterus(28%). Serum creatinine value of >3 gm/dl (10%)and Hemoglobin level of <5gm/dl was significantly associated with mortality(p value <0.05).Incidence of severe falciparum malaria was 36% in our study out of which 29% expired. **Conclusions:** Severe anaemia and cerebral malaria are the most common presenting features in the pediatric population as per our study. Serum creatinine levels of > 3 gm/dl and haemoglobin levels of <5gm/dl were significantly associated with mortality. The signs significantly associated with mortality were; Glasgow Coma Scale <8, splenomegaly, neck rigidity.

Key Words: Plasmodium falciparum, severe anaemia, complications, prognostic indicators

Introduction

Malaria continues to create menace in developing countries especially Indian subcontinent. India contributes about 70% of malaria cases in South East Asia region [1]. The regional differences in India in terms of weather, socioeconomic status and infrastructural irregularities makes certain regions particularly important for burden of malaria. Madhya Pradesh, the state situated in central India is one of the worst affected states by Malaria [2]. Despite a substantial disease burden in this area, little is known about the natural history of complicated falciparum malaria. Therefore, the present prospective study was undertaken to assess the clinical course, complications and outcome i.e. to understand the clinical profile and assess prognostic indicators of falciparum malaria in children in tertiary care centre of Central India, Bhopal.

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Material and Methods

Study Area: This study was done in Department of paediatric of Gandhi MedicalCollege Bhopal, important tertiary referral centre of whole central Madhya Pradesh.

Each year a large number of patients with malaria get admitted to this hospital especially in the rainy season. Most of the patients are drained from the rural areas of Bhopal as well as adjacent part of Madhya Pradesh. The annual range of temperature differs by around 12°C.

The temperature varies from a maximum of 45.6°C to a minimum of 6^0 C.The monsoon season is June to August.

Study Design: This was a prospective hospital based study conducted on 150 consecutive paediatric admissions of slide positive complicated falciparum malaria cases (as defined by WHO criteria). Diagnosis was based on thick and thin blood smear examination after staining in Leishman′s stain examined by qualified experienced persons. Detailed demographic and clinical evaluation was done. Routine laboratory tests included complete blood cell count, platelet count , blood sugar, liver and renal tests, coagulation profile was done, hepatitis markers in all jaundiced patients , blood culture and CSF study, chest X-ray, and urine for hemoglobinuria wherever necessary. Patients having clinical or laboratory evidences of other significant illness not attributable to severe malaria were excluded from the study. The outcome of complications with particular reference to number of death (fatal outcome) was documented. The statistical analysis was done using paired t –test and p value of< 0.05 was taken as significant.

Results

1. Patient characteristics and demographic:

150 cases of severe malaria that had symptoms consistent with severe malaria and were found peripheral smear positive to falciparum infection.74 were ≤5 years of age and 76 >5 years of age. Males were 82(54.7%) outnumbered females 68(45.3%). (Table:1)

Table No 1: Age and Sex Distribution

Age/sex	<1 years	1-5 years	>5 years	total
Male	8	34	40	82
Female	5	27	36	68
Total	13	61	76	150

Mean duration of complaints was 4.7±4.89 days, and hospital stay was 5.0±2.1 days. 80% cases were admitted from adjacent rural area and belong to lower socioeconomic status. Although patients presented to hospital throughout the years but about two third cases were admitted from August to November months.

2. Clinical features and examination

A. Central nervous system:

Altered sensorium was present in 50% of cases. The children with altered sensorium had a statisticallysignificant mortality rate with a p- value of <0.05.Convulsions were noted in 37% of cases out of which27% of children could not survive (p value <0.05) (Table No 2)

B. Respiratory system: Breathlessness was present in 28% of cases and it was significantly correlated with mortality with a p value of <0.05.

C. Gastrointestinal system: Vomiting was documented in 45%of cases with a significant association with mortality.(p value< 0.05)

D. Renal involvement: At the time of admission oliguria was found in 13% of cases. It is significantly associated with mortality p value<0.05.

E.Bleeding manifestations in the form of melena, epistaxis,petechaie,hematemesis were noted in 9% of cases.

F.Fever: Majority of patients, ie 98% of them admitted with complaint of fever.The fever was intermittent in 54% of children. A significant percentage of patients had continuous fever (34%).

Table No 2: Clinical Symptoms with prognostic value

Symptoms	No.of cases	percentage	Patients expired	P value
Fever	148	98	16	>0.05
Vomiting	67	45	12	<0.05
Lose motions	33	22	10	>0.05
Oliguria	20	13	6	<0.05
Hemoglobinuria	12	8	7	>0.05
Headache	32	21	7	>0.05
Altered Sensorium	76	50	12	<0.05

Clinical Sign

Table 3: Effect of Hemoglobin level on Mortality

	Hemoglobin levels	No. of cases	Percentage	Mortality	P value
1	<5gm/dl	52	34	10	<0.05
2	5-7gm/dl	58	38	4	>0.05
3	7-10gm/dl	26	17	1	>0.05
4	>10gm/dl	14	9	1	>0.05

Pallor was present in majority of patients ie 96%.Severe anaemia defined as haemoglobin concentration below 5g/dl (according to WHO malaria action programme) was observed in 34% of the cases, which was significantly associated with mortality (p value <0.05).(Table- 3)

Table No 4: Biochemical Parameters as Prognostic Indicator

S.No	Biochemical Parameters	No.of Cases	Percentage	Percentage expiry	Probability
1	Blood Sugar <40mg/dl	54	36	14	>0.05
2	Serum Creatinine>3mg/dl	16	10	25	<0.05
3	Serum bilirubin >3 mg/dl	46	31	8.5	>0.05

Icterus was observed in 28% of the children. The children with total serum bilirubin concentration of >3 mg /dl had a significant mortality rate with p value <0.05.Hepatomegaly (defined by age appropriate liver span) was observed in 57% of total cases and it was significantly associated with mortality i e p value <0.05. Splenomegaly was present in 65% of cases, and its association with mortality was statistically significant.

Hypotension (Blood pressure<5th percentile for age) was recorded in 30% of patients. Neurological signs in terms of deep coma ie Glasgow coma scale of<8 was significantly associated with mortality (p value<0.001).Other signs like neck rigidity (7.3%) and tonic posturing (14%) were found to be significantly associated with mortality.

Biochemical changes: (Table: 4)

(1) Hypoglycaemia: Blood sugar <40mg/dl was the most common abnormality found in 36% of total patients. Its association with mortality was not statistically significant.

(2) Serum creatinine: Value of serum creatinine of >3mg/dl was observed in 105 of patients and it was significantly associated with mortality.

(3) Hyperbilirubinemia: Total serum bilirubin of >3mg/dl was present in 31% of patients and this was significantly associated with mortality (p value<0.05).

Table No 5: **Incidence of severe Malaria**

S. No	No. of cases	Expired	Percentage Expiry
Severe falciparum malaria	54	16	29
Uncomplicated Malaria	96	0	0

Discussion

Since 1977, there is a consistently declining trend in the annual malaria incidence in our country. During 2005 about 1.8 million cases were reported with 940 deaths. There were 0.79 million cases of falciparum malaria. Infants, young children and pregnant women have been identified as malaria high risk groups [3, 4]. In this study >5 year of age group were commonly affected with severe malaria than older children similar to previous studies [5, 6].

The difference in the age of presentation in severe malaria might be the result of multiple factors including differential parasite organ sequestration in young children as compared to older children and adults [7]. Low level of complementary regulatory proteins is leading to increased red cell destruction in young children [8]. Satpathy et al reported 40.5% cases of cerebral malaria we also reported 45%cases [9].

Malaria with impaired consciousness is a well-recognized syndrome, although the exact definition of cerebral malaria is controversial [10]. Seizures and altered sensorium were significantly present in children 37%and 45% respectively which was comparable with the Tripathy R.at el [11].The incidence of severe falciparum malaria is more in male children (54%) as compared to female. Other Studies demonstrated similar results [12- 14]. Deep coma i.e. Glasgow coma scale score of <8 was associated with statistically significant mortality (p value of <0.001.)

Fever is the most common presenting symptom (98%), similar observation was been made by studies done by Taksandeet al [12] and,Kaushik et al [15].

Altered pulmonary function in malaria is common and includes airflow obstruction, impairedventilation, impaired gas transfer, and increased pulmonary phagocytic activity, and its occurrence in both vivax and falciparum malaria suggests that there may be common underlying inflammatory mechanisms [16]. Breathlessness was present in 28% of patients and it was significantly associated with mortality. Similar findings have been reported by Giha et al and Abdullah Al Taiar et al reported 31% and 40% respectively [17, 18].

Vomiting (45%) and diarrhoea were the frequent symptom found in this study. Hepatomegaly and splenomegaly were documented in 57% and 65% respectively whereas Chander V. et al [19] reported 44.5% and 40.9% respectively. The cause may be vascular congestion and reticuloendothelial proliferation. High spleen palpable rate in this study indicates the disease endemicity in this area. Jaundice was seen in 31%.

Similar observations were made in study done by Chaudhary et al[20] they observed icterus in 49% of cases in study done in 2012 in Gujrat. It is one of the common manifestations of severe falciparum malaria. Its incidence varies between 10-54% in different reports, and is seen more in adults than in children. Presence of raised bilirubin in these patients not only indicates haemolysis but liver dysfunction were also responsible to the raised serum bilirubin. ARF complicates falciparum malaria in less than 1 to 4.8% of native patients in endemic areas, yet it is much more frequent in non immune Europeans; reported figures usually are 25 to 30% [21].In our study we found acute renal failure were more common in >5 age group of children, (10% of total cases); results were comparable with the otherstudies [9, 10].

Severe anaemia was observed in 34%of cases especially which is quite similar to that of reported by Chander Vet al. [19] & Kunduet al [13]. The pathophysiology of anaemia is multifactorial reflecting an extremely complex series of interaction involving parasites red cell destruction,erythrophagocytosis, inhibition of reticulocyte release, depressed or ineffective erythropoesis, immune mechanism and dyserythropoesis [19]. It was rapidly reversible after giving timely blood transfusion, and had better tolerability.

Overall mortality in our study was 10%very similar to other studies [9].The majority of children, especially those with circulatory collapse and respiratory distress, died within 24 hours after admission similar to Mockenhaupt FP et al.[22] emphasizing the need for triage and early treatment. Cerebral malaria responsible for majority of the deaths (case fatality rate29%) similar

to other Indian studies [9, 11] but less than African studies Mockenhaupt FP[22] et al (36.2%). Severe anaemia is a highly prevalent complication (34%) and it was significantly associated with mortality. Similar observation has been made by Abdulla AL Taiar etal[18]. They reported severe anaemia in 37% of cases and Taksande et al [12] reported in 67.85% of cases. The observation made by Kevin Marsh et al[7], for severe anaemia was 17.6% .Splenomegaly was significantly associated with mortality and was present in 65% of cases though Kamble et al[14] reported 53% of cases.

Serum creatinine levels of >3 mg/dl was present in 10 % of cases. High degree of suspicion should be maintained to differentiate these complications so that by early detection and prompt management morbidity and mortality can be reduced. It was significantly associated with mortality (p value <0.05).The study done by Rashid SB [21] have reported renal failure in 5.9% of cases, Kaushik et al[15] reported 8.9%.

Hypoglycemia was present in 36% of total cases.Similar observation was made in study done by N.J .White et al [23]

Conclusion

Severe falciparum malaria is a major problem affecting the health of children in this area. Severe anaemia, cerebral malaria, and respiratory distress are the commonest complications in children with severe malaria presenting to hospital. Certain biochemical and clinical features which when present in a child with falciparum malaria can predict poor prognosis, in terms of mortality,should be identified and managed appropriately and promptly. In our study the serum creatinine levels of > 3 gm/dl and haemoglobin levels of <5gm/dl were significantly associated with mortality. The signs significantly associated with mortality were Glasgow Coma Scale <8, splenomegaly, neck rigidity.

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