



Prevalence of Hospital-Based Malaria among Children in Jos, North Central Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author CO conceived and designed the study, conducted some of the laboratory investigations and drafted the manuscript. Author MS supervised the study and reviewed the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Background: In Nigeria, malaria is one of the main causes of morbidity and mortality in children. Nigeria government has put in efforts on malaria control and prevention. This is in consonance with Roll back malaria initiative's objectives. Thus, with the expiration of RBM 2010 target deadline for malaria, there is a need to assess the prevalence of malaria among the risk group in this malaria endemic area, to ascertain how far we have gone in achieving the initiatives objectives.

Objective: The aim of this study was to determine the prevalence of malaria among children.

Method: This is a hospital based cross- sectional study of 600 children with or without malaria attending various health care centers in the urban area of Jos, North central Nigeria. Giemsa stained thick and thin blood films were examined for malaria parasite using x 100 (oil immersion) objective.

Result: Six hundred children with or without malaria were recruited for the study, in which 287 (47.8%) were boys. Based on microscopical diagnosis of malaria, 306 (51.00%) of the children had malaria parasitaemia. 48.06% prevalence rate was obtained among febrile under-5 children. One hundred and twenty-one (20.17%, 121/600) of the children had fever out of which 103 (85.12%, 103/121) had fever and the remaining had no fever. The geometric mean of the parasites was 385.85 parasites/ul and 20 (6.53%) of the

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children with malaria parasitaemia had parasite density > 500 parasites/ μ l. Malaria parasitaemia was relatively higher in children aged 5-9 years.

Conclusion: There is still a high prevalence of hospital-based malaria among children aged 1-day to 18 years in the urban areas of Jos, north central Nigeria. Consequently, there is a need to intensify effort on malaria treatment, control and prevention in these areas.

Keywords: Hospital-based; childhood; malaria; prevalence; Jos.

1. INTRODUCTION

Malaria is endemic in the tropics and still claims the lives of many African children. Due to various malaria control, prevention and elimination measures, malaria mortality which peaked at 1.84 million in 2004 dropped to 1.24 million in 2010, of these, 714,000 were children less than 5 years while 524,000 were individuals of 5 years and above [1]. However, World Health Organization, reported that there was a level off in global funding for malaria prevention and control between 2010 and 2012, consequently, there wasn't a significant difference in the estimated malaria death and cases between 2010 and 2012 [1]. Nigeria and Democratic Republic of Congo accounted for >40% of the estimated global malaria deaths and cases between 2010 and 2012 [1]. Almost all cases are caused by *P. falciparum* although most of them are usually unconfirmed [2].

A community-based survey conducted by the National Malaria Control Programme, (NMCP) in 2010, stated that the ratio of childhood malaria translates into 42%. The South-West zone of Nigeria in the survey recorded the highest prevalence of malaria [3]. Also, Ikeh and Teclaire, 2008 [4], recorded 56.9% malaria prevalence rate among febrile under -5 children seen in primary health care centers in Jos, north central Nigeria. 64% prevalence rate was obtained by Sarki Alhaji (2009) [5] among children aged 1-10 years in two hospitals in Gombe State, northeast Nigeria. In Kenya, there was a rise in malaria cases from 3% in 2007 to 8% in 2009 in children less than 5 years [6]. Malaria prevalence dropped from 86.8% to 27.5% in Ghana in a community-based survey by the National Malaria Control Programme 2013 [7]. A recent World Malaria Report stated that no evidence exists of decreased malaria in Malawi since 2000 in Malawi [8].

Nigeria government in consonance with the Roll Back Malaria Initiatives has put in efforts on malaria control and prevention through provision of more sensitive diagnostic tools, distribution of anti-malaria drugs and insecticide treated bed nets to [9]. Thus, with the expiration of RBM 2010 target deadline for malaria, there is a need to assess the prevalence of malaria among the risk group in this malaria endemic area, to ascertain how far we have gone in achieving the initiatives objectives. Thus, the aim of this study was to determine the prevalence of malaria among children. The knowledge gained is vital in evaluating the effects of the increased malaria control efforts thus providing policy makers necessary data for further appropriate planning of malaria control activities.

2. METHOD

2.1 Study Location, Design, Population and Data Collection

This is a hospital based cross-sectional study conducted between August and November 2011. The hospitals were: Jos University Teaching Hospital (JUTH) which is a reference

hospital in Jos north local government area, Bukuru Central (BC), Bukuru Express (BE) and Bukuru Ray-field (BR) Primary Health Care Centers in Jos south local government area, all in the urban areas of Plateau state.

The study was conducted among children attending the Emergency Paediatric Unit, Special Care Baby Unit, Paediatric Outpatient Department including the immunization unit of JUTH and the primary health care centers (PHCs) including those who came to the PHCs solely for the purpose of the study.

Children who met the study's inclusion criteria were recruited for the study. The inclusion criteria were: [1] children who came to the health centers for receiving treatment or solely to participate in the study. [2] Consent of children or parent/ caregiver [3]. Presence or absence of clinical signs/symptoms of malaria such as: fever, cough, diarrhoea, pallor, jaundice, vomiting, chill and others. [4] Children without any history of treatment with anti-malaria drugs in the past 1 to 2 weeks or paracetamol in the past 24 hours and [5] Children aged 1-day to 18 years old. This wide childhood age range was used to exclusively cover the age group of World Health Organization biological definition of a child. Through clinical examination children with any other diagnosed illness apart from malaria, individuals older than 18 years and non-consenting individuals/parents/caregivers were excluded from the study. Children or Parents/guardians of eligible children gave written informed consent to allow their children to participate in the study. Participants were consecutively recruited into the study until the sample size of 600 was reached. Qualified health personnel used a pre-tested English questionnaire to collect patient's demographic information and the reasons why he/she was brought to the health center. The axillary body temperature was measured using a digital clinical thermometer. Fever was defined as body temperature $\geq 37.5^{\circ}\text{C}$.

2.2 Malaria Diagnosis

Double slides of thick and thin blood films of the subjects were stained with 30% freshly prepared Giemsa stain for 3 minutes. Samples were collected in the morning hours.

Thin blood films were fixed with 100% methanol prior to staining. Quality controlled Giemsa stain; dust-free microscopy glass slides and phosphate buffer pH 7.2 were used.

Giemsa stained thick and thin blood films were examined for malaria parasite using x 100 (oil immersion) objective by an experienced medical laboratory scientist who was involved in the study. This served as the internal quality control. The slides were also cross-read by an experienced microscopist who was not otherwise involved in the study (independent reader) this served as the external quality control. The degree of variation in the results was determined and subjected to statistical analysis at 95% confidence limit to test for significance using SPSS version 17, 2008 (www.spss.com). Malaria diagnosis was based on identification of asexual stages of *Plasmodium falciparum* on the thick blood smears. Film was reported as 'malaria parasite not seen' i.e. negative after examining about 100 fields. Thin films were used to identify species and stages of Plasmodium. Parasite density was by the number of parasites per microlitre of blood (thick film) method [10]. Data were analyzed using SPSS version 17, 2008 (www.spss.com). A p-value of 5% as a test of significance was adopted.

Table 1. Prevalence of malaria parasite (MP) by age categories of the children in the various hospitals

Hospitals	MP	Age categories				Total
		1day-4 years	5-9 years	10-14 years	15-18 years	
BE PHC	Positive	43(43.43%)	26(57.78%)	5(55.56%)	6(54.55%)	80(48.78%)
	Negative	56(56.57%)	19(42.22%)	4(44.44%)	5(45.45%)	84(51.22%)
	Total	99(100.00%)	45(100.00%)	9(100.00%)	11(100.00%)	164(100.00%)
BC PHC	Positive	34(28.81%)	10(38.46%)	4(36.36%)	1(14.29%)	113(69.75%)
	Negative	84(71.19%)	16(61.54%)	7(63.64%)	6(85.71%)	49(30.25%)
	Total	118(100.00%)	26(100.00%)	11(100.00%)	7(100.00%)	162(100.00%)
BR PHC	Positive	58(61.05%)	16(76.19%)	5(50.00%)	1(50.00%)	80(62.50%)
	Negative	37(38.95%)	5(23.81%)	5(50.00%)	1(50.00%)	48(37.50%)
	Total	95(100.00%)	21(100.00%)	10(100.00%)	2(100.00%)	128(100.00%)
JUTH	Positive	63(63.00%)	27(64.29%)	4(50.00%)	3(50.00%)	97(66.44%)
	Negative	27(27.00%)	15(35.71%)	4(50.00%)		
	Total	100(100.00%)	42(100.00%)	8(100.00%)	3(50.00%)	49(33.56%)
				6(100.00%)	146(100.00%)	

Table 2. Levels of parasitaemia by age categories of the children

Levels of parasitaemia (parasites/ μ l)	Age categories				Total
	1day- 4 years	5-9 years	10-14 years	15-18 years	
01-100	46	8	0	2	56
101-200	126	47	10	7	190
201-300	10	8	6	0	24
301-400	10	0	2	0	12
401-500	4	0	0	0	4
501-600	0	12	0	2	14
601-700	0	2	0	0	2
701-800	0	0	0	0	0
801-900	2	0	0	0	2
901-1000	0	2	0	0	2
Total	198	79	18	11	306

3. RESULTS

The prevalence of malaria by age in the various hospitals is shown in above Table 1. The overall prevalence of malaria was 51.00% (306/600). 48.06% (198/412), 58.96% (79/134), 47.37% (18/38) and 42.31% (11/26) prevalence were obtained amongst the children aged 1 day-4 years, 5-9 years, 10-14 years and 15-18 years respectively. Among the different hospitals, the highest prevalence (66.44%, 97/146) was recorded among children attending JUTH.

Two hundred and eighty seven (47.83%) of the children were males, out of which 148 (51.6%) were infected. One hundred and twenty one (20.27%) children had fever. One hundred and three (103/121, 85.12%) of the children with fever had malaria positive blood films.

The level of parasitaemia by age categories of the children is shown in above Table 2. The highest level of parasitaemia was obtained at 901-1000 parasites/ μ l (++++). One hundred and ninety (62.09%) of the infected children had a parasitaemia level within 101- 200 (++) parasites/ μ l while 20 (6.54%) had parasite density > 500 parasites/ μ l. Children aged 5 to 9 years old had the highest level of parasitaemia.

4. DISCUSSION

This study shows an overall prevalence rate of 51.00%. This is lower than 64% obtained by Sarki (2009) [5] among children aged 1-10 years in a hospital-based study in Gombe state, north-east Nigeria. Geographical location, seasonal variation, environmental condition, as well as rate of use of malaria intervention tools could be the possible reasons for the varying results [11,12]. The authors in their previous study had reported that in the present study locations, 69.4%, 6.2%, 14.4% and 1.2% subjects were using insecticide treated bed-net, non-insecticide treated bed-net, indoor residual spraying and anti-malaria drugs as means of controlling and preventing malaria [13]. The authors also reported that there was a high availability of mosquito breeding sites in these areas and low level of environmental and personal hygiene [13]. This study has shown that there is still a high prevalence of malaria cases among children attending some hospitals in Jos. Consequently, it is advisable that policy makers on malaria control in Nigeria should intensify efforts on malaria control strategies, particularly in Jos. The high prevalence of malaria (85.2%) obtained among febrile children is in agreement with the World Health Organization (WHO) case definition for malaria in endemic areas which associated fever with malaria [14]. The malaria negative result obtained among some febrile children could be an indication that some of the children had other febrile-causing illness other than malaria. Furthermore, the presence of malaria parasites without febrile illness in some of the children could partly be due to acquired immunity [15]. Consequently, some of the children who have acquired partial immunity are likely to be asymptomatic or present with periodic fever [15]. This finding agrees with that from malaria endemic areas [16,17].

4.1 Study Limitations

The cross sectional nature and the influence of seasonal variations are some of the limitations of the study. Thus, further investigation on malaria prevalence, with comparisons between seasons and predictors of malaria in the present study area is necessary.

5. CONCLUSION

There is still a high prevalence of hospital- based malaria among children aged 1day to 18 years in Jos. Consequently, there is a need to intensify effort on malaria treatment, control and prevention in this area.

CONSENT

All authors declare that, 'a written informed consent was obtained from the parents/caregivers of the patients/ participants for publication of this case report'.

ETHICAL CONSIDERATIONS

The Medical and Health Ethics Committee of Jos University Teaching Hospital and that of the primary health care centers approved this study.

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COMPETING INTEREST

The authors hereby declare that they have no conflicting interests.

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