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Prevalence of Malaria in Febrile Under Five Children in Port Harcourt, Nigeria

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Abstract
Background*: Malaria remains the commonest tropical disease in the world characterised by periodic bouts of severe chills and high fever. It is one of the most significant public health problems in Nigeria leading to significant morbidity and mortality.*
Objectives: *To determine the prevalence of malaria in under five children presenting with fever and the other common symptoms of malaria other than fever.*
METHODS: *It was a 6 months prospective study carried out amongst under five children presenting with fever in the outpatient department of the Braithwaite Memorial Specialist Hospital in Port Harcourt, Nigeria.*
Blood film for malaria parasite and complete blood count were done for each recruited subject and before commencement of antimalarial.
RESULTS: *Two hundred and fifty-four children were enrolled into the study, of which 153 had positive malaria parasite giving a prevalence of malaria in febrile under five children as 61.7%. Plasmodium specie was the only specie identified in all subjects. One hundred and fourteen (74.5%) had 1+ parasitaemia. The prevalence of malaria was higher among children from rural settlements (83.3%) and children of high socio-economic class (63.9%). Cough (56.9%) and vomiting (54.2%) were the commonest symptoms observed in febrile children with positive malaria parasite. One hundred and seventy-eight (74.8%) children with positive malaria parasite had anaemia.*
Conclusion: *The prevalence of malaria in febrile under five children is high. Cough and vomiting are the commonest clinical features of malaria seen in under-five febrile children with malaria.*
Keywords: *Clinical features; Malaria; Under-fives; Port Harcourt; Prevalence*

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I. Introduction

Malaria, a preventable and treatable infection, predominantly occurring in the tropical and subtropical regions of the world, is caused by plasmodium species*(falciparum*, *malaria*, *ovale* and *vivax*) with *plasmodium falciparum* being responsible for over 90% of infections documented in Africa.[1]

It is a major cause of morbidity and mortality especially among under-fives, taking the life of a child every two minutes.[2]According to the 2016 World Health Organization (WHO) malaria world report, 212 million new cases of malaria occurred globally in 2015 with the WHO African Region accounting for 90% of these infections and Nigeria contributing about 29% of this burden.[3]

In Nigeria, malaria accounts for 60% of all outpatient visits and 30% of all under-five hospitalizations. Additionally, in 2015, 27.4% under-fives in Nigeria had positive malaria parasite test using microscopy, and 45.1% by Rapid Diagnostic Test (RDT).[4]

It is quite difficult to distinguish the symptoms of malaria from those of other common childhood diseases such as common cold, viral illnesses, otitis media, pharyngitis and sepsis as they have similar symptoms especially fever.[5] Thus, in localities where laboratory diagnosis of malaria was unavailable or where there were anticipated delays in obtaining laboratory results, presumptive treatment of febrile children with antimalarial drugs was widely practiced in Africa, as a delay in treatment could worsen the clinical outcome of the affected children.[6] This practice is however being discouraged as the equipment and manpower needed for laboratory diagnosis of the disease is becoming widely available, with rapid diagnostic test kits for malaria now readily accessible. In addition, the higher cost of the artemisinin based combination therapy now being used for treatment, in comparison to the previously used monotherapies like chloroquine and amiodiaquine discourages the treatment of febrile children with antimalarials without laboratory diagnosis.[7]It is also being postulated that since there is a decline in the prevalence and transmission of malaria in Africa especially in sub Saharan Africa, presumptive treatment of febrile children with antimalarial may lead to over-treatment of malaria among these children and a failure to treat other causes of fever in them.[5,6]However, other researchers have argued against

discarding the presumptive treatment of malaria in Africa based on the fact that though the overall prevalence of malaria in a country may be on the decline, considerable heterogeneity in prevalence rates exists within a country. Therefore, such practices may not be safe in countries or regions within a country with relatively high prevalence rates of malaria among febrile under-five children.[8]

This study was therefore designed to ascertain the prevalence of malaria among febrile children presenting to the Braithwaite Memorial Specialist Hospital, Port Harcourt,Nigeria.

II. Materials And Methods

It was a prospective study carried out in the Paediatric outpatient department (POPD) of the Braithwaite Memorial Specialist Hospital (BMSH) Port Harcourt in Nigeria over a 6 months period from 1st May to 30th October, 2016.

Braithwaite Memorial Specialist Hospital is a public institution owned by the Rivers State government in the South-South geo-political zone.It is a 375 bedded hospital thatserves as a primary and tertiary care centre for the state as well as a referral centre for the 23 Local government areas in the state and neighbouring states.

Informed consent was obtained from parents or authorized caregivers in the absence of the parents.Only children with documented fever (axillary temperature $\geq 37.5^0$ C) at presentation without prior commencement of antimalarial were recruited consecutively into the study.Detailed clinical history including age, sex, place of residence and symptoms other than fever were obtained.

Half a millilitre of venous blood was obtained from each child recruited and sent to the microbiology laboratory for the preparation of thick and thin blood smears within 24 hours of collection. Prepared slides were air dried and thereafter stained with Giemsa.[9]Each film was examined microscopically at a magnification of X100 under oil immersion. The film was said to be positive for malaria parasites if asexual forms of malaria parasite (trophozoites or ring forms) were present. Asexual malaria parasites were counted concomitantly with the leucocytes in each field and the parasite count recorded as the ratio of asexual forms per 200 leucocytes in each field.Parasites were counted using the 'Plus system'. Load of malaria parasitaemia were reported as 1+ if parasite count is 1-10 per 100 thick fields, 2+ If 11-100 per 100 thick fields, 3+, presence of 1-10 per thick fields and 4+ > 10 per thick fields.[10]A slide was said to be negative for malaria parasite if after examining a minimum of 200 leucocytes, no malaria parasite was found.[11]Full blood counts were also done for each recruited child to exclude probable sepsis.

Results were collated with the aid of questionnaires designed for the study. Data was analyzed with the aid of SPSS version 17.0 statistical software. The level of significance was set at 95% confidence level.

III. Results

Two hundred and fifty-four children who had fever were enrolled into the study but six children were excluded because they did not carry out the test for malaria parasites. The data of 248 children were therefore analysed for the study

Characteristics of the Study Population

The children were aged 0 to 59 (mean 19.47± 15.9) months. There were 146(58.9%) males and 102 (41.1%) females with a male: female ratio of 1.4: 1.

Majority of children were aged 0 – 11 months, 102 (41.1%) as shown in Table I.

Table I: Age Distribution of the Study Population

Age Group (Months)	Female No (%)	Male No (%)	Total No (%)
0 – 11	38 (37.2)	64(43.8)	102 (41.1)
12 - 23	29 (28.4)	26 (17.8)	55 (22.2)
24 - 35	17 (16.7)	26 (17.8)	43 (17.3)
36 - 47	7 (6.9)	9 (6.2)	16 (6.5)
48 - 59	11 (10.8)	21(14.4)	32 (12.9)
Total	**102(100)**	**146(100)**	**248 (100)**

One hundred and eight (43.5%), 52 (21%) and 88 (35.5%) children belonged to the high, middle and low socio-economic class respectively.

Two hundred and twenty three (89.9%) were from urban areas / Port Harcourt metropolis and 25 (10.1%) from rural communities in Rivers State.

Characteristics of Children with Positive Malaria Parasite

Of the 248 children recruited, 153 had positive malaria parasite test and 95 (38.3%) did not. The prevalence of malaria in the study population was 61.7%.

Plasmodium falciparum was the specie identified in all subjects.

One hundred and fourteen (74.5%) of those who had positive malaria parasite test had 1+ parasitaemia (Fig 1)

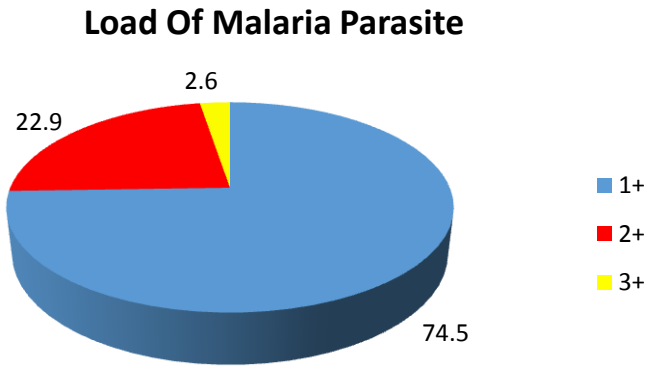

Fig 1: Load of plasmodium falciparum in the study population.

The highest prevalence of malaria (69.8%) was seen among children aged 24 – 35 months and the least (56.3%) was among children aged 36 – 47 months and 48 -59 months. These differences were however not statistically different, (Table II).

Table II: The prevalence of Malaria among children in the different age Groups

Age Group (Months)	Malaria Parasite Test		
	Positive N (%)	Negative N (%)	Total
0 -11	63 (61.8)	39 (38.2)	102 (100)
12 -23	33 (60.0)	22 (40.0)	55 (100)
24 -35	30 (69.8)	13 (30.2)	43 (100)
36 -47	9 (56.3)	7(43.8)	16 (100)
48 -59	18 (56.3)	14 (43.8)	32 (100)
Total	153 (61.7)	95 (38.3)	248 (100)

(χ^2 =1. 855 , p value = 0.762)

Although the prevalence of malaria was higher 91 (62.3%) among the males than females 62 (60.8%), this difference was not statistically significant, (χ^2 = 0.061, P = 0.806).

The prevalence of malaria wassignificantly higher among children from rural settlements (83.3%) than those in the urban settlements (59.4%), Table III.

Table III: The prevalence of malaria among children from urban and rural communities

Type of Community	Malaria Parasite Test		
	Positive N (%)	Negative N (%)	Total
Urban	133 (59.4)	91 (40.6)	224 (100)
Rural	20 (83.3)	4 (16.7)	24(100)
Total	153 (61.7)	95 (38.3)	248 (100)
χ^2	5.265		
P	0.022		

Majority of children with positive malaria parasite were of the high socioeconomic class (63.9%) while the least were of the low socioeconomic class (53.8%). This was not statistically significant, Table IV.

Table IV: Prevalence of malaria among the socioeconomic classes.

Socioeconomic class	Malaria Parasite Test		
	Positive N (%)	Negative N (%)	Total
Low	28(53.8)	24 (46.2)	52(100)
Middle	56 (63.6)	32 (36.4)	88(100)
High	69 (63.9)	39 (36.1)	108(100)
Total	153 (61.7)	95 (38.3)	248 (100)
χ^2	0.716		
P	0.424		

Of all the children studied, 116 (48.7%) had leucocytosis (Table V).

Table V: Prevalence of leucocytosis among children with malaria.

Malaria Present	**Leucocytosis Present**		
	Yes N (%)	**No N (%)**	**Total**
Yes	73 (50.3)	72 (49.7)	145(100)
No	43 (46.2)	50 (53.8)	93 (100)
Total	116 (48.7)	122 (51.3)	238 (100)
χ^2	0.383		
P	0.536		

Among the 153 febrile children who had positive malaria parasite, cough (56.9%) and vomiting (54.2%) were the commonest symptoms observed while the least was convulsion(Table VIII).

Table VIII: The distribution of symptoms found in children who had malaria

Symptoms	Frequency	Percent
Fever	153	100
Cough	97	56.4
Vomiting	83	54.2
Catarrh	74	48.4
Fast breathing	38	24.8
Headache	5	3.3
Body pain	3	2.8
Abdominal pain	19	12.4
Poor appetite	3	2.8
Watery stools	10	6.5
Convulsion	1	1.9

Anaemia and Malaria parasitaemia:

Of the 248 children recruited for the study, 238 had their Packed Cell Volume (PCV) estimation done. The PCV ranged from 7 – 48% with a mean of 29.26 $\pm$ 5.26%. 0ne hundred and seventy-eight (74.8%) had anaemia with PCV less than 33% while 60 (25.2%) did not. Four children (1.7%) had severe anaemia with PCV <15% while 174 (73.1%) had mild - moderate anaemia with PCV of 15 to< 33%. One hundred and seven (73.8%) children with positive malaria parasitewere anaemic.

Table IX: The prevalence of anaemia among children with malaria.

Malaria Present	**Anaemia Present**		
	Yes	**No**	**Total**
Yes	107(73.8)	38 (26.2)	145 100)
No	71 (76.3)	22 (23.7)	93 (100)
Total	178 (74.8)	60 (25.2)	238 (100)
χ^2	0.196		
P value	0.760		

IV. Discussion

The prevalence of malaria in febrile under five children of 61.7% observed in the present study was perceived to be high and thus suggest that malaria remains a major cause of morbidity in Port Harcourt, Nigeria. This figure is comparable to the 65%,[12]63.3%[13]62.7%,[14]and 58.2%[15] observed inAba, Bayelsa, Ogun State and Anambra State, Nigeria respectively. This prevalence was lower than the prevalence of 75.77%[16] observed in Edo State, Nigeria a study done 8 years earlier. It is however, much higher than the38%[17] 35.7%[18]observed in Jos and Kaduna in Nigeria respectively. This shows that heterogeneity in prevalence rates of malaria thus exists in different regions of Nigeria. The prevalence of malaria in other parts of Africa[19,20] and Asia[21]of 19.7%, 16% and5.9% respectively were very low.The low prevalence of malaria in the latter studies could be attributable to the fact that children with, without and history of fever were recruited whereas in the present study febrile sick children at presentation were recruited.The reasons for the varying prevalence of malaria could be due to the difference in geographic locations, seasonal variations, varying methodology and varying environmental conditions.

Febrile children between the ages of 24-35months had the highest prevalence of malaria in the present study while those aged 36-47 months and 48-60 months had the least prevalence. This is however contrary to similar studies carried out in Markurdi[22]and Maiduguri,[23]Nigeria which revealed the highest prevalence of malaria among ages49-60months. The study in Aba,[12] also revealed children of age 5 being mostly affected while the least was age 4. This difference in the prevalence of malaria in the different age groups could be attributed to the difference in the methodology. In the present study, only febrile children at presentation were recruited while in the latter studies, both well, sick and children with history of fever were recruited.

Plasmodium falciparium was the only specie isolated in the present study. This was also observed in most parts of Nigeria.[13,14,22,23]Although studies in Ghana[24] and Tanzania[25] revealed predominance of *Plasmodium falciparium*, other plasmodium species were also isolated. A study in Ethiopia however showed a predominance of *Plasmodium vivax*.[20] This difference could be due to differences in geographic location.

The present study did not show any significant difference between the sexes in malaria. This was also observed in other studies[15,17,23,25,26]

Majority of under five children in the present study had 1+ parasitaemia. This is however contrary to the study in Jos,[17] Nigeria where majority had 2+. This difference could be due to the different study population recruited; children 0-5years were recruited in the present study while the latter studyrecruited children between the ages of 1 day to 18 years. This difference in the parasitaemia could also be attributed to difference in the geographic location and varying environmental conditions.

The prevalence of malaria in the rural settlement was significantly higher than those in the urban settlements in the present study. This was also observed in Ethiopia.[20] This could be due to the fact that there could be less malaria control measures in the rural areas as compared to the urban settlements.

Malaria was observed to be commoner in the high socioeconomic class while the least was in the low socioeconomic class. This was contrary to the study in Maiduguri[23] where children with low socioeconomic class had the highest malaria prevalence and the middle class the lowest. These findings were however not statistically significant.

Apart from fever observed in all children recruited in the present study, cough, vomiting and catarrh were the commonest clinical features of malaria while the least common was convulsion.

Majority of under 5 children with positive malaria parasite had anaemia with PCV less than 33%. This was also observed in other studies.[18,13,22]This is not surprising as anaemia is one of the common complications of malaria contributing to its morbidity and mortality.

The present study also highlights the fact that malaria is not the only cause of fever as close to 40% of febrile children less than 5 years had negative blood film for malaria parasite. Thus other illnesses apart from malaria should also be sought in children presenting with fever.

In conclusion, the prevalence of malaria among febrile children in Port Harcourt is high. It is therefore important to consider the diagnosis of malaria in children presenting with fever.

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