Research Paper

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Malaria Parasitaemia Among Residents of Isu Community, Onicha Local Government Area of Ebonyi State.

Biology

KEYWORDS : Malaria, parasitaemia, residents, prevalence, community.

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ABSTRACT

Background : *Malaria is a global health problem and its prevalent rates have been on the increase in recent years. In rural settlements, poor access to healthcare facilities, poor malaria control awareness, low literacy level, among other factors, encourage malaria spread and pose major challenges to the success of antimalarial campaign. Consequently, this study, for the first time, investigated the prevalence and intensity of malaria parasitaemia in one of the rural communities in Onicha Local Government Area of Ebonyi State, Southeast Nigeria, Isu Community.*

Methodology: *This study investigated the prevalence of malaria among individuals in selected villages of Isu community in Onicha Local Government Area of Ebonyi State. A two-stage sampling design was adopted. The first stage involved selection of villages as Primary Sampling Units (PSUs) with three villages comprising Isuachara, Agbabor and Mgbala-ukwu, out of the seven villages selected randomly. In the second stage, a simple random sample of 240 individuals was taken from the three villages selected, using 95% confidence level and a margin of error of 6.32% with a standard deviation of 0.5. Thick blood smears of venous blood stained with Giemsa were examined microscopically for malaria parasitaemia (MP) and its intensity.*

Results: *The overall prevalence and parasite intensity in the study population were 37.5% (n = 90) and 2361+857.55p/μL respectively. Most of the infected individuals had mild infection. There was no difference in infection rate among the sexes. Though the prevalence was higher among younger age groups, the differences between these age groups were not statistically significant (P>0.05).*

Conclusion: *Regardless of the endemicity of malaria in the study area, the prevalence rate and intensity of malaria parasitaemia remained mild, indicating high tolerance of the disease. Sex did not determine the trend of malaria parasite infection in this study, while there was decline in prevalence of the infection with increase in age. Thus, this study has increased our understanding of the contributions of malaria to the public health burden of the area, bringing to limelight the background information about malaria prevalence in the area.*

Introduction

Malaria remains one of the most pressing global public health problems with an estimated 300-500 million cases annually, of which 90% occurs in Africa (Tarimo *et al.*,1998). It is the most important infection of great global public health concern and by far the world's most important tropical parasitic disease that kills more people than any other communicable disease except tuberculosis (Yah *et al.*, 2005). According to WHO (2000) about 500 million people are affected by malaria at any time and approximately 2 million of them mostly children die each year. The infection may be acquired wherever there are human hosts carrying the parasites and a sufficiency of suitable *Anopheles* mosquitoes together with conditions of temperature and humidity which favour the development of the parasite in the mosquitoes. The malaria situation in sub-Saharan Africa is grim and the disease constitutes a leading cause of poverty in the region (Kilama, 2000). This is because African region has the greatest number of people exposed to stable malaria transmission and the greatest burden of malaria morbidity and mortality in the world (Snow *et al.*, 1999). The problems associated with malaria treatment in Africa and drug resistance also increase the rates of severe illness and death substantially (Peter *et al.*, 2000).

Although accurate figures are difficult to come by, it is estimated that in Africa alone malaria is responsible for one million death of infants and young children each year (Angyo*et al.*, 1996). With regards to morbidity, people in areas of high endemicity usually go through several attacks every year and each attack may last about 5 to 15 days often incapacitating the victim. In highly endemic areas, most cases of severe malaria occur among children aged six months and five years with the highest mortality in those between one and three years of age. Another risk group in endemic areas are pregnant women who become susceptible to severe infection due to diminished cellular and humoral immunity during pregnancy (Uneke, 2008). This is because pregnancy is usually accompanied by physiological and immunological changes that modify both resistance to infection and the pathogenesis of the disease.

The four species of the parasite that infect man are *Plasmodium falciparum, P. vivax, P. malariae*and *P. ovale. Plasmodium falciparum* and *P. vivax* are the most common in the tropics but mixed infection with two or more of the *Plasmodium* species is common. Blood stage cycle of *Plasmodium falciparum* is responsible for most cases of malaria and for the most severe, often fatal forms of the disease. It has varied modes of presentation with occasional life threatening complications. It is said to be complicated when any one or more of the clinical features such as cerebral malaria, jaundice, renal failure, pulmonary oedema, hypoglycemia, circulatory collapse, spontaneous bleeding, repeated generalized convulsion and acidosis are manifested (Bag *et al.*,1994). Severe falciparum malaria remains an important cause of mortality in the tropical world with an annual mortality of 1-2.7 million people and a mortality rate as high as 15-30%, despite effective anti-malarial treatment (WHO, 1993).

Until date, there is paucity of information on the prevalence malaria in the study area. Our objective was therefore to determine the prevalence as well as intensity of malaria parasiteamia in the area as part of strategies towards fashioning out control programmes.

Materials and Methods

Study Area

The study was a community based cross sectional survey conducted atIsuOkoma Community in Onicha Local Government Area of Ebonyi State, South-eastern Nigeria (see Figure 1). The villages that make up Isu community include Agbabor, Isuacha-

ra, Mgbaleze, Amanator, Uminiko, MgbalaUkwu-ukwu and Obeagu (see Figure 1). It is bounded to the West by Nkanu in Enugu State, to the South by Ohaozara, to the North by Ishielu and to the East by Ezza North Local Government Areas ofEbonyi State. It is about 120-180 meters above sea level and covers a land area of approximately 51km^2. The study area is defined by longitude 8°6^1 6" E and latitude 6° 22^1 28" N. The vegetation is characteristic of derived savannah with high rainfall intensity, high run-off volumes and high relative humidity and an average rainfall of about 1600mm-2000mm per annum. The mean daily maximum and minimum temperatures are 32°C and 25°C respectively. The residents are prominently farmers but also engage in trading and crafts as well as public and civil services. A government owned General Hospital is the largest health institution located in the area. There are also some comprehensive health centres that operate under the supervision of medical doctors.

Figure 1: Map of Isu showing the selected villages

Ethical consideration: Clearance was obtained from the Ethical Committee of the Federal Medical Centre Abakaliki, Ebonyi State. Informed consent of the village heads of the villages and those of the subjects involved in the research were sort and permission granted before the study commenced.

Sampling of Study Participants

From seven villages that make up IsuOkoma community, a multi-stage sampling technique was used to select three villages. A two-stage sampling design was adopted in which selection of villages constituted the first stage/Primary Sampling Units (PSUs) where three (3) villages (Isuachara, Agbabor and Mgbala-ukwu) out of the seven villages were selected using simple random sampling. In the second stage, a simple random sample of 240 individuals was taken from the three villages selected, using 95% confidence level and a margin of error of 6.32% with a standard deviation of 0.5. One hundred and seven (107) males and one hundred and thirty-three (133) females of ages not less than three years were involved in the study. People that were currently taking anti-malaria drugs and those that had treated malaria for the last one month were excluded from the study.

Laboratory Investigations

Venous blood was obtained from each of the 240 participants and thick smear was made on microscope slide, dried and stained with Giemsa stain in-situ and taken to the laboratory to be examined microscopically for malaria parasitaemia (MP) and intensity using x100 objectives with oil immersion.

Estimation of Parasite Density

Parasitaemia was quantified in thick films by counting parasites against white blood cells (Cheesbrough, 1999) while the intensity of parasitaemia was measured per high power field or microscopic field. Up to 5-10 high power fields were examined before intensity was confirmed and the number of parasites per field noted per sample. Severity of parasitaemia was assessed as parasitic index (P1) and expressed as scanty, mild and severe (+, ++ and +++) (Melita*et al.*, 2001).

Statistical Analysis

Data analyses were done statistically using Chi-square and descriptive statistics. Statistical significance was considered at p values less than 0.05 ($p < 0.05$).

RESULTS

Overall prevalence of malaria parasitaemia

A total of 240 individuals were involved in this study andout of this number, 90(37.50%) were positive for malaria parasite while 150(62.50%) were negative. Of the 240 individuals examined, 107(44.58%) were males while 133(55.42%) were females. The mean age ± standard deviation is 30.19±14.69 years. Probability 0.05 shows significant difference while P >0.05 shows no significant difference.The prevalence of infection by sex shows that equal number of males and females were positive for malaria parasite (See Table 1). Among the ages, individuals in the age range 10 – 16 years had the highest prevalence of 14(56.0%) followed by the age range 24-30 years 27(48.2%) while no individual was positive at the range 66 – 72 years (See Table 1). However, the differences between the age groups were not statistically significant (P>0.05).

Intensity of malaria parasitaemia among malaria positive individuals

Among the 90 individuals positive for malaria,70 (77.8%) had mild infection, 13(14.4%) had moderate infection while 7(7.8%) had severe infection (See Table 2). With regards to sex, 35(50.0%) males had mild infections while 8(61.5%) and 2(28.6%) males had moderate and severe infections respectively. On the other hand, 35(50.0%), 5(38.5%) and 5(71.4%) females had mild, moderate and severe infection respectively (See Table 2). Individuals in the age groups, 52 – 58 years, had only mild infection 4(100.0%) while moderate infection was highest among individuals in 38 – 44 years age group and the rate of severe infection was highest among individuals in 3 – 9 years age group 1(50.0%).

Mean parasite intensity among malaria positive individuals

The mean parasite intensity of the 90 participants that tested positive for malaria parasite is 2361.89±857.55p/µ with 1854±1066.59p/µ for positive males and 2869.11±1351.19p/µ for positive females (See Table 3). The mean parasite intensity is highest in individuals in 45 – 51 years age group (7876.67±7307.73p/µ) but least in the age group 52 – 58 years (165.00±26.30p/µ) (See Table 3). The mean malaria parasite intensity is highest in individuals that have severe infection, followed by those with moderate infections and least in individuals that have mild infections (See Table 4).

Table 1: Prevalence of malaria parasite by sex and age among study population

	Number examined	
Overall	240	90(37.50)
Sex		
Male	107	45(42.1)
Female	133	45(33.8)
X^2	1.710	
Significance or P value	0.228^{ns}	

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Total	240	90(37.5)
Age(years)		
3-9	13	2(15.4
10-16	25	14(56.0)
17-23	49	18(36.7)
24-30	56	27(48.2)
31-37	34	12(35.3)
38-44	20	4(20.0)
45-51	18	6(33.3)
52-58	13	4(30.8)
59-65	7	3(42.9)
66-72	5	0(0)
Total	240	90(37.5)

x^2 = 15.27

P value = 0.084

Table 2: Overall, intensity of malaria parasite by age and sex

	No of individuals infected	No of individual with MILD infection n(%)	No of individuals with Moderate infection n(%)	No of individuals with Severe infection n(%)
Overall	90	70(77.8)	13(14.4)	7(7.8)
Sex				
Male	45	35(50.0)	8(61.5)	2(28.6)
Female	45	35(50.0)	5(38.5)	5(71.4)
Total	90	70(77.78)	13(14.4)	7(7.8)
Age(years)				
3-9	2	1(50.0)	0(0)	1(50.0)
10-16	14	10(71.4)	2(14.3)	2(14.3)
17-23	18	15(83.3)	2(11.1)	1(5.6)
24-30	27	25(92.6)	1(3.7)	1(3.7)
31-37	12	8(66.7)	4(33.3)	0(0)
38-44	4	1(25.0)	2(50.0)	1(25.0)
45-51	6	4(66.7)	1(16.7)	1(16.7)
52-58	4	4(100.0)	0(0)	0(0)
59-65	3	2(66.7)	1(33.3)	0(0)
Total	90	70(77.8)	13(14.4)	7(7.8)

Table 3: Overall, mean malaria parasite intensity of malaria positive individuals by age and sex

	Number positive	Mean ± S.E(p/μ)
Overall	90	2361.89±857.55
Male	45	1854.671066.59
Female	45	2869.11±1351.19
P value		0.557^{ns}
Total	90	
Age(years)		
3-9	2	$5320.0±5080.00^{ab}$
10-16	14	$6074.27±4118.971^{a}$
17-23	18	$1567.78±1116.024^{ab}$
24-30	27	$324.07±63.79^{b}$
31-37	12	$525.00±160.89^{ab}$
38-44	4	$5795.00±3272.92^{ab}$
45-51	6	$7876.67±7307.73^{a}$
52-58	4	$165.00±26.30^{ab}$
59-65	3	$840.00±680.00^{ab}$
Total	90	

In age groups, mean parasite intensity with different alphabet show significant difference (P<0.05).

In sex, 'ns' = no significant difference.

Table 4: Comparison of mean parasite intensity of malaria infected individuals.

Intensity of malaria parasite	Number of individuals infected	
Mild	70	$246.43±11.56^{b}$
Moderate	13	$2040.00±704.78^{b}$
Severe	7	$2.41E4±7213.73^{a}$
Total	90	

Mean parasite densities with different alphabet show significant difference (P<0.05).

DISCUSSION

The result of this study showed that the overall prevalence of *Plasmodium* parasite was 37.50% (n=90). This indicated that malaria is endemic in the area as it is in every other part of the country. The finding agreed with several reports from both within and outside the country (Nwaorgu and Orajiaka, 2011 and Kalu *et al*., 2012). These researchers all reported high prevalent rates in their respective studies. This also agreed with Ukpai and Ajoku (2001) that malaria infection is holo-endemic in Nigeria and widespread in tropical and subtropical regions of Africa. These high rates can be one of the reasons for high mortality rates in these areas especially among children and pregnant women. Transmission may be achieved where there are human hosts carrying the parasites and sufficient *Anopheles* mosquitoes, together with conditions of temperature and humidity that favour the development of parasites in the mosquitoes. Such factors are readily available in the tropics, hence, the high prevalent rates in these regions. However, the prevalence of malaria parasitaemia in this present study is much lower than that of (Adeyemo*et al.,* 1999) who reported 80% parasitaemia. The wide difference between the two results may be attributed to the increased awareness about the infection, increased use of insecticide treated nets and similar measures in the prevention of malaria.

Among the sexes, the study showed that there was no sex difference in infection as same number and percentage of both sexes were infected. This disagreed with studies by Ani, (2004), Nwaorgu and Orajiaka (2011) and Okafor and Oko-Ose, (2012). All these researchers reported higher prevalence in males than females. This may be due to the fact that the males expose themselves more than the females especially during hot weather. At such times, they tend to move about bare-bodied and expose themselves more to mosquito bites than the females who cover themselves for decency sake. Krogstad, (1996) also attributed such sex differences in malaria infection to genetic and hormonal factors. However, in most of the studies that reported sex differences, such differences were not statistically significant. The present study is, however, in agreement with the findings of Mbanugo and Ejim (2000) who reported that sex did not affect the prevalence of malaria.

In the present study, the age range 10-16 years had the highest prevalent rate of 56.0% followed by 24-30 years while the age range 66-72 years had no infection. This is also similar to the findings of Aribodor*et al*., (2003) and Nwaorgu and Orajiaka, (2011) which reported decline in prevalence by age. This also agreed with the report of Ani (2004) that children in the first decade of life had the highest prevalence of malaria. The most likely reason for decline in prevalence by age is that older individuals may have developed anti-malaria immunity after many years of continuous expose to mosquito bites and malaria infection. Malaria being a protozoan infection induces immunity to reinfection. 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).

Analysis of data on the intensity of malaria parasite this study revealed that majority of the infected individuals had mild infection. For example, 70 (77.8%) out of 90 positive individuals had mild infection (Table 2). Furthermore, the mean parasite intensity of the 90 positive individuals is 2361.89 ± 857.55p/μl. This shows that majority of the infected individuals had low parasite densities. This could be attributed to natural immunity derived by these individuals from persistent attacks of malaria. This is in agreement with previous findings of Ogunrin (2001) who stated

that in hyper-endemic areas, the disease is mild and asymptomatic especially in the adults. Therefore age and nutritional status of the host may represent natural or acquired resistance and hence can play a role in the severity of the disease produced.

CONCLUSIONS

Malaria prevalence was found to be high in the study area as in every other part of the country in particular and the tropical region in general. Sex did not determine the trend of malaria parasite infection in this study, while there was decline in prevalence of the infection with increase in age. Greater percentage of the infected individuals had mild infection which showed that malaria is both endemic and well tolerated in the area.

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