Original article

Childhood malaria in the Niger delta area of Nigeria: mothers/care givers´ perception, definition and treatment practices

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Abstract

Objective: The objective of the study was to evaluate mothers/care givers perception of malaria, their treatment practices and the effects on the outcome of malaria. **Methods**: Four hundred and sixty children were enrolled and their mothers/care givers interviewed. The children were screened for malaria parasitaemia and there after, blood specimens were obtained for biochemical and haematological evaluation from those children who met the criteria and tested positive to *P. falciparum* parasites. Packed cell volume, electrolytes, urea, creatinine, plasma glucose, and serum bilirubin were analyzed. **Results**: A total of 460 children were studied, 233 (50.7%) males and 227 (49.3%) females. Mild malaria cases were 112 (24.3%) and severe malaria 348 (75.7%). Those who presented early 106 (23.0%) and those who presented late 354 (77.0%). Perception and definition of malaria as well as the treatment seeking behaviors vary significantly with the level of education of the mothers and care givers. Those without formal education 68 (51.9%) wrongly perceived that the etiology of malaria can only be diagnosed by native doctors compared to those with primary six education 61 (26.5%) and junior secondary education 10 (10.1%). Only 43 (9.3%) gave the correct dose of chloroquine syrup to their sick children, while 32 (7.0%) gave at sub optimal doses. **Conclusion**: Wrong perception of malaria especially the complicated malaria and wrong treatment practices are major contributory factors to the high mortality and morbidity of malaria in Nigeria. There is therefore a need for health education to correct the wrong ideas about the cause and treatment practices of malaria as part of malaria control programme.

Keywords: Childhood malaria; Mothers/Caregivers; Perception and treatment practices; Nigeria

INTRODUCTION

In many parts of the developing world, the vast majority of malaria cases in both adults and children are treated at home[1]. Malaria, particularly that caused by *plasmodium falciparum* remains one of the most serious diseases in the world endangering infant and early childhood development in many tropical regions that lack the resources to implement thorough widespread control programme[2]. Wrong treatment practices, wrong perception of malaria, and delay in presenting the febrile child to hospital for treatment, are some of the factors that increases the mortality and morbidity of malaria especially in the rural areas where education levels are low. Studies conducted on malaria treatment in Guinea and Togo showed that mothers in Africa often give chloroquine to their children for episodes of fever[3, 4]. Many of these mothers do not give the chloroquine at the correct dosage (quantity) or at the right interval (time-interval). Because of wrong administration practices, resolu-

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tion of malaria may not be achieved and the disease often becomes complicated in many cases. Complicated malaria is common and contributes significantly to the high morbidity and mortality seen in malaria cases. It is therefore essential to understand the epidemiological characteristics of the treatment practices, perception, and treatment seeking behaviors of mothers and care givers in rural areas where malaria is endemic.

The aim of this present study is to document some epidemiological and biochemical aspects of malaria in children and also evaluate mothers and caregivers´ perception of malaria, treatment seeking behaviors and practices and the effects on the outcome of malaria, in some rural villages of Delta state of Nigeria.

MATERIALS AND METHODS

This study was conducted at the Baptist Medical Centre, Eku in Delta state of Nigeria, among children residing in seven rural villages, in a previously described focus endemic for sleeping sickness[5]. Delta state has a high prevalence of malaria and transmission occurs all year round. Malaria was defined as a febrile illness accompanied by *p. falciparum* trophozoite stage parasitaemia and clinical features for which no other cause(s) could be found.

Information and data collection

This survey was conducted during the period of study, (March 2005 - February 2006) to assess knowledge of mothers and caregivers concerning malaria, reconfirmation of febrile illness in children, time of presentation of the sick child at the hospital, clinical features and outcome of the illness. A total of 460 subjects, 233 (50.7%) males and 227 (49.3%) females aged 5 years and below were enrolled. The characteristics of the children were collected by the authors using structured questionnaire to collect categorized information. This was administered to the mothers/caregivers who accompanied the children to the hospital after a diagnosis of malaria had been determined. Information obtained from the mothers/care givers included ages, level of education, their definition/perception of malaria, time of presentation of the sick child to the hospital, correct administration of antimalaria at home and thier treatment seeking behavior when their children are ill.

Parasitological and hematological testing

A specimen of 10milliliter of blood was obtained with informed consent for parasitological, haematological and biochemical measurements. The blood sample for electrolytes urea and creatinine and bilirubin analysis were collected into specimen bottles containing lithium heparin as the anticoagulant. They were centrifuged at 3 000 rpm and the plasma separated and stored frozen until analysis was carried out in batches. However the analysis of plasma glucose and bilirubin was done on the same day of the specimen collection. Blood films were stained with Giemsa and blood slides screened microscopically for malaria parasite. The criteria for smear positivity were the demonstration of trophozites with characteristic morphological features consistent with previously described for *plasmodium falciparum*[6]. Parasite count per microlitre of blood was of parasites present per 100 high power fields and multiplying the number by 500[7]. Packed cell volume was determined using micro capillary tube and a haematocrit centrifuge. Values were read on a manual haematocrit reader and expressed in percentage[8]. The mean PCV value was recorded for each child.

Biochemical assays

Random Blood sugar was estimated by the glucose oxidase method[9], electrolytes were estimated by flame photometric method[10]. Creatinine was estimated by modified Jaffe´s method[11]. Serum bilirubin was by the Evelyn Malloy´s method[12], and blood urea estimation was by urease enzymatic method[13].

Clinical features

All children presenting with fever and malaria diagnosed clinically and parasitological positive blood smear were included. The criteria accepted for clinical diagnosis were fever with temperature at 38℃ and above, lethargy, vomiting, rigors, poor appetite, headache, diarrhea and convulsion. Severe malaria was defined according to WHO criteria as malaria complicated by severe anaemia or hypoglycaemia or coma[14]. Severe anaemia was defined as haemoglobin level of 7.5 g/dL or PCV of 21%. Hypoglycaemia was defined as random blood glucose level of < 2.2mmol/L (40mg/dL). Hyperpyrexia was defined as rectal temperature higher than 39℃ while cerebral malaria was defined as coma not attributable

to any other causes[15]. Patients with mild malaria had illness which did not satisfy the diagnostic criteria for the severe form of illness. Early presentation was defined as the presentation of the child at the hospital at the first recognition of febrile illness without any form of medication at home within 24-48 hours of onset of fever. Presentations which did not satisfy these criteria were classified as late.

Data analysis

Data analysis was performed using Instat graph pad soft ware version 3.0. Means and standard deviations were determined for quantitative data and frequency determined for categorical variables. Student-t test was used to test for significant association. Analysis of variance was used to compare multiple means, while Chi-squared test was used to analyze group differences for categorical variable. P value $\leqslant 0.05$ was considered statistically significant.

Ethical consideration

Ethical clearance was sought and obtained from the institution ethical committee. All subjects gave informed consent after due explanation by any one of the researchers.

RESULTS

Population characteristics of the children according to age and sex

A total of 460 children where enrolled and their mothers/caregivers were interviewed. Table 1 shows the population characteristics of the patients (children). Two hundred and thirty three (50.7%) were males and females were 227 (49.3%). Mild malaria cases were 112 (24.3%) and severe malaria 348 (75.7%).

Patients presenting symptoms and the educational level of the mothers/care givers

The presenting Symptoms and the educational level of the mothers/care givers are shown in table 2. One hundred and thirty one (28.5%) of the respondents had no formal education, 230 (50.0%) had primary school education and 99 (21.5%) had junior secondary school education. The main presenting symptoms were fever, chills and rigors, vomiting, diarrhea and convulsion. Mothers and caregivers present their children more at the hospital for treatment for malaria when the child has fever 260 (56.5%) chills and rigor 129 (28.0%) than when the child has other symptoms like vomiting 32(7.0%), diarrhea 36(7.8%) and convulsion 3(0.7%).

Definition of malaria and the treatment seeking behaviors of the respondents

Table 3 shows the respondents definition of malaria, and the treatment seeking practices. Three hundred and forty nine (75.9%) of the respondents regard malaria as a febrile illness, while 173 (37.6%) agreed that it is transmitted by mosquito and 176 (38.3%) said malaria was a communicable disease. Only 21 (16.2%) of the respondents with no formal education said malaria was transmitted by mosquito, and 102 (77.9%) of them also wrongly perceived malaria as a communicable disease. Severe malaria was seen as different illness from malaria mainly by those without formal education 103 (78.6%) and those with primary education 149 (64.8%). Those without formal education 68 (51.9%) also wrongly perceived that the etiology of malaria can only be diagnosed by native doctors compared to those with primary six education 61 (26.5%) and junior secondary school 10 (10.1%), $P < 0.000\ 5$.

Those presenting late 115(87.8%), had no formal education compared to 191 (83.0%) with primary education and 48(48.5%) with junior secondary. One hundred and fifteen (25.0%) of the respondents said home treatment was their first action whenever their children aged $\leqslant 5$ were ill with malaria. Eighty five (18.5%) said they indulged in seeking treatment from multiple treatment sources, the hospital being the last place to visit when all efforts to find cure failed. Two hundred and thirty seven (51.5%) respondents said they reported to orthodox hospital as first action for treatment of malaria. Forty three (9.3%) gave the correct doses of chloroquine to treat their children, while 32 (7.0%) gave at sub optimal doses, $P < 0.005$.

Figures 1 and 2 compare the time of presentation of malaria in the hospital and the out come of malaria (mild or severe). Those presenting late have more complicated cases than those who presented early.

Biochemical profile of severe and mild malaria

Hyperbilirubinaemia (serum bilirubin > 5mg/dL) was present in 200 (43.5%) of those with severe

malaria compared to 30(6.5%) of those with mild malaria, P<0.0001. Random blood glucose of < 40mg/dl was also more prevalent in those children with severe malaria compared to those with mild malaria; 120(26.1%) Vs 0(0.0%), $P<0.001$. Electrolyte disorders were quite prevalent in those children with severe malaria when compared with those with mild malaria, table 4.

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Table 1 Population characteristics of sampled children according to age and sex.

Age(yrs)	sample size (n=460)		Mild Malaria (112)		Severe Malaria (348)	
	M%	F%	M%	F%	M%	F%
<2(n=71)	35(7.6)	36(7.8)	10(2.2)	16(3.5)	25(5.4)	20(4.4)
>2-3(n=144)	66(14.3)	78(17.0)	19(4.1)	22(4.8)	47(10.2)	56(12.2)
>3-4(n=112)	62(13.5)	50(10.9)	15(3.3)	10(2.2)	47(10.2)	40(8.7)
>4-5(n=133)	70(15.2)	63(13.7)	10(2.2)	10(2.2)	60(13.0)	53(11.5)
Total	233(50.7)	227(49.3)	54(11.7)	58(12.6)	179(38.9)	169(36.7)

Table 2 Level of education of the respondents and the presenting complains of the Children.

Symptoms	No formal Education (n=131)	Primary Six(n=230)	Junior Secondary (n=99)
Fever	120(91.6%)	90(39.1%)	50(50.5%)
Chills/rigors	11(8.4%)	65(37.0%)	23(33.3%)
Vomiting	0(0.0)	28(12.2%)	4(4.0%)
Diarrhea	0(0.0)	24(10.4%)	12(12.1%)
Convulsion	0(0.0)	23(4.3%)	10(10.1%)
Total	131(28.5%)	230(50.0%)	99(21.5%)

Table 3 Definition of malaria, and treatment seeking behavior of respondents.

	No. Formal Education	Primary Six	Junior Secondary	Total
Number interviewed	131	230	99	460
Definition/mode of transmission				
Mild Malaria				
Febrile illness	123(93.9)	145(63.0)	81(81.8)	349(75.9)
Transmitted by mosquitoes	21(16.2)	75(32.6)	77(77.8)	173(37.6)
Communicable disease	102(77.9)	70(30.4)	4(4.0)	176(38.3)
Severe Malaria				
Fever/or splenomegaly	70(53.4)	92(40.0)	10(10.1)	172(37.6)
Etiology is revealed only by native doctors	68(51.9)	61(26.5)	10(10.1)	33(29.0)
Treatment seeking behavior/practices				
Number presenting late to orthodox hospital	115(87.8)	191(83.0)	48(48.5)	354(77.0)
Home management appropriate	11(8.4)	26(11.3)	6(6.1)	43(9.3)
Home management inappropriate	28(21.4)	-(0.0)	4(4.0)	32(7.0)
Home treatment as 1st action	39(29.8)	68(29.6)	8(8.0)	115(25.0)
Multiple treatment sources	50(38.1)	25(10.9)	10(10.1)	85(18.4)
Traditional healers as 1st action	17(13.0)	6(2.6)	-(0.0)	23(5.0)
Orthodox hospital as 1st action	36(24.5)	130(56.2)	71(71.7)	237(51.5)

Table 4 Biochemical profile of children with mild and severe malaria.

	Severe Malaria	Mild Malaria	*P*-value
Serum Bilirubin			
< 5mg/dL	148 (32.2)	82(17.8)	*P* <0.000 1
> 5mg/dL	200 (43.5)	30(6.5)	
Random blood glucose			
<40mg/dL	120(26.1)	0(0.0)	*P* <0.000 1
>40mg/dL	228(49.6)	112(24.3)	
Potassium(K^+)			
<3.3mmol/L	48(10.4)	7(1.5)	
3.3 - 5.0mmol/L	208(45.2)	97(21.1)	*P* <0.000 1
> 5.0mmol/L	92(20.9)	8(1.7)	
Sodium (Na^+)			
< 135mmol/L	68(14.8)	10(2.2)	
135-145mmol/L	208(45.2)	91(19.8)	*P* <0.000 1
>145mmol/L	72(15.6)	11(2.4)	
Bicarbonate (Hco_3^-)			
<20mmol/L	108(23.5)	5(1.1)	
20 - 30mmol/L	228(49.6)	92(20.0)	*P* <0.000 1
>30mmol/L	2(0.4)	15(3.3)	
Urea			
< 15mg/dL	8(0.3)	5(1.1)	
15 - 45mg/dL	140(30.4)	74(16.1)	*P* <0.000 1
>45mg/dL	200(43.5)	33(7.2)	
<1mg/dL	148(32.2)	100(21.7)	*P* <0.000 1
> 1mg/dL	200(43.5)	12(2.6)	
<5g/dL	128(27.8)	0(0.0)	
5 - 10g/dL	210(45.7)	6(1.3)	*P* <0.000 1
> 10g/dL	10(2.2)	106(23.0)	

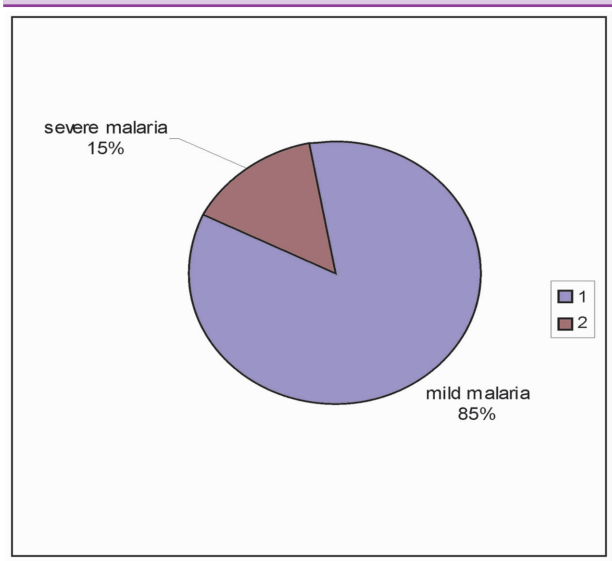

Figure 1 Patients who presented early to hospital

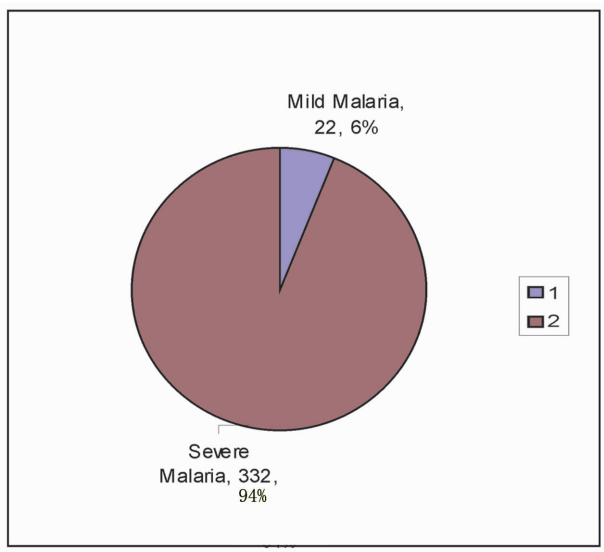

Figure 2 Patients who presented late to hospital

DISCUSSION

We found that mothers/caregivers´ perception, definition of malaria, mode of transmission, treatment seeking behaviors and practices are all influenced significantly by their level of education. This study reveals low educational levels of most of the rural women, the highest level of education was junior secondary school and majority had no formal education. Mothers with no formal education define mild malaria as febrile illness that is inevitable and will only seek treatment at orthodox hospital after series of home management and in traditional healer´s homes. When Malaria becomes complicated with convulsion and anaemia, they wrongly attribute it to mean a different kind of illness that is suffered by children of adulterous mothers and can only be managed by traditional healers. It is likely that mothers of children with severe malaria may hide their children for a long time before presenting in hospital. This may be a contributory factor leading to late presentation in hospital since no woman wants to be accused of adultery. Late presentation of the child with malaria in hospital for treatment increases the development of severe malaria as revealed by our findings of 85% of mild cases compared to 15% of severe cases in those that presented early. Similarly only 6% of the cases that presented late were mild compared to 94% that were severe. These finding is similar to the finding of other workers[16, 17].

Patients presenting symptoms is also significantly influenced by the level of education of the mothers. Generally mothers sought treatment for their sick children in orthodox hospital if the main presenting symptoms were fever, chills/rigors than when the child´s complain is vomiting, diarrhea and convulsion. Mothers with no formal education do not seem to seek for treatment in the hospital when the presenting complains is vomiting, diarrhea and convulsion because they do not attribute these symptoms to malaria. A higher percentage of those mothers with secondary education visited orthodox hospital first in seeking treatment for malaria compared to those with primary education and without formal education.

Treatment at home that is inappropriate also contributes to delay presentation of children with malaria in hospital. Only a few percentages (9.3%) of the mothers know how to give chloroquine syrup at optimal doses at the correct dose intervals. Sub-optimal use of chloroquine may contribute not only to development of severe malaria but could also encourage the emergence of chloroquine resistance malaria parasites. It is clear that the higher the level of education the better the level of awareness concerning malaria as a disease.

Hyperbilirubinaemia in malaria can be traced to red cell destruction by the malaria parasite. Early treatment by using the correct dose and dosage interval of anti malaria will eliminate the parasite from the blood and red cell destruction cease. But delayed treatment due to late presentation will lead to more red cell destruction and consequently lead to elevated serum bilirubin and anaemia. Red cell haemolysis is also responsible for the severe anaemia in children with severe malaria[18]. Reduced plasma glucose (hypoglycaemia) seen in malaria may be a combination of factors like loss of appetite, nausea and vomiting, that are common features of malaria. Hypoglycaemia is a severe complication of malaria that should be recognized and treated early since it could lead to coma and death[18].

Electrolyte disorders frequently complicate severe malaria as shown in this study. Both hypokalaemia and hyponatraemia are common features of malaria parasitaemia. We found hyponatraemia in more than 50% of cases of children with severe malaria. Hyponatraemia may present clinically as lethargy and sometimes convulsion because of cerebral oedema[18,19]. Electrolyte disorders especially hyperkalaemia have been reported to be one of the commonest cause of mortality and morbidity in severe malaria[19].

The increased plasma urea and creatinine may be traceable to pre renal azotaemia; as a result of fluid losses from lack of intake, vomiting or diarrhea, that are common features of malaria parasitaemia. Replacement of fluid losses and correction of electrolyte imbalance are major treatment that can reduce malaria mortality and morbidity[19, 20].

Wrong perception of malaria especially the complicated malaria and wrong treatment practices are major contributory factors to the high mortality and

morbidity of malaria in Nigeria. There is therefore a need for health education to correct the wrong ideas about the cause of malaria as part of malaria control programmes. This will be made easier if women education is encouraged in the rural areas.

ACKNOWLEDGEMENT

We thank the Staff of Eku Baptist Hospital for their co-operation. We also thank the secretariat Staff of Chemical Pathology department in the University of Benin Teaching Hospital for typing this manuscript.

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