

Clinical presentation & survival outcome of severe malaria among hospitalized children- a single centre observational study

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Abstract

Introduction: Malaria is characterized by paroxysms of fever, chills, sweats, fatigue, anaemia & splenomegaly. Fatality rates around 10-30 % have been reported among children mainly due to cerebral malaria & anaemia followed by respiratory infections, diarrheal disease & malnutrition. **Methodology:** This study was done in Department of pediatrics, S.C.B medical college & S.V.P. P.G.I.P., Cuttack, from October 2013 to September 2015 with Objectives to study the clinical presentation & survival outcome of severe malaria in children of age group 1 to 14 yrs. A detailed history of illness, clinical examination, investigations, treatment & responses to therapy of each case were noted in standard proforma. **Results:** A total of 134 children with severe malaria were studied. Maximum number of cases were seen in age group of 1-5 years (40.29%) followed by age group of 5-10 years (33.58%). Male: Female ratio was 1.6:1. Fever was present in 100% of cases, altered sensorium in 50%, convulsion in 49% & jaundice in 35.82%. Most of the cases were due to p. Falciparum (80.59%). Out of 41 cases of severe anemia, 22(53.65%) survived. Out of 8 cases with respiratory distress, 1(0.74%) survived. Out of 67 cases with CNS involvement, 45(67.16%) survived. Out of 25 cases with Hepatopathy, 25(18.65%) survived. Out of 47 cases of single organ involvement 45 cases survived & 2 cases died. Out of 60 cases of multiple organ involvement 36 cases survived. **Conclusion:** Awareness about the changing spectrum of severe malaria is of great importance to every level for healthcare provider.

Keywords: Severe malaria, Survival outcome, Multiorgan involvement

Introduction

Malaria is characterized by paroxysms of fever, chills, sweats, fatigue, anaemia & splenomegaly [1]. Malaria is almost as old as human race & has been described since 5th century B.C. by Hippocrates. Even Charak & Susruta of ayurvedic period gave vivid description of its association with mosquito bite [2]. It is caused by intracellular plasmodium protozoa transmitted to humans by female anopheles mosquito. Malaria is characterized by paroxysms of fever, chills, sweats, fatigue, anaemia & splenomegaly. Malaria is of overwhelming importance in the developing world today, with an estimated 300-500 million cases & more than 1 million deaths each year [3]. Approximately half of global population is at risk of malaria. Fatality rates around 10-30 % have been reported among children

referred to hospital with severe malaria mainly due to cerebral malaria & anaemia followed by respiratory infections, diarrheal disease & malnutrition [6]. Severe falciparum malaria is defined as acute malaria with signs of severity/ occurrence of vital organ dysfunction.

In severe falciparum malaria processes of cytoadherence, resetting & agglutination results in sequestration of RBC containing mature forms of the parasite in vital organs thereby interfering with microcirculatory flow leading to cerebral, cardiac, pulmonary, intestinal & hepatic failure [4]. Severity of malaria is manifested by unarousable coma/cerebral malaria, academia/acidosis, severe normochromic normocytic anemia, renal failure, pulmonary oedema/ARDS, hypoglycemia, hypotension/shock, bleeding/ DIC, convulsions, hemoglobinuria, impaired consciousness, prostration & hyperparasitaemia.

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Multiorgan dysfunction syndrome is defined as dysfunction of > 1 organ, requiring intervention to maintain homeostasis [5,6].

In addition to “traditional” sepsis, severe falciparum malaria is an important etiology of MODS. While uncomplicated falciparum malaria causes a mortality of about 0.1%, once vital organs dysfunction occurs mortality risk rises steeply [7].

There is a paucity of studies on the different clinical presentations & organ involvements in severe malaria among children. Hence this study was made to analyse the varied clinical presentations of severe malaria among children & its outcome.

Aims & Objectives

To study the clinical presentation & survival outcome of severe malaria in children of age group 1 to 14 yrs.

Materials and Methods

This study was done in the Department of paediatrics, S.C.B medical college & S.V.P. P.G.I.P., Cuttack, a tertiary care referral hospital from October 2013 to September 2015. It's a direct observation prospective study.

Inclusion criteria: All children between 1-14 years of age admitted to Paediatrics indoor of S.C.B.M.C. and S.V.P.P.G.I.P., Cuttack during the study period with a

primary diagnosis of malaria who satisfy any 1 of WHO Criteria for severe malaria were included [8].

Exclusion criteria: Children with suspected malaria treated as severe malaria but laboratory studies were suggestive of malaria negative & those children with similar presentation diagnosed to be due to other aetiopathological cause were excluded from the study.

In our study 134 number of cases fulfilling the inclusion criteria were taken in to study.

Methodology

A detailed history of illness, clinical examination, investigations, treatment & responses to therapy of each case were noted in standard proforma. Necessary Investigations done to reach the final diagnosis. The data were noted in tabulate form & results were interpreted by using statistical analysis.

Blood smear preparation: Third or fourth finger of left hand is pricked at distal part of palmar aspect under all aseptic conditions (area to be pricked is wiped with alcohol & allowed to dry).

Microscopic examination of blood film: Thin blood films- At least 100 fields to be examined for 10 min before discarding as MP negative. Thick blood film- It concentrates 20-30 layers of red cells on a small surface, & detects parasitemia as low as 20 parasites/ml.

Results

A total of 134 children with severe malaria were studied, result of which are tabulated as below.

Table-1: Age & sex distribution in the study group

Age group (years)	Male	Female	Total	Percentage
1-<5	36(26.86%)	18(13.43%)	54	40.29%
5-<10	25(18.65%)	20(14.92%)	45	33.58%
10-14	22(16.41%)	13(9.70%)	35	26.11%
Total	83(61.94%)	51(38.05%)	134	100%

Maximum number of cases were seen in age group of 1-5 years (40.29%) followed by age group of 5-10 years (33.58%). About 26.11% belonged to 10-14 years age group. The mean age of presentation was 6.4 years. Male: Female ratio was 1.6:1.

Fever was present in 100% of cases, altered sensorium in 50%, convulsion in 49% & jaundice in 35.82% Prostration was found in 20.89% , Hemoglobinuria was present in 5.22%, Spontaneous bleeding was found in 7.46% & decreased urination was found in 17.1% cases.

Table-2: Presenting complaints of the patients (n=134)

Presenting complaint	No of cases	Percentage (%)
Fever	134	100%
Altered sensorium	67	50%
Convulsion	49	36.56%
Jaundice	48	35.82%
Respiratory distress	8	5.97%
Hemoglobinuria	7	5.22%
Decreased urination	23	17.1%
Bleeding	10	7.46%
Prostration	28	20.89%

Table-3: Clinical signs of the studied cases

Clinical signs	No of cases	Percentage
Pallor	113	84.32 %
Icterus	55	41.04 %
Oedema	21	15.67 %
Hepatomegaly	122	93.12 %
Splenomegaly	111	82.83 %
Oliguria	23	17.16 %
GCS < 11	67	50%
Shock	23	17.1 %
Bleeding	10	7.4 %
Chest signs	8	5.9 %

Hepatomegaly was found in 93.12% of patients & splenomegaly in 82.83% cases. Normal platelet count was noted in 72.38% & Thrombocytopenia (TPC <150,000) in 27.61%. TPC <50,000 was found in 5.22% cases. Normal Serum Creatinine was found in 5.377%. Creatinine >3 mg % was found in 12.68 %.

Mean S. Creatinine level was 1.44 mg%. Serum Bilirubin of < 3 mg/dl was found in 68.65%, 3-5 mg/dl was found in 10.44%, between 5-10 mg/dl was found in 8.95% & >15mg/dl in 3.73% patients. Mean bilirubin level was 3.38mg/dl. CRP was raised in 86.56% of patients.

Table-4: Distribution of cases according to presenting hemoglobin concentration (n=134)

Hemoglobin in gm %	No of cases	Percentage (%)
< 5	41	30.59 %
>5 - <8	35	26.11 %
8 - <10	36	26.86%
> 10	22	16.41 %
Total	134	100 %

This table depicts distribution of cases according to the presenting hemoglobin level. 41 patients (30.59%) cases have got severe anemia (hemoglobin <5 gm %) where as 93 (69.40%) cases have hemoglobin level >5gm%.

Table-5: Parasitological parameters of severe malaria

Type of species	p.falciparum	P.vivax	Mixed
Number of cases (%)	109 (80.59%)	2 (1.49%)	23 (17.91)

Most of the cases were due to p. falciparum which accounts for 80.59%, followed by mixed infection (P.f + P.v) accounting for 17.91% cases and the least by P. vivax around 1.49% of cases.

Table-6: Survival based on organ involvement

	Survivor Cases (%)	Non Survivor Cases (%)	No of cases	P value
Severe Anemia <5g/dl present	22(53.65%)	19(46.34%)	41(30.59%)	Significant (< 0.0001)
Severe anemia absent	85(91.39%)	8(8.6%)	93(69.4%)	
Respiratory distress present	1(12.5%)	7(87.5%)	8(5.97%)	Significant (< 0.00001)
Respiratory distress absent	106(84.12%)	20(15.87%)	126(94.02%)	
CNS involvement Present	43(64.17%)	22(32.83%)		Significant (0.0003)
CNS involvement Absent	62(92.53%)	5(7.4%)	67(50%)	
Serum Billirubin(T) >3mg/dl Present	25(59.52%)	17(40.47%)	42(31.34%)	Significant (0.0001)
Serum Billirubin(T) >3mg/dl Absent	82(89.13%)	10(10.8%)	92(68.65%)	
Sr.creatinine>3mg/dl Present	10(58.82%)	7(41.17%)	17(12.68%)	Significant (0.0212)
Sr.creatinine>3mg/dl Absent	97(82.90%)	20(17.09%)	117(87.31%)	
Shock Present	3(13.04%)	20(86.95%)	23(17.16%)	Significant (<0.001)
Shock Absent	104(93.69%)	7(6.3%)	111(82.83%)	
Organ involvement Present	80(74.76%)	27(25.23%)	107(79.85%)	Significant (0.0036)
Organ involvement Absent	27(100%)	0(0%)	27(20.14%)	
Multi organ involvement	36(60%)	24(40%)	60(56.07%)	Significant (0.0001)
Single organ involvement	45(95.74%)	2(4.25%)	47(43.92%)	

The table shows significant association of anaemia, involvement of respiratory system , CNS , hepatic, renal , multiorgan system, including Shock on survival.

Discussion

In our study majority were between 1-5 years (40.29%) & between 5-10 years (33.58%) which was similar to other studies [9,10]. We observed that males outnumbered females in all age groups. There were a total of 83 males (61.94%) & 51 females (38.05%) with

the male: female ratio of 1.62:1 which was similar to other studies [10,11, 12, 13, 14,15]. The sex difference may be explained due to medical care seeking behaviour in different socioeconomic status ethnic groups, attitude of parents especially mothers towards

male children, more outdoor activity of males & better clothing of females in India.

Most common presentation was fever which was similar to other studies [10,6,7,8,9,10,11]. Other predominant symptoms were altered sensorium (50%) & convulsion (36.56%) which were comparable to other studies [10,13,14,15,19]. Jaundice was present in 41.04 % which was comparable to other studies [11,20].

Presence of raised serum bilirubin not only indicates hemolysis but also liver dysfunction. Prostration, defined as the inability to sit unsupported (for children over 6 months of age) or the inability to drink or breast-feed in younger children was found in 20.89% of the cases as against around 40% in other studies [13,21].

Shock as described as SBP < 70 mm Hg or need of Isotonic IV Fluid bolus \geq 40ml/kg in 1hr need for vasoactive drug to maintain BP in normal range (dopamine > 5 μ g/kg/min or dobutamine, epinephrine, or norepinephrine at any dose was found in 17.1%) as against 10% in other studies [14,22]. Pallor was found in 84.32% cases similar to other study [14].

Majority of cases had hepatosplenomegaly with hepatomegaly in 93.12% & splenomegaly in 82.83% cases which was consistent with other studies [14,16, 23]. Hemoglobinuria was present in 5.22 % which was comparable to other studies [10,11,15,21,24].

Respiratory distress as described by tachypnea & deep breathing with use of accessory muscles of respiration & chest recession was found 5.97% which was comparable to other studies [11,13,15]. However higher incidence between 25-40 % were noted in some studies [9,19,21,25].

Spontaneous bleeding was found in 7.46% which was similar to some studies [14,15] & slightly more than other studies [11,21]. Oliguria was found in 17.16% cases which is slightly more than other studies [10,13]. In our study 74.62% cases had some degree of anemia whereas 25.37% had severe anemia (hemoglobin <5 gm %) which was similar to other studies [11,13,14,19,21,26,27,28].

Leucocytosis TLC > 15,000 /cmm was found in 13.43% which was comparable to other studies [15,29]. Thrombocytopenia (TPC < 150,000) was found in 27.6% patients whereas TPC < 50,000 was found in 5.22% cases which was comparable to another study [1]. Renal failure (S.Creatinine > 3 mg %) was found in

12.68 % which was similar to other studies [3,21]. Hepatopathy (S.Bilirubin > 3 mg %) was found in 31.34 % which was comparable to other studies [3,17,18,26].

Out of 25.37% cases of severe anemia 14.17% died whereas 11.19% cases survived. Severe anemia was a major predictor of fatal outcome with a significant p value < 0.05 which matches other studies [17,22,26]. We observed that out of 5.97% with respiratory distress only 1 survived while 7 did not.

Respiratory distress was another key presenting feature of childhood malaria with a very high mortality rate (66.7%) which was similar to other studies [17,18,27,28]. Among 50% patients of CNS involvement 16.41% died whereas 33.58% cases survived which matched other studies [10,19]. Out of 107 patients with organ dysfunction 59.70% survived whereas 20.17% did not.

All 27 patients (20.14%) without any organ dysfunction survived. Multi organ involvement was associated with higher morbidity & mortality which was similar to other studies [19,28].

Conclusion

Awareness about the changing spectrum of severe malaria is of great importance to every level healthcare provider. Today, in India with any level of transmission the possibility of falciparum malaria should always be suspected in a patient presenting with fever along with jaundice or renal failure.

P. vivax is emerging as an important cause of malarial morbidity & mortality. Besides shock, cerebral malaria & severe anemia which have been implicated even in the past as predictors of complications in severe malaria, hepatic involvement & renal failure also have emerged with significant impact over the course of the disease.

Abbreviations

ABG- Arterial Blood Gas, **ALP**- Alkaline Phosphatase, **ARDS**- Acute Respiratory Distress Syndrome, **BP**- Blood Pressure, **B.C.**- Before Christm, **Cmm**- Cubic Millimeter, **CRP**- C- Reactive Protein, **CSF**- Cerebrospinal Fluid, **C/S**- Culture Sensitivity, **DC**- Differential Count, **DIC**- Disseminated Intravascular Coagulation, **ECG**- Electrocardiogram, **GCS**- Glasgow Coma Scale, **Hb** – Haemoglobin, **HBsAg**- Hepatitis B Surface Antigen, **ICT**- Immunochromatographic Test, **IV**- Intra Venous, **LFT**- Liver Function Test, **Min**-

Minute, **MI**- Millilitre, **Mp**- Malaria Parasite, **Ps**- Peripheral Smear, **QBC**- Quantitative Buffy Coat, **RBC**- Red Blood Cell, **RBS**- Random Blood Sugar, **RE**- Routine Examination, **SBP**- Systolic Blood Pressure, **SGOT**- Serum Glutamic Oxaloacetic Transaminase, **SGPT**- Serum Glutamic Pyruvic Transaminase, **TPC**- Total Platelet Count, **TLC**- Total Leucocyte Count, **USG**- Ultrasonogram, **WHO**- World Health Organisation

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