

# Pattern and Outcome of Severe Malaria at the Emergency Paediatrics Unit of a Tertiary Hospital, North-Central Nigeria

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**Abstract:** Background: Severe malaria, caused predominantly by the falciparum specie of plasmodium parasite, accounted for many childhood Hospital admissions and mortality in the tropics. There is dearth of study on malaria and its complications among children in this environment. This study aimed at determining the burden of malaria, the pattern of its complications as well as the outcome among children seen at the Emergency Paediatric Unit (EPU). Materials and Methods: A retrospective cross sectional study among children aged 6 months to 18 years at the Emergency Paediatric Unit (EPU) of Dalhatu Araf Specialist Hospital Lafia between 1<sup>st</sup> September 2017 to August 31<sup>st</sup> 2018. Results: The mean age of children with severe malaria is  $6.85 \pm 2.1$ . More than half of the children with severe malaria are within the age range of 1 - < 5 years while more than a third are aged between 5 - < 10 years old. Cerebral malaria, severe anaemia, multiple convulsions and hypoglycemia were the highest contributors to morbidity while severe anaemia, cerebral malaria and hypoglycemia were the main contributors to mortality. Severe malaria accounted for 15 (17.9%) of the 84 mortalities. Case fatality from severe malaria is 7.3%. Conclusion: Severe malaria remains a major cause of morbidity and mortality especially among the under five children.

**Keywords:** Morbidity and Mortality, Outcome, Pattern, Severe malaria

## 1. Introduction

Malaria remain endemic in developing countries like ours with most deaths from it seen among the under five children and in sub-Saharan Africa.<sup>1</sup> Malaria is caused by Protozoa of the Plasmodium species affecting about half a billion of the world Population.<sup>2</sup> Most cases of malaria are uncomplicated but few cases are complicated and worse enough to be referred to as severe malaria.<sup>3</sup> Severe malaria, caused predominantly by the falciparum specie of plasmodium parasite, accounted for many Paediatric Hospital admissions and childhood mortality in the tropics.<sup>4</sup>

A multi-country studies some years ago found a 4.3% case fatality from severe malaria.<sup>5</sup> A case control study in Zimbabwe in year 2017, showed a case fatality rate of 28.8%.<sup>6</sup> A study in North Eastern Nigeria reported 8.2% case fatality from severe malaria.<sup>7</sup> Aside mortality, it also account for a significant cause of hospital admission as some researchers reported as high as 18% morbidity from malaria related illnesses.<sup>8</sup>

There is dearth of study on malaria and its complications among children in this environment. This study aimed at determining the burden of malaria, the pattern of its complications as well as the outcome among children seen at the Emergency Paediatric Unit. Outcome of this study will bring to fore the magnitude of this disease among children in this environment, in view of the challenges being faced in management of severe malaria.<sup>9</sup> The findings may guide clinical practice. It will help the department and hospital at large in planning to curb the menace. It will also provide handy information to the legislators so as to make meaningful laws as well as other policy makers.

**Null Hypothesis:** Severe malaria is not a burden among under-five children

**Alternate Hypothesis:** Severe malaria is a burden to under-five children

The study hopes to address the following research questions:

- 1) What is the prevalence of severe malaria among children at DASH?
- 2) What are the clinical profiles / pattern of presentation?
- 3) What are the contributors to mortality?

### General Objective

To determine the prevalence and outcome of severe malaria at the Emergency Paediatrics Unit of the Dalhatu Araf Specialist Hospital Lafia.

### Specific Objectives

- 1) To determine the prevalence of severe malaria among children at Dalhatu Araf Specialist Hospital Lafia
- 2) To determine the pattern of complications
- 3) To determine the clinical outcome of such patients

## 2. Methodology

### Study Design

It is a retrospective cross sectional study among children aged 6 months to 18 years.

### Study Site

The Emergency Paediatric Unit (EPU) of Dalhatu Araf Specialist Hospital Lafia. The EPU has a fourteen bed capacity. It is equipped with resuscitative gadgets such as suctioning machine, oxygen cylinders, ambulatory bags and pulse oximeters. It has various cadres of doctors from house

officers to consultant Paediatricians, Paediatric nurses, in-house pharmacist as well as a side Laboratory manned by the doctors with the assistance of a medical laboratory technician.

### Study Population

Children aged 6 months to 18 years attended to at the Emergency Paediatrics Unit, Dalhatu Araf Specialist Hospital Lafia between 1<sup>st</sup> September 2017 to August 31<sup>st</sup> 2018.

Lafia is the capital of Nasarawa State. The state shares boundary with Benue, Taraba, Plateau, Kaduna, FCT and Kogi states.

### Sample size

Sample size was calculated using the formula:

$$n = \frac{Z^2pq}{d^2}$$

n = sample size calculated, P is the prevalence at 18%, q = 1 - p, Z = standard deviate at 95% confidence level = 1.96, d = level of precision at 5%

$$n = \frac{1.96^2 \times 0.18 \times 0.82}{.05^2}$$

$$n = 230$$

### Inclusion criteria

All children seen at the EPU within the study period whose record can be found.

### Exclusion criteria

- 1) Children with known or features of Sickle cell disorder
- 2) Children with other co-morbidities such as sepsis

### Ethical approval

Ethical approval was sought and obtained from the Hospital Ethical Research Committee (ERC).

### Case definition of severe malaria

Severe malaria diagnosis is made in the presence of asexual parasitaemia in the peripheral blood film (detected with either microscopy or with a rapid diagnostic test {RDT} for malaria) with any of the following complications:<sup>4</sup>

- 1) Cerebral malaria: Unarousable coma or altered consciousness Glasgow Coma Score (GCS) < 11/15 or Blantyre Coma Score (BCS) < 3/5.
- 2) Multiple convulsions: Two or more convulsions within 24hours.
- 3) Hypoglycemia: Random blood sugar < 40mg/dl or < 2.2mmol/L.<sup>10</sup>
- 4) Prostration: Extreme weakness resulting in inability to sit, stand or walk without support.
- 5) Severe anaemia: Pack cell volume < 15% or Hb < 5g/dl
- 6) Hyperparasitaemia: Asexual parasitaemia > 10% or more than 100,000 parasites per microlitre.
- 7) Respiratory distress
- 8) Acute kidney injury: Blood urea > 10mmol/L.
- 9) Shock etc.

### Recruitment procedure

The EPU record of admission was used to recruit subjects that meet the criteria. Their folders were then be retrieved from the hospital medical records to get their respective biodata, clinical presentation and outcome. The above were

used to complete the questionnaire (Appendix I) by the researcher/trained assistants.

**Benefit(S) of Participation:** The findings from this study will be made available for policy makers to assist with health care planning.

**Potential Risk of Participation:** There is less than minimal risk involved.

**Confidentiality:** The information obtained from the participants record and folder will be treated with strict confidentiality. They will be stored as code in a passworded computer, the raw data will be stored and locked up in a well secured locker.

### Data Analysis

The data were entered into a microsoft excel sheet with the variables coded before transferring into a statistical package for social sciences SPSS version 20.0. Categorical variables were presented with tables of frequency distribution. Mean and standard deviation of continuous variables were calculated. The association between two mean was calculated using student T test, while that between two categorical variables was calculated using chi square. The significant p value was p < 0.05.

### Outcome

Severe malaria

### Conflict of Interest

None

### Funding

None

**Author's Contributions:** BSO; Conceptualization, Review of Literature, Data collection and analysis, Final manuscript writing. AE; Review of Literature, Data collection and analysis, Final manuscript writing.

### 3. Results

There are more males than females with severe malaria, males were 107 (59.1%) and females 99 (48.1%) with a male to female ratio of 1.1:1 (Figure 1 above). Similarly, males accounted for 661 (63.6%) and females 379 (36.4%) of the admissions during the year with M:F of 1.7:1.

### Mean Age and Distribution of Severe Malaria by Age

There is a statistically significant difference in the mean age of the study population which is 8.15±2.8 compared to that of children with severe malaria 6.85±2.1. (*p* = **0.012**) This implies that the children with severe malaria are much younger when compared with the overall admissions. More than half of the children with severe malaria are within the age range of 1 - < 5 years while more than a third are aged between 5 - < 10 years old as shown in Table I below.

### Pattern of Severe Malaria with its Outcome

Cerebral malaria, severe anaemia, multiple convulsions and hypoglycemia were the highest contributors to morbidity

while severe anaemia, cerebral malaria and hypoglycemia were the main contributors to mortality as shown in Table II below.

#### Contributors of Severe Malaria to Mortality

Eighty four children (8.4%) died of various ailments during the study period. Severe malaria accounted for 15 (17.9%) of the 84 mortalities. Case fatality from severe malaria is 7.3% as shown in Table III below.

#### 4. Discussion

There are more males than females in this study, similar to the findings by Imoudu et al at Azare North-Eastern Nigeria.<sup>8</sup> The mean age of subjects in this study was  $6.85 \pm 2.1$ , which is comparable to the  $6.29 \pm 3.8$  reported in Ilorin North-Central Nigeria.<sup>9</sup>

Over 50% of children with severe malaria from this study are under five, this is similar to earlier study at Azare North - Eastern Nigeria.<sup>10</sup> This is closely followed by children aged 5 to < 10 years which made up over a third of the subjects managed. This increasing trend of severe malaria was also reported in a study at Abeokuta South-Western Nigeria.<sup>2</sup>

Severe malaria accounted for 19.8% of the overall admissions in this study. It is a leading cause of hospital admission as it is responsible for approximately one out of every five admissions. This is similar to findings from earlier study by Olanrewaju and Johnson in Ilorin North-Central Nigeria.<sup>9</sup> It does not only account for high morbidity among children, it also accounted for 17.9% of all mortality in this study. This is higher than the 12.4% reported in a 6year retrospective review in of severe malaria cases by Orimadegun et al in Ibadan South-Western Nigeria.<sup>7</sup> The case fatality rate of 7.3% is comparable to the 8.2% earlier documented by Imoudu et al at Azare North-Eastern Nigeria.<sup>8</sup> It is also within the 1 – 25% case fatality reported globally in a meta-analysis.<sup>3</sup>

Severe malaria accounted for 19.8% of our admission, lower than the 33.7% reported in Ilorin years back (2001).<sup>9</sup> This may be due to advances in malaria control program. But higher than the 11.3% reported in Ibadan South Western Nigeria. The availability of multiple secondary and tertiary health facilities both public and private facilities in addition to a higher number of qualified personnel may be responsible.

Mortality in severe malaria was largely from cerebral malaria and severe anaemia cases as reported in other studies.<sup>7-9</sup>

The case fatality of 7.3% in this study is comparable to 8.2% reported in North Eastern Nigeria.

It is much lower than the 28.8% reported in a case control study in Zimbabwe. The different in study design, the study age group as well as the geographic difference may account for the disparity.

#### 5. Conclusions

- Severe malaria still remains a burden among children in DASH Lafia as it accounted for approximately 20% of morbidity and 18% of mortality.
- Severe malaria cases are highest among under five children and closely followed by age 5 to less than ten years
- Severe anaemia and cerebral malaria are major contributors to mortality.
- Effort at reducing the scourge needs to be intensified.

#### 6. Recommendations

- 1) More effort is required to curb the ugly trend of severe malaria and its outcome.
- 2) Pragmatic programs being put in place for the control and elimination of malaria among the under five should be extended to children aged 5 – 10 years.

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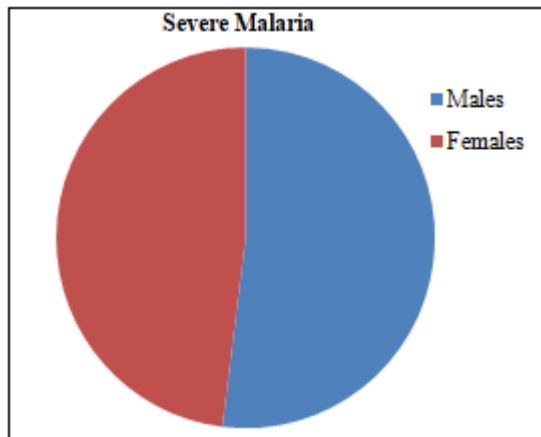


Figure 1: Gender Distribution of Severe Malaria

Table 1: Mean Age and Distribution of Severe Malaria by Age

Age range	Overall admissions n (%)	Severe Malaria n (%)	t	P value
Mean ± SD	8.15±2.8	6.85±2.1	5.910	0.012
Age range				
< 1	286 (27.5)	18 (8.7)		
1 - < 5	448 (43.1)	105 (51.0)		
5 - < 10	183 (17.6)	78 (37.9)		
10 - 18	123 (11.8)	5 (2.4)		
Total	1040 (100)	206 (100)		

t= student t test, SD= standard deviation, p is significant at value <0.05

Table 2: Pattern of Severe Malaria with its Outcome

Manifestations	Frequency (%)	Case fatality (%)
Cerebral malaria	96 (46.6)	6 (40.0)
Severe anaemia	69 (33.5)	8 (53.3)
Multiple convulsions	27 (13.1)	-
Hypoglycemia	14 (6.8)	1 (6.7)
Total	206 (100)	15 (100)

Table 3: Contributors of Severe Malaria to Mortality

Variable	Frequency	Mortality / case fatality
	n	n (%)
All admissions within the study period	1040	84 (8.1%)
Malaria cases	206	15 (7.3%)
Contribution of malaria to overall deaths	15	-17.90%

Appendix I

Study Proforma

PATTERN AND OUTCOME OF SEVERE MALARIA AT THE EMERGENCY PAEDIATRICS UNIT OF THE DALHATU ARAF SPECIALIST HOSPITAL LAFIA

Serial number..... Hospital number.....

A. Socio-demographic characteristics

- Age (as at last birthday)
- Sex: Male [ ] Female [ ]
- Family type: (1) Monogamous (2) Polygamous
- Ethnic group of mother: (a) Yoruba [ ] (b) Hausa [ ] (c) Ibo [ ] (d) Eggon [ ] (e) Alago [ ] (f) Tiv [ ] (g) Koro [ ] (h) Mada [ ] (i) Others [ ] Specify.....
- Religion of father: (a) Christianity [ ] (b) Islam [ ] (c) Others [ ] Specify.....

- Educational status of father: (a) None [ ] (b) Primary [ ] (c) Secondary [ ] (d) Tertiary [ ] (e) Others [ ] Specify.....
- Occupation of father.....
- Educational status of mother: (a) None [ ] (b) Primary [ ] (c) Secondary [ ] (d) Tertiary [ ] (e) Others [ ] Specify.....
- Occupation of mother.....
- Religion of child.....
- Class in school.....

B. Symptoms of child

Symptoms Yes No Duration

Fever

Cough

Vomiting

Passage of coke coloured urine

Jaundice

Multiple convulsions

Breathing difficulty

Hypoglycemia

Prostration

Severe anaemia

Cerebral malaria

Hyper pyrexia

Metabolic acidosis

Other Symptoms

12. Previous transfusion Yes [ ] No [ ] When [ ]

13. Where was blood transfusion done? (a) Tertiary hospitals [ ] (b) General hospitals [ ]

(c) Private hospital [ ] (d) Others

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