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Original Research Article

Burden, clinical manifestation and outcome of severe malaria in children at a tertiary hospital in Northeast, Nigeria

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ABSTRACT

Background: Severe malaria is a life-threatening medical emergency and requires prompt and effective treatment to prevent death. The presentation of severe malaria varies depending on such factors as country, age, immunity, socioeconomic factors, drug resistance and type of intervention measures used. The aim of this study is to document the burden and forms of severe malaria in children in this region. Objective of this study was to determine the prevalence, clinical manifestation and outcome of children with severe malaria in Federal Teaching Hospital, Gombe
Methods: Case notes of patients admitted to the emergency Paediatric Unit and paediatric medical ward of Federal Teaching Hospital, Gombe with severe malaria from January 2014 to December 2018 (5years) were reviewed. Information sought included age, gender, use of ITN, parents' education and occupation, criteria for diagnosis, treatment and outcome.
Results: A total of 2,808 children were admitted during the period of study, out of these 237 (8.4%) had severe malaria. There were 140 (59.1%) male and 97 (40.9%) female with M: F of 1.4:1. Majority 129 (54.4%) of patients were aged more than 5 years. The most frequent modes of presentation were multiple convulsions 124 (52.3%), cerebral malaria 97 (40.9%) and severe anaemia 61 (25.7%). Some 45 (19.0%) of the subjects presented with multiple diagnostic criteria. Multiple convulsions, cerebral malaria and severe anaemia were significantly related to likelihood of mortality.
Conclusions: The prevalence of severe malaria is high and multiple convulsions, cerebral malaria and severe anaemia are significantly associated with risk of mortality.

Keywords: Children, Manifestation, Outcome, Severe malaria

INTRODUCTION

Severe malaria is a complex multisystem disorder which presents as a medical emergency that rapidly progress leading to death without prompt treatment.[1] The WHO report 2019 estimates that 228 million cases of malaria occur worldwide, out of these, African children account for 6 million severe malaria episodes resulting in 405,000 deaths.[2] At present the clinical manifestation and case fatality of severe malaria in children shows substantial variation between African countries.[3]

Case fatality in children with severe malaria presenting to hospital is between 10 and 30%, with about 50% of these deaths occurring within 12 h of admission.[3] In Uganda severe malaria in children was reported to be 6.1% in 2016 and severe anaemia was the most common presentation accounting for about 7.5 - 34% and up to 11% of children admitted are discharged with neurologic complications.[4]

Differences in the occurrence of specific clinical features such as seizures, impairment of consciousness or

respiratory distress with transmission or parasite load are also unclear.[5] Report from Ghana shows that severe malaria was seen in 3.4% of children admitted and the main manifestations were severe anemia (36.5%); prolonged or multiple convulsions (21.6%); respiratory distress (24.4%) and cerebral malaria (5.4%).[6] The report from Ghana also demonstrated that although severe anemia was the commonest presentation it was not significantly associated with risk of death, however, cerebral malaria and hyperlactatemia were the main predictors of mortality in children with severe malaria.[7] Incidence of severe malaria in hospitalized children in lumumbashi was 14.6% with males being more commonly affected and cerebral malaria and severe anemia as the highest mode of presentation.[8] Prostration, anemia and neurological symptoms were the most frequent manifestations in Children under 5 years of age who present with severe malaria in Kenya.[9] Evidence that hypovolemia is a key indicator of fatal outcome in severe malaria was reported.[10] Similar findings of hypovolemia in children with severe malaria was documented from Azare, North east Nigeria.[11] The peculiarity of these studies were the finding that most of the subjects were less than one year, this could explain why vomiting and diarrhoea with hypovolemia were prominent clinical manifestation. Therefore, signs of impaired tissue perfusion should be rapidly evaluated in infants admitted with diagnosis of severe malaria.

In Nigeria, 9.0% of children admitted in Eunugu had severe malaria, Ademola et al reported a prevalence of 11.3% from Ibadan and also demonstrated an increasing burden of severe malaria among children, findings from the same study showed that severe malaria was associated with high mortality rate especially in children below five years.[12,13] Report from Agbor in Delta state showed that the commonest presenting symptom in children with severe malaria was fever and joint pains and severe malaria anemia was the most frequent complication.[14] The study from Agbor in Delta state and Azare in Bauchi State goes to show that severe malaria in not uncommon in infants as earlier suggested.[5,11,14]

The understanding of the epidemiology of severe malaria in children in a particular community remains a high priority for planning and intervention. In view of reports of changing pattern of clinical manifestation, risk factors, increasing number of infants and older children.[15,16] This study was designed to determine the prevalence and document the clinical manifestations of severe malaria in Gombe North east Nigeria.

METHODS

Study area Gombe state is situated at the centre of the North east geopolitical zone. The state shares boarder with Borno, Yobe, Adamawa, Taraba and Bauchi states. The main indigenous ethic groups are Fulani, Hausa, Tangale, Bolewa, waja, Tula among others.[17] The people are mainly subsistent farmers, traders and artisans. Federal Teaching Hospital, is located in Gombe metropolis which is also the administrative capital of Gombe State. The pediatric department is made of Emergency Pediatric Unit (EPU), Pediatric Medical Ward (PMW) and Special Care Baby Unit (SCBU).

The EPU is a 6-bed capacity critical care unit. Patients with life threatening emergencies are admitted to this unit where they are stabilized within 24 - 48 hours before being transferred to the PMW. Some patients are however, admitted directly to PMW depending on the clinical conditions at presentation. The study was conducted at Emergency Paediatric Unit and Paediatric Medical Ward of Federal Teaching Hospital, Gombe.

Data collection

This was retrospective study involving all patients admitted with diagnosis of severe malaria in EPU and PMW from 2014 to 2018 (5 years). The case notes of these patients were retrieved and relevant data extracted. Information sought included socio-demographic and anthropometric parameters, parent's education and occupation, presenting symptoms and signs, results of malaria parasite on thick blood film and diagnostic criteria for severe malaria.

The data was entered in a computer and analysed using SPSS version 25. Results were presented as frequencies in tables and graphs. Chi square test and likelihood ratio were used to compare means of variables and values < 0.05 were considered statistically significant.

Inclusion criteria

All patients admitted with diagnosis of severe malaria during the study period were included.

Ethical consideration

Ethical clearance was obtained from the Ethics and Research Committee of Federal Teaching Hospital, Gombe before the commencement of the study.

RESULTS

Out of the 2,808 children admitted during the study period 237 (8.4%) had severe malaria. The patients with severe malaria consisted of male 140 (59.1%) and 97 female with M:F of 1.4:1. Majority 187 (78.9%) of subjects were admitted directly to the emergency ward while 50(21.1%) of the patients were either admitted in PMW or were referred from other health facilities.

A total 111 (46.7%) subjects were of low while 44 (18.7%) were of high socioeconomic status Table 1. Fulani was the highest ethic group followed by Hausa, others were Bolewa and Tangale with 7 (2.9%) each Figure 1.

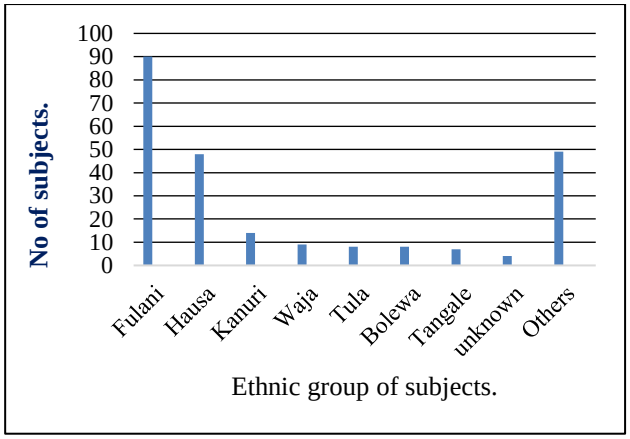

Figure 1: Ethnic group distribution of children with severe malaria.

Table 1: Socio-demographic characteristics of children with severe malaria.

Characteristics	Number	Percent
Age (years)		
0 - 4	108	45.6
5 - 9	83	35.0
10 -14	20	8.4
≥15	26	11.0
Gender		
Male	140	59.1
Female	97	40.9
Referral		
Yes	50	21.1
No	187	78.9
Use of ITN		
Yes	66	27.8
No	171	72.2
SES		
High	44	18.7
Middle	82	34.6
Low	111	46.7

*****SES = Socioeconomic status, ITN insecticide treated net.

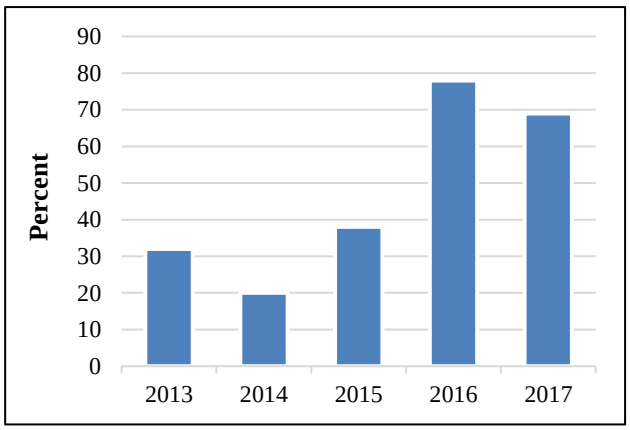

Figure 2: Trend of severe malaria cases for the 5 years under review.

Table 2: Clinical manifestation of children with severe malaria.

Present			Absent	
Symptom	**No**	**(%)**	**No**	**(%)**
Multiple convulsions	124	52.3	113	47.7
Cerebral malaria	97	40.9	138	58.2
Prostration	78	32.9	159	67.1
Jaundice	26	11.0	211	89.0
Dark urine	15	6.3	222	93.7
Hypoglycaemia	15	6.3	222	93.7
Shock	8	3.4	229	96.6
Acute kidney injury	7	3.0	230	97.0
Abnormal bleeding	4	1.7	233	98.3

Figure 2 Shows the annual trend of severe malaria which demonstrated that there was an increase in the number of cases from 2014 with a peak in 2016 (33%) and a slight drop in 2018.

Majority of patients with severe malaria had only one plus (MP +) of malaria parasite seen in the thick peripheral blood smear while only 4 (1.7%) patients had 4 plus (MP ++++) seen in the peripheral blood film (Figure 3).

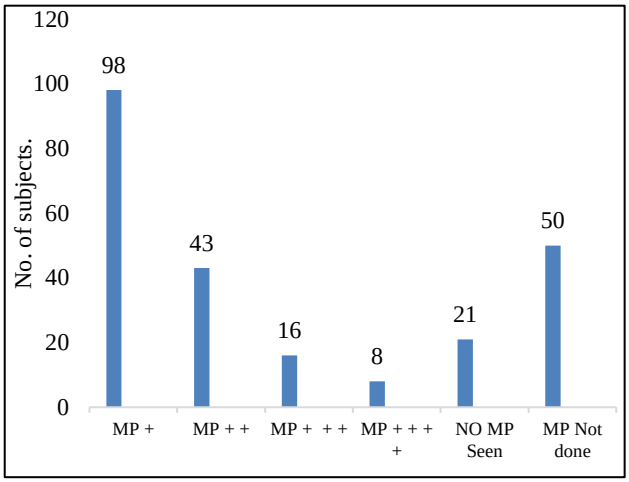

Figure 3: Malaria parasite in children with severe malaria.

The more frequent clinical manifestation of severe malaria were multiple convulsions 124 (52.3%), cerebral malaria 97 (40.9%) and severe anaemia 61 (25.7%). Some subjects 45 (19.0%) presented with multiple diagnostic features, while shock, acute kidney injury and abnormal bleeding were seen in 3.4%, 3.0% and 1.7% of patients respectively (Table 2). Multiple convulsions, cerebral malaria and severe anaemia are clinical manifestations that are significantly related to mortality (Table 3).

Table 4 shows that there were more deaths in patients from low socioeconomic class than those from middle

and high socioeconomic status but the difference is not statistically significant.

Table 3: Clinical manifestation and outcome in children with severe malaria.

Parameter	Discharged (%)	Death (%)	p-Value
Multiple convulsion			
Yes	102 (83.6)	20 (16.4)	0.000*
No	111 (96.5)	4 (3.5)	
Cerebral malaria			
Yes	78 (78.0)	22 (22.0)	0.000*
No	135 (96.4)	2 (3.6)	
Prostration			
Yes	75 (77.3)	22 (22.7)	0.000*
No	138 (98.6)	2 (1.4)	
Severe anaemia			
Yes	61 (98.4)	1 (1.6)	0.002*
No	152 (86.7)	23 (13.3)	
Jaundice			
Yes	26 (89.7)	3 (1.3)	0.512*
No	187 (89.9)	21 (10.1)	
Hypoglycaemia			
Yes	15 (88.2)	2 (1.8)	0.588*
No	200 (90.1)	22 (9.9)	
Acute kidney injury			
Yes	4 (57.1)	3 (42.9)	0.137*
No	209 (90.7)	21 (9.3)	

*Likelyhood ratio

Table 4: Socioeconomic class and outcome in severe malaria.

Socioeconomic class	Discharged	Death	Total
High	24 (81.5)	4 (14.8)	26 (100)
Middle	76 (92.7)	6 (7.3)	82 (100)
Low	96 (87.2)	14 (12.8)	120 (100)

$X^2 = 6.713$, p - value = 0.348

Out of 137 male 127 (92.7%) were discharged while 13 (7.3%) died and amongst the female 86 out of 97 were discharged and 11 (11.4%) died. There was no significant difference in mortality by gender (Table 5).

Table 5: Outcome by gender in children with severe malaria.

Gender	Discharged	Death	Total
Male	127 (92.7)	13 (7.3)	137 (100)
Female	86 (88.6)	11 (11.4)	97 (100)

$X^2 = 3.604$, p-value = 0.307

DISCUSSION

Although severe malaria has been reported in some parts of the country, this is the first attempt to describe the burden, types of clinical presentation and risk of mortality in hospitalized children with severe malaria in a tertiary hospital in northeast Nigeria.

The prevalence of severe malaria in children admitted during period under review of 8.4% is higher than figures reported from other African countries, but similar to reports from other parts of the Nigeria.[4,5,11-13] The reasons for high prevalence of severe malaria in Nigeria despite concerted efforts by government and partners on control measures could be multi factorial. There are obvious gaps in appropriate practices particularly the use of ITN which was demonstrated to be very low in this study (27,8%) a similar low level of ITN utilization was reported in northern Nigeria.[16,17] The current economic hardship may also affect the capacity to buy chemicals for indoor residual spraying coupled with decrease funding by partners for purchase of free antimarials.[18]

There were more male than female which is consisted with other studies in different parts of Nigeria.[11,13,16] The male preponderance might reflect cultural practices that places higher premium on the male child thereby doing everything to ensure his survival. Additionally, males are more likely to stay outside playing where they can be easily exposed to malaria than their female counterparts that are usually restricted and spend most of their time indoors. Fulani and Hausa were the most affected ethnic group, this might be a reflection of the population dynamics of Gombe metropolis.[19] Majority of subjects with severe malaria were from low socio-economic class, this is not unexpected because the north east region has been plagued by insurgency for over a decade resulting in poor physical and economic access to public health facilities which is an impediment to early treatment. Also, there are many displaced and homeless children who are repeated exposed to mosquito bites thereby increasing their risk of developing severe malaria.

The annual trend of cases admitted with severe malaria shows that there were fewer cases in the first 3 years (2013-2915) followed by a stiff rise in the curve for the last 2 years (2016-2017). The rise in prevalence from 2016 and 2017 may mean that the economic recession is causing a reversal in gains recorded before 2015 when there was accelerated efforts to meet the MDG target for malaria. This trend suggest that malaria control initiative in Nigeria is potentially fragile and the challenge therefore, is the ability to sustain the gains until elimination becomes a reality.[19]

Multiple convulsions and cerebral malaria were the more common presentations of severe malaria in this study. This is in contrast with reports from Agbor, Sokoto and Enugu where severe anaemia was the most frequent presentation of children with severe malaria.[11,14,16] This differences may be due late presentation in this study as 78.9% of subjects were admitted directly to EPU in critical conditions and also most of the subjects were aged above five years, thus anaemia secondary to

malnutrition that is prominent in children less than five years who form a greater proportion in other repots might not be a significant factor.

Majority of subjects with severe malaria had only +MP in the peripheral blood, this might be due to wide spread use of antimalarial drugs before presentation or the fact that in severe malaria parasite are usually sequestered in deep tissue. This may underscore the need for rapid diagnostic test (RDT) and several (3X) blood films in the diagnosis and classification of malarial severity.

Outcome showed a mortality rate of 10.1% which is within the range reported in Nigeria, presence of multiple convulsion, cerebral malaria and severe anaemia were significantly related with the likelihood of dying as previously reported.[2,3,5,13,14,20,21] The likelihood of death from severe malaria was not significantly related to age, sex or socioeconomic status of subject in this study.

CONCLUSION

The burden of severe malaria in hospitalized children is high. Multiple convulsions, cerebral malaria and severe anaemia are the most common forms of presentation of severe malaria and are significantly associated with the likelihood of mortality.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Ethics and Research Committee of Federal Teaching Hospital, Gombe, Nigeria

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