

Severe Malaria at a Tertiary Paediatric Emergency Unit in South West Nigeria

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Abstract: Severe malaria is an important cause of paediatric emergency admissions in Nigeria. It is also a significant cause of morbidity and mortality in Nigerian children. Knowledge of the manifestation and the predisposing factors to severe malaria is expected to provide information that will reduce its incidence and reverse the negative outcome of this disease. To document the incidence, manifestations, rate of use of right anti-malarial combination therapy and outcome of severe malaria, at the Paediatric Emergency Unit (PEU) of the Ladoke Akintola University of Technology Teaching Hospital, Osogbo. All children admitted into the PEU with severe malaria between the 1st April 2007 and 31st September 2007 were studied. The manifestation of severe malaria was noted and recorded in a proforma. The data on the age, sex, socio-demographic status, clinical features, intervals between symptom and presentation, outcomes and drugs used before presentation were also recorded. All the patients were treated with intra muscular Artemisin and oral Amodiaquine on admission. Of the 286 children admissions at the PEU over the 6 month period, 58 (20.3%) had severe manifestations of malaria. The 58 children consist of 34 boys and 24 girls giving a male to female ratio of 1: 0.7. Febrile convulsions, severe anaemia, persistent vomiting, jaundice, hypoglycaemia, cerebral malaria, prostration, hyperpyrexia and acidocis occurred in 23 (31.5%), 22 (30.1%), 13 (17.8%), 3 (4.1%), 3 (4.1%), 3 (4.1%), 3 (4.1%), 2 (2.8%) and 1 (1.4%) case, respectively. The mean duration of hospitalization was 3.2 days. Fever resolved in 50 (86.2%) subjects within 48 h of administration of ACT while on PEU admission. About 53 (91.4%) of the 58 children were discharged home in a satisfactory condition while 2 (3.4%) were discharged against medical advice and the remaining 3 (5.2%) died as a result of severe anaemia. These 3 deaths represent 15% of the total 20 mortalities recorded at PEU in the 6 month period. The right ACT was used by 5 (8.6%) of the 58 studied and ignorance concerning ACT was the reason given for non use among those who did not. Of the 4 subjects who consulted government owned hospitals prior to presentation, two used the correct ACT and 2 did not compared to the remaining 54 subjects who received treatment from left over home stock, patent medical stores, pharmaceutical shops and private hospitals of whom 3 used the correct ACT and 51 did not. $\chi^2 = 4.55$, $p = 0.03$ Yate's correction applied. Severe malaria is an important cause of morbidity and mortality in Nigerian children. Febrile convulsions and severe anaemia are the most common presentations of severe malaria. The use of ACT's was poor in this study. It is likely that the disease burden from severe malaria can be drastically reduced by the prompt administration of correct ACT, judging from the good response to ACT at the health facility of study.

Key words: Severe malaria, children, emergency, predisposing factors, PEU, Osogbo

INTRODUCTION

Malaria continues to be an important cause of morbidity and mortality among Nigerian children (Orimadegun *et al.*, 2007; Oyedeji *et al.*, 2009). However, there is a scarcity of literature on severe malaria in Nigerian children most especially after the roll back malaria era.

Severe malaria is the presence of life threatening features in a patient with the presence of *Plasmodium falciparum* peripheral parasitaemia. Severe features of malaria include severe anaemia (haematocrit of 15% or less), unarousable coma (cerebral malaria), acidosis, oliguria and haemoglobinuria among others

(Oyedeji *et al.*, 2009; World Health Organization, 2000), Children are vulnerable to severe attacks of malaria because of their poorly developed immune defenses against malaria. The disabilities and economic implications following severe malaria and its complications are enormous and difficult to quantify. Financial implications arise from the costs and treatment of the disease or complications such as brain damage, epilepsy which may follow cerebral malaria or transfusion following severe anaemia. Also, the days wage may be lost by parents of hospitalized children, who may be unable to attend work in order to care for their child (Oyedeji *et al.*, 2009).

The World Health Organization (2000) has stated that prompt diagnosis, prompt and treatment with effective

artemisin-anti-malarial combination therapy and the use of insecticide treated nets are effective ways of reducing the toll of malaria (Breman *et al.*, 2004; Narasimhan and Attaran, 2003). A drastic reduction in the occurrence and progression of uncomplicated to severe malaria is expected in areas where the World Health Organization (2000) of roll back malaria strategies is being implemented. It is thus desirable to document the prevalence and manifestations of severe malaria and determine why they still present with severe malaria in the practice, irrespective of this known cost effective interventions.

MATERIALS AND METHODS

The study was conducted in the paediatric emergency unit of the Ladoke Akintola University of Technology Teaching Hospital, Osogbo. The paediatric emergency unit has facilities for admitting 22 children at any point in time. The teaching hospital is owned by Osun and Oyo states and located in Osun state which has a population of approximately 3.2 million people based on the 2006 census. This paediatric facility is patronized by inhabitants of neighbouring states such as Oyo, Ekiti, Ondo and kwara states. All these states have a tropical weather with peak rainfalls in the rainy season between the months of April and September which is also the peak of malaria transmission.

Consecutive children admitted with severe malaria to the children emergency ward of the Ladoke University of Technology teaching hospital, Osogbo between 1st of April and 31st of September 2007 were studied. Diagnosis of severe malaria was made in the patients studied based on finding features consistent with any of the following, cerebral malaria, severe anaemia, repeated febrile convulsions, jaundice, prostration, acidocis and hyperpyrexia in febrile children (Oyedeji *et al.*, 2009; Singhal, 2004). Asexual forms of *Plasmodium falciparum* were detected in the blood film of all the febrile subjects studied while other infectious causes of fever were excluded (Oyedeji *et al.*, 2009; Singhal, 2004).

Information obtained from the proforma include age, sex, diagnosis, symptoms at presentation, duration of symptoms before admission, drugs used before presentation, facilities consulted or attended before admission, also enquiries were made concerning the laboratory investigations done before presentation. All patients were subjected to a quick comprehensive general and systemic examination and the findings were recorded in the proforma. Other details recorded in the proforma include the duration of hospitalization, severe manifestation of malaria seen, outcome of disease, education status and occupation of parents.

Children with hemoglobinopathies and red blood cell enzymopathies were excluded. The results of the investigations conducted on the subjects were recorded in the proforma. Examples of specific tests carried out on all patients include film examination for malaria parasites, pack cell volume, random blood sugar. Electrolytes, urea and creatinine tests were conducted when necessary.

The educational attainments of the mothers were classified into three classes based on Oyedeji *et al.* (2009) method (Carter *et al.*, 2004). Mothers with post secondary school training such as ordinary diploma, higher national diploma, undergraduates, graduates, postgraduates were classified as group I. The mothers with primary 6, uncompleted secondary school training, commercial school certificate and equivalents were grouped as class II. All mothers with no formal education or below primary 6 completed education were grouped as class III.

Data was analyzed using the SPSS for windows 11.0 (SPSS Inc, Chicago IL). The results were analyzed with the Pearson chi-squared (χ^2). $p < 0.05$ were considered significant and Yates correction was applied when necessary. Results were expressed as descriptive statistics as range, mean, standard deviation, simple percentages and ratios.

All patients were treated with parenteral artemisin and oral amodiaquine. Other forms of treatment such as blood transfusion, parenteral anti-convulsants, dextrose fluid infusion and oxygen were administered when required.

RESULTS AND DISCUSSION

Total population studied: About 286 children aged above 6 months were seen at the children emergency unit over the 6 month period of study. Of the 286 children 173 (60.5%) were aged between 6 months and 5 years while 113 (39.5%) were aged above 5 years. Of the 286 children 168 were boys and 118 girls giving a male to female ratio of 1:0.7. About 58 (20.3%) of the 286 children seen over the 6 months had severe malaria of which 34 were boys and 24 girls giving a male to female ratio of 1: 0.7. Table 1 shows the age and sex distribution of the children studied.

Presenting complaints and duration of presenting complaints: Fever was the most common presenting complaint and it was present in all the subjects and it was noticed in 30 (51.7%) of the 58 children studied for at least 2 days before the children presented for treatment. Other common complaints were convulsions, vomiting, passage of dark urine, weakness, diarrhea, cough, abdominal pain and poor feeding in 25, 20, 10, 6, 5, 5, 3 and 2, respectively.

Table 1: Age and sex distribution

Age groups	Sex		Total in age group
	Male (%)	Female (%)	
6 months-5 years	24 (60.0)	18 (45.0)	42
>5-10 years	06 (46.2)	05 (53.8)	11
>10-15 years	04 (66.7)	01 (33.3)	05
Total	34 (57.8)	24 (42.2)	58

Table 2: Pattern of severe malaria admissions

Severe malaria	No. of cases	Percentage of total cases
Repeated febrile convulsion	23	31.5
Severe anaemia	22	30.1
Persistent vomiting	13	17.8
Jaundice	03	04.1
Hypoglycaemia	03	04.1
Cerebral malaria	03	04.1
Prostration	03	04.1
Hyperpyrexia	02	02.8
Accidocis	01	01.4
Total	73	100.0

Total number of children studied is 58 but seventeen children had >1 feature of severe malaria

Manifestations of severe malaria: Febrile convulsions, severe anaemia, persistent vomiting, jaundice, hypoglycaemia, cerebral malaria, prostration, hyperpyrexia and accidocis occurred in 23 (31.5%), 22 (30.1%), 13 (17.8%), 3 (4.1%), 3 (4.1%), 3 (4.1%), 3 (4.1%), 2 (2.8%) and 1 (1.4%), case, respectively. Table 2 shows the manifestations of severe malaria.

Laboratory investigations done prior to presentation:

None of the 58 patients studied had undergone any laboratory investigation. All patients had presumptive malaria treatment before treatment.

Use of antimalarial combination therapy: Of the 58 subjects studied 5(8.6%) used antimalarial combination therapy drugs before presentation, while the remaining 53 (91.2%) did not. The reasons given for not using anti-malaria combination drugs was ignorance. Amongst the patients who failed to use ACT, paracetamol and chloroquine were the most common drugs used by 35 and 20. Haematinics, antibiotics and herbal concoctions were used by 12, 10 and 3 subjects, respectively.

Facility were patient received treatment before presentation and use of ACT: Patent medicine store 17, Home stock 14, Private hospital 11, Pharmaceutical store 6, teaching hospital 4, general hospital 2, maternity 2 Alternate medical practitioners 2.

The facilities consulted by the 5 children who used ACT before developing severe malaria were the teaching hospital, a private hospital and a pharmaceutical shop and left over home stock. Of the 4 patient who consulted the teaching hospital 2 (50.0%) received ACT while 1 (16.7%) of the 6 children who consulted

Table 3: Duration of hospitalization of the studied children

Duration of admission (days)	No. of children affected
1	6
2	5
3	30
4	9
5	5
6	1
7	2

pharmaceutical shop received ACT also 1(9.1%) of the 11 children who consulted private hospitals received ACT also. Of the 13 children treated from left over home stock 1 (7.7%) received the right anti-malaria combination therapy. Of the 4 subjects who consulted the tertiary hospital two used the correct ACT while 2 did not compared to the remaining 54 subjects of whom 3 used the correct ACT and 54 did not. $\chi^2 = 4.55, p = 0.03$ Yate's correction applied.

Duration of hospitalization: The range of hospital admission days ranged from 1-7 days. The mean number of days stayed by the children is 3.2 days. About 41 patients were discharged cured before the 3rd day of admission while 17 were discharged after the 4th day of admission. Table 3 shows the details of the duration of admission.

Outcome: About 53 (91.4%) of the 58 children were discharged home in a satisfactory condition while 2 (3.4%) of the parents requested for the discharge of their child against medical advice because of financial constraints. Of the 58 children with severe malaria 3 (5.2%) died. The 3 deaths represent 15% of the total 20 mortalities recorded at PEU in the 6 month period.

Education status of the mothers and prompt use of right anti-malarial drug: Of the 58 mothers studied 9 (15.5%) had post secondary school education, while 28 (48.3%) had educational attainments that were equivalent to completed primary school, secondary school or commercial school training and 21 (36.2%) had educational attainments equivalent to uncompleted primary school education or no formal education. Of the 5 children who used the right anti-malarial combination therapy, 2 of the mothers had post secondary school education and the remaining three had education attainments equivalent to secondary school education, completed secondary school training or commercial school equivalents. None of the mothers without formal education or uncompleted primary school training used the right anti-malarial drugs.

Severe malaria is a significant contributor to paediatric emergency admissions and burden of diseases in Nigerian children (Orimadegun *et al.*, 2007; Oyedeji *et al.*, 2009; Bondi, 1992; Ayoola *et al.*, 2005). Severe malaria was responsible for >20 and 15% paediatric emergency admissions and mortality, respectively in the present study. It also accounted for a mean period of 3 days of hospitalization and febrile convulsions, severe anaemia and persistent vomiting were the most common forms of presentations in the present study. The high morbidity and mortality indices in the present study are unacceptably high after more than a decade of implementation of the roll back malaria programme in Nigeria. Poor use of ACT's was recorded in the present study. It is a proven cost effective strategy recommended by the WHO. The poor use of ACT's was thought to be responsible for the high morbidity and mortality indices obtained.

The present study reveals that all the patients had presumptive treatment, i.e., no laboratory examinations were done to detect malaria parasitemia in the blood film before commencing anti-malaria treatment. This practice is at variance with the World Health Organization (2000) recommendation that requires prompt diagnosis by rapid diagnostic tests or through microscopy before use of anti-malaria drugs (Brieger, 2009). Presumptive treatment of malaria has been documented by previous studies to produce sub-standard case management of malaria and result in wastage of effective anti-malaria combination drugs in febrile patients without malaria (Oyedeji *et al.*, 2009; Brieger, 2009). This practice is counter productive to the goal of RBM.

The poor use of artemisin based combination therapy in this study may also partly explain the unacceptably high morbidity and mortality resulting from malaria. The most commonly used drugs by the patients was paracetamol and chloroquine. The Federal Ministry of Health in Nigeria has reported a high prevalence of resistance to chloroquine in the Nigeria. This necessitated a policy change, in the treatment of malaria resulting in the recommendation of Artemisin based combination therapy for the treatment of malaria (Federal Republic of Nigeria, 2004).

Poor use of ACT is probably the most important factors leading to the development of severe malaria in these patients. A previous study has also shown that the use of insecticide treated nets is poor among children in the Nigerian community (Oyedeji *et al.*, 2009). Poor use of ITN logically makes the children easily accessible for transmission of malaria parasites while use of drugs such as analgesics and anti-pyretics which lack anti-malarial property or the use of non-ACT drugs allow for proliferation of plasmodium falciparum parasites in

infected children. Thus it may not be surprising that these patients developed severe manifestations of malaria such as anaemia, febrile convulsions and persistent vomiting. The manifestations of severe malaria recorded in the present study are similar to those in previous study (Orimadegun *et al.*, 2007; Oyedeji *et al.*, 2009).

No case of resistance was recorded to the Artemisin based combination therapy administered for the treatment of the severe malaria cases in the present study. Efforts therefore need to be concentrated on ensuring that the public is aware of effective anti-malaria combination therapy. The present study shows that all the mothers of the children who did not receive artemisin based combination drugs were not aware of it. The health facilities consulted also influenced the types of drugs used in treatment of these children who developed severe malaria. More than half of the children in the present study were treated using left over home stock of drugs and drugs received from patent stores which were not artemisin based combination anti-malarials. It can be surmised that most of personnel treating this children are unaware of the current trends recommended for the treatment of malaria in children in Nigeria. Recent studies also show that most of the health workers are ignorant of the current drugs recommended for the treatment of Malaria in children in Nigeria (Ogungmaigbe *et al.*, 2005; Ariba *et al.*, 2006). Thus there is a need for the Federal Government to train and retrain health workers on the current concepts in the management of malaria. The general public also needs to be informed about the correct drugs for the treatment of malaria. This will enable to the children and their parents to make informed decision concerning the anti-malarials administered to them. The mass media can provide the medium for the education of the general public.

CONCLUSION

It is concluded that the use of effective anti-malarial combination therapy is very poor among the children studied. Presumptive treatment of malaria is also the rule. Thus, there is a need to make the populace change their behaviour in order to embrace this cost effective proven strategies for rolling back malaria.

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