

ENDEMICITY OF MALARIA AMONG PRIMARY SCHOOL CHILDREN IN EBONYI STATE, NIGERIA

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ABSTRACT

A study was undertaken to determine the prevalence of malaria among primary school children in Ebonyi State. The degree of malaria parasite, infection and species of the parasite isolated were used to determine the level of endemicity of the disease. Out of one thousand and two hundred (1,200) primary school children aged between 5 –16 years sampled, the prevalence rate of 40.08 % was recorded. The species of the parasite associated with the disease was Plasmodium falciparum. It was observed that the rate of malaria parasitaemia was higher in younger (aged 5-10 years) than those of older (aged 11-16 years) children. A χ^2 test conducted on the infection rate according to ages of the pupils showed significant difference between the age groups indicating that infection was age dependent ($P < 0.05$). Greater number of males (243) than females (238) were infected but the infection rate according to sex was found not to be significant and therefore not sex dependent ($P > 0.05$). Among the Local Government Areas, Ivo had the highest prevalence rate. This was followed by Ishielu and Abakaliki local government areas of Ebonyi State. The results showed that malaria is endemic in the state and a major health problem for school children. The possible effect on academic performance was discussed.

Keywords: Malaria, Prevalence, Children, Endemicity, Parasitaemia, Ebonyi State

INTRODUCTION

Malaria remains one of the most pressing health problems in the world with an estimated 300-500 million cases annually of which 90 % occurs in Africa (Tarimo *et al*, 1998). It is by far the world's most important tropical parasitic disease and kills more people than any other communicable disease except tuberculosis.

According to Wenceslaus (2000), the malaria situation in sub-Saharan Africa is grim and the disease now constitutes a leading cause of poverty in the region. This is because sub-Saharan African region has the greatest number of people exposed to malaria transmission, greatest burden of malaria morbidity and mortality in the world (WHO, 1996; Snow *et al*, 1999). The problems associated with malaria treatment in Africa had substantially increased the rates of illness and death (Peter *et al*, 2000). It is estimated in Africa that, malaria is responsible for over one million deaths of infants and young children each year (Angyo *et al*, 1996). With regard to morbidity, people in areas of high endemicity usually go through several attacks every year. Such attack episode may last for 5 - 15 days often incapacitating the victim. Furthermore, in these areas, most cases of severe malaria occur among children aged between 1 and 3 years of age.

In many countries malaria exerts an enormous toll on lives, medical cost and daily labour cost. The daily labour cost coupled with cost of treatment and high mortality associated with the disease make malaria one of the main factors retarding development in Africa (Mutero *et al*, 1998). By adversely affecting people's health, strength and productivity, malaria further marginalizes and impoverishes them (David, 2000). In Nigeria, Malaria is hyper-endemic with stable transmission (Ofofwe and Eregie, 2001).

Malaria is an infection caused by the parasite *Plasmodium*. There are four species of the parasite that infect man. These are *Plasmodium falciparum*, *vivax*, *malariae* and *P. ovale*. *P. falciparum* and *P. vivax* are the most common. Mixed infections with two or more of the *Plasmodium* species are common. *P. falciparum* is responsible for the most severe, often fatal forms of malaria. It is deeply entrenched in tropical Africa. *P. vivax* is the commonest species in America and Asia while *P. malariae* and *P. ovale* rarely occur. The disease is transmitted by female *Anopheles* mosquitoes. The infection may be acquired wherever there are human hosts carrying the parasites and sufficient Anopheline mosquitoes, together with condition of temperature and humidity that

favours the development of parasite in the mosquitoes.

The diagnosis of malaria is made with certainty on identification of the malaria parasite in blood films of patients together with other symptoms associated with the disease. Due to the large and increasing number of children in attendance at health – centres, clinics and out-patient department of hospitals in areas where the disease is endemic, it is not always possible to investigate every suspected case even where sufficient laboratory equipment, chemicals and staff are available. Thus diagnosis of clinical malaria is commonly made in children who are feverish without other overt childhood diseases, and chloroquine is often given as therapeutic measure (Azuike, 1993).

Prevalence surveys can give insights into the transmission patterns of diseases in any given area and act as useful tools for control purposes. In Ebonyi State, previous information on the prevalence of malaria parasitaemia among primary school children is lacking. This study was undertaken, therefore to determine the prevalence of malaria parasitaemia among primary school children in Ebonyi State, and as such provide baseline data for future malaria control programmes in the State.

MATERIALS AND METHODS

Study Area: The study was carried out in Ebonyi State (Figure 1). This is one of the thirty-six States of Nigeria. It is in the South - eastern part of the country and is made up of thirteen Local Government Areas which are Abakaliki, Ebonyi, Izzi, Ishielu, Ezza North, Ezza South, Ikwo, Ohaukwu, Onicha, Ohazara, Ivo, Afikpo North and Afikpo South local government areas. It has a population of about 1.8 million and a total land area of about 5935 km² which gives a population density of over 300 persons per square kilometer (Anon, 1997).

The state is located between latitudes 7°30' East and 8° 30' East and longitudes 5°40' North and 6° 45' North within the rain forest zone of Nigeria characterized by high rainfall, run-off volumes and relative humidity. The annual rainfall is over 1600 mm while the mean daily rainfall is over 150 mm. The mean daily maximum and minimum temperatures are 32°C and 25°C respectively (Anon, 1997)

The fertile and rich soils of Ebonyi State encourage large scale agriculture. Available statistics indicate that agriculture provides productive employment to over 85 % of Ebonyians (Anon, 1997). This makes agriculture

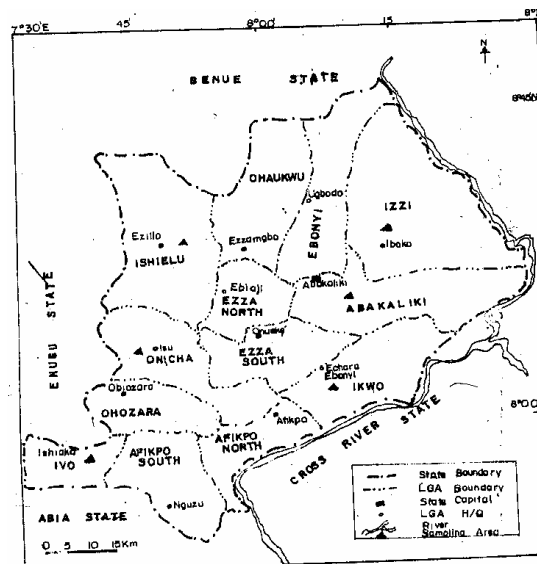


Figure 1: Map of Ebonyi State showing sampled areas

the mainstay of the state's economy. In fact Ebonyi state is regarded as one of the food basket states of the federation (Anon, 1997).

There are primary health centres in all the local Government Areas, some comprehensive health centres operated under the supervision of medical doctors and free mobile health clinic. There is a Federal Medical Centre and a State's University Teaching Hospital in the state capital. There are also strong beliefs in the use of traditional medicine in many rural areas of the state.

Selection of Schools: Three senatorial zones of the state: (Ebonyi South, Ebonyi North and Ebonyi central) were selected for study. In each senatorial zone of the State, Local Government Areas that make up the zone were listed and two out of them were selected using simple random sampling. The six Local Government Areas selected were Onicha and Ivo from Ebonyi South, Ikwo and Ishielu from Ebonyi Central and Abakaliki and Izzi from Ebonyi North Senatorial zone. Primary schools in each of the selected Local Government Area were listed and four schools were selected from each Local Government Area using random sampling technique. In the random sampling for Local Government Areas and schools, table of random numbers was used.

Blood Sample Collection and Analysis: From each of the twenty-four schools selected, 50 pupils were sampled using lottery method of sampling. In this method, papers written "yes" and "no" were folded neatly and displayed to the pupils to pick. The lottery papers were

usually counted for the expected number of "Yes" donors in each school. Those that picked yes were separated from those that picked "No". At the end of this exercise, the age, sex, weight and height of the pupils that picked yes were recorded. A total of 1,200 pupils aged between 5-16 years were sampled.

Venous blood was collected from each pupil using disposable needles and syringes. Thick and thin blood films were smeared on the slides for malaria parasite (mp) and species identification. For mp, the smears were stained with Giemsa stain while those for species identification were stained with Leishman's stain. Slides were examined under the binocular light microscope using x 100 objective oil - immersion. The presence of malaria parasites, the degree of infection and the species of parasite were identified. (Shute and Maryon, 1966).

The intensity of parasitaemia was measured per microscopic field. Up to 5 microscopic fields were examined and the number of parasites per field counted. The average number of parasites per five microscopic fields was then taken.

Statistical Analysis: The data were analyzed statistically using chi-square (χ^2) test.

RESULTS

A total of 1,200 primary school children aged between 5 to 16 years were examined for malaria parasite. Out of this number, 481 (40.08 %) were infected. The malaria parasite isolated was *Plasmodium falciparum*.

Malaria Parasitaemia in Primary Schools:

The highest prevalence rate of 52 % was recorded in Central School, Okue in Ivo L.G.A and Eketube Enyigba Community School, Abakaliki L. G. A. These two schools are located in the rural villages of the state. These were followed by Central School, Ntezi and Ndibulofia Ominyi Community School, Izzi with 50 % prevalence rates. Other values recorded were Agalegu Amachi Community School in Abakaliki with 48 %, Ataragu Amagu community Primary School, Ivo, with 46 % etc. The least infection rate of 22% was recorded in Community Central School Amanator Isu in Onicha L.G.A (Table 1)

Gender, Age and Malaria Parasitaemia in Ebonyi State: The highest prevalence of 231 (47.05 %) was recorded in children between 5 - 7 years. This was followed by 179 (39.08 %)

recorded in the age class 8 - 10 years. The least prevalence of 3 (17.65 %) was recorded in 14 - 16 years class. A chi-square test carried on the data to know if the infection was age dependent was statistically significant ($P < 0.05$). It can be observed from Table 2 that malaria parasitaemia was higher in children of younger age groups than in those of older age groups. Table 2 also highlights the prevalence of malaria parasitaemia due to sex. Out of 591 males and 609 females examined, 243 males and 238 females were infected. This difference in infection according to sex was not statistically significant ($P > 0.05$). In the male and female, the highest prevalence was recorded in the 5-7 years age class, while the least prevalence was recorded in the 14-16 years age class. The parasitaemia in both sexes followed a similar pattern.

Intensity of Infections: The intensity in each age group is shown in table 3. In all the age groups sampled, children under the age class 8 - 10 years had the highest intensity of 11.59. Those under the age class 5 - 7 had 11.56 while the least intensity of infection was recorded in the age class 14 - 16 years.

DISCUSSION

The parasite rate of 40.08 % in this study was quite high, indicating a high degree of malaria parasitaemia among primary school children in Ebonyi State. The species of malaria parasite was *Plasmodium falciparum*. The malaria infection in the state is severe because *Plasmodium falciparum* causes complicated form of malaria especially in young children.

Several studies have shown high parasite rates among primary school children in Nigeria. Salako *et al*, (1990) reported a parasite rate of 74 % in Nigeria while Ademowo *et al*, (1995) reported a lower percentage of 27 % among school children from a rural village in Western Nigeria. Furthermore, Adegemo *et al*, (1999) recorded a parasitaemic rate of 80 % among primary school children in malaria endemic village of Erunmu in South- West Nigeria. The endemicity is high in rural than urban communities of Ebonyi State. For instance, the highest parasitaemic rate of 52 % was recorded in two rural schools of Okue and Eketube. This result suggests that the rural environment offers adequate conditions for breeding of mosquitoes. The socio-economic status of parents in rural communities also helps in the transmission of malaria.

Table 1: School by school malaria parasitaemic rates among primary school children in Ebonyi State

LGA	School	Number Examined	Number Infected	Infection Rate (%)
Ivo	Iyioji Comm. Pri. School, Akaeze.	50	19	38
"	Ndiobasi Comm. Pri. School, Ishiagu.	50	21	42
"	Central School, Okue.	"	26	52
"	Ataragu Amagu Comm. Pri. School.	"	23	46
Abakaliki	Eketube Enyigba Comm. School.	"	26	52
"	Agalegu Amachi Comm. School.	"	24	48
"	EBSU Staff Pri. Sch., Abakaliki	"	18	36
"	Ezikwo Rd Pri. School, Azuiyokwu.	"	18	36
Izzi	Ndibuolfia Ominyi Comm. School, Izzi	"	25	59
"	Ezzainymagu Comm. School Ndubia	"	21	42
"	Agbaja Central School, Izzi	"	20	40
"	Onuenyim Comm. School, Izzi	"	17	34
Ikwo	Comm. Pri. Sch. Agubia Ikwo	"	14	28
"	Urban Pri. Sch. Ndufu Echara	"	13	26
"	Comm. Cent. Sch. Echialike Ikwo	"	22	44
"	Comm. Pri. Sch. Ndiagu Amagu	"	22	44
Ishielu	Comm. Pri. Sch. Ezillo	"	19	38
"	Central School, Ntezi	"	25	50
"	Central School Umuhuali	"	20	40
"	Comm. Cent. Sch. Ohofia Agba	"	22	44
Onicha	Amokpara Comm. School, Oshiri	"	22	44
"	Amanator Onicha Comm. Pri. Sch.	"	20	40
"	Comm. Cent. Sch. Anamnator Isu.	"	11	22
"	Isuachara pri. School, Isu	"	13	36
Total		1,200	481	40.08

Table 2: Sex and age – related malaria parasitaemia among primary school children in Ebonyi State

Age Class (Years)	Male		Female		Total No Exam. In each class	Total Number & (%) infected in each class
	Number Examined	No & (%) infected	Number Examined	No & (%) infected		
5-7	248	117(47.18)	243	114(46.91)	491	231(47.05)
8-10	223	88(39.46)	235	91.(38.72)	458	179 (39.08)
11-13	115	37 (32.07)	119	31(26.05)	234	68 (29.06)
14-16	5	1 (20)	12	2 (16.67)	17	3 (17.65)
Total	591	243 (41.12)	609	238 (39.08)	1200	481 (40.08)

Table 3: Age-related intensity of parasitaemia

Age class (years)	Number of Parasites	Number of pupils infected	Intensity
5-7	2670	231	11.56
8-10	2075	179	11.59
11-13	760	68	11.18
14-16	30	3	10.00
Total	5535	481	11.51

Most of these parents cannot afford screening of their homes, insecticides and treated bed nets for mosquito control. Illiteracy and ethnic beliefs among the rural dwellers have further encouraged the transmission of malaria parasites. In some cases, the infected children are not fully treated with the correct doses of antimalaria drugs. Among the age groups sampled, children between the 5 - 7 years age group had the highest rate of parasitaemia and thus vulnerable to malaria attacks due to the fact that their immunity to malaria parasite had not been fully developed.

Angyo *et al.*, (1996) in a similar study at Jos Nigeria reported a parasite rate of 70.5 % among children of the same age group. In this study, children of 8-10 years age group had parasitaemic rate of 39.08 %, those of 11- 13 years age class had 29.06 % while those of 14 -16 years age class had 17.65 % parasitaemic rates indicating that the parasitaemic rate decreases with increasing age. Older children are therefore less susceptible to malaria attack because they seem to have developed their own active immunity against malaria parasite (Angyo, *et al.* 1996).

Immunity has important effects on the transmission of the disease by reducing the level of parasitaemia after infective bites and increasing ten folds the rate of clearance of parasitaemia (Ademowo, 1995). With repeated infections in areas of intense transmission, the level at which parasitaemia stabilizes falls and the threshold for symptoms rises. Consequently, parasitaemia becomes asymptomatic and the risks of unrestrained parasitic multiplication to lethal

burdens decline (Ademowo, 1995). Numerically, more males than females were infected despite the fact that more females than males were examined in the present study. This is comparable to the report of Okeahialam *et al*, (1972) and Uzoegwu and Onwurah (2003) for children and adults respectively. However, in this present study, the difference in males and females infected with malaria parasite was not statistically significant and therefore infection was not dependent on sex.

The intensity of parasitaemia was high. The fact that children with such parasite densities were healthy and able to go to school means that malaria is well tolerated in Ebonyi state just as in many other parts of the sub-Saharan Africa. This is in consonance with the report of Ogunrin, (2001) who noted that children in endemic areas might tolerate very high levels of parasitaemia without severe symptoms.

Conclusion: Efforts must be put up to undertake a massive attack on the parasite and its vectors in the state because it is evident that malaria parasitaemia is widespread among younger children. If the situation is not checked, more children will be vulnerable to malaria attack and soon most of the debilitating effects of malaria will surface. Therefore concrete steps should be taken quickly to avert an epidemic of malaria especially among children of school going age. Apart from chemotherapeutic control of malaria in the state, health education focusing on malaria control should be intensified both at school and at the community level to ginger up community participatory activities aimed at sustainable malaria control.

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