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Prevalence of Malaria Parasite among Asymptomatic and Symptomatic Students of Federal University of Technology, Akure, Ondo State

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Abstract

This study was carried out to determine the prevalence of malaria parasites infection among asymptomatic and symptomatic students of the Federal University of Technology, Akure, Nigeria. A total of 300 students (150 each for the two categories of students), 155(51.67%) males and 145(48.33%) females; age range: <20-30 years were recruited for the study after informed consent. Both thick and thin films were made and stained using parasitological standard procedures after collection of blood samples from the students. Analysis of the result showed that 241(80.33%) of the subjects had malaria parasites, 80(53.3%) and 141(94.0%) prevalence for both categories respectively. Highest prevalence (59.0%) and (94.4%) was recorded among the males than the females (46.3%) and (93.6%) respectively for asymptomatic and symptomatic students. Age distribution showed the highest prevalence among subjects of age range <20 years in the two categories (68.4% and 100%) while the least prevalence of 42.9%, 76.9% and 48.3% were recorded among subjects of age range 25-27. According to Body index mass, the result showed that 55.0% of the infection occurred among underweight and 96.3% for normal weight for asymptomatic and symptomatic subjects with a significant difference (p=0.01). On the use of Insecticide Treated Net for both categories of students, those using nets had the higher prevalence of malaria infection 61.9% and 94.4% respectively. Asymptomatic malaria was a risk factor among the students therefore measures to reduce the prevalence are advocated.

Keywords: Asymptomatic; Symptomatic; Malaria parasite; Prevalence; Students

Introduction

Malaria is a mosquito-borne infection of human and animals caused by genus Plasmodium. Over 2 million febrile episodes and one million deaths are caused by malaria in sub-Saharan Africa [1]. Five species of Plasmodium can infect and transmit malaria to humans and majority of death are caused by *P falciparum*, *P vivax*, *P ovale*, *P malaria* and *P knowlesi* [2]. Plasmodium infection remains an important cause of mortality and morbidity in many parts of the world and it could have adverse effect on the population, both on health and socio-economic attitudes [3].

The WHO reports that, there are about 300-500 million incidences of malaria causing 2-3 million deaths each year in the tropical and subtropical regions of the world. About 90% of these deaths occur in Sub-Saharan Africa. This could be as a result of *P. falciparum* which is the most dangerous of the four parasites being the main cause of infections in this region and also the main malaria transmitting vector (Anopheles gambiae) being spread widely and very difficult to control [4]. Regardless of the soaring malaria incidence in endemic regions, a certain group of individuals seem to have more immunity to malaria than others. This could be accounted by several factors including haemoglobin vari- ants, ABO blood group system and enzyme action, among others [5].

Infection with Plasmodium falciparum has a wide spectrum of manifestations that are roughly classified into three clinical groups: asymptomatic infection, mild malaria and severe malaria. In malaria endemic areas, a large proportion of the populace harbour parasites without presenting signs of clinical malaria and are considered asymptomatic cases [6]. Asymptomatic carriers do not usually seek treatment for their infection and therefore constitute a reservoir of parasites available for transmission by Anopheles mosquitoes [7]. They were of the opinion that it may represent a mode of entry to symptomatic malaria, as well as transmission, especially in young children [8].

Despite recent progress leading to the reduction of malaria morbidity and mortality, there are both empirical and theoretical evidence that the current suite of interventions is insufficient to eliminate malaria from those areas in Sub-Saharan Africa with high levels of malaria transmission. In order to achieve reduced morbidity and mortality resulting from malaria, the infection must be recognized quickly so that patients are treated promptly. The clinical diagnosis of malaria is usually based on the patient's symptoms, which include fever, chills, sweats, headaches, muscle pains, nausea, and vomiting, which are also associated with other diseases. This makes early diagnosis difficult, leading to delays in the commencement of treatment [9].

The World Health Organization (WHO) recommends that the treatment of malaria should be based on a laboratory-confirmed diagnosis, with the exception of children less than 5 years of age in areas of high transmission in whom treatment may be provided on the basis of a clinical diagnosis. However, the high prevalence of asymptomatic infections and lack of resources such as microscopes and trained microscopists in highly endemic areas have led peripheral health facilities to use "presumptive treatment." Children who suffer from a fever that does not have any obvious cause are presumed to have malaria and are treated for that disease. Though this allows the rapid treatment of a potentially fatal disease, it can lead to incorrect diagnoses and unnecessary use of antimalarial drugs [10].

Materials and Methods

Study Area

The study was carried out at the Health centre of the Federal University of Technology, Akure. Akure, the capital city of Ondo State, South Western Nigeria. It is located on Longitude and Latitude with two distinct seasons, namely dry and wet seasons. The temperature ranges between 210c- 280C and the vegetation is tropical rainforest.

Study Population

Three Hundred (300) students of the University who were the Health center attendees were recruited for this study between February to September, 2015.They consisted of 155 males and 145 females with their age ranging from 16 to 30 years. The weight and height of each participant was measured and used to determine the body mass index (BMI). The BMI was used to categorize each student into underweight (<18kg/m^2), normal weight (18-24.9kg/m^2) and overweight (> 25kg/m^2) [11].

Ethical Clearance

Approval for the study was given by the ethical committee of the University and the Chief Medical Director of the Health Centre. Informed consent of individual student was obtained and were asked orally if they were using insecticide treated net (ITN) with affirmative Yes or No before the collection of specimen.

Specimen Collection and Processing

5 millilitres of blood was collected from each student and dispensed into ethylene diamine tetra acetic acid (EDTA) bottle and mixed. Plasmodium infection was diagnosed through the examination of a Giemsa stained thick blood film. Thick blood films made from each of the blood sample and air dried. Slides were stained with 3% Giemsa stain for 30 minutes, rinsed with tap water and allowed to dry. Slides were examined for malaria parasites by microscope with an oil immersion objective lens.

Data Analysis

Data obtained were analysed using Chi square and Statistical significance was set at p<0.05.

Results

A total of 221(73.7%) were infected with malaria parasite out of the 300 students sampled. From the 150 Asymptomatic subjects sampled, 80 (53.3%) were positive for malaria parasite while 141 (94.0%) were positive for the Symptomatic students (Figure 1).

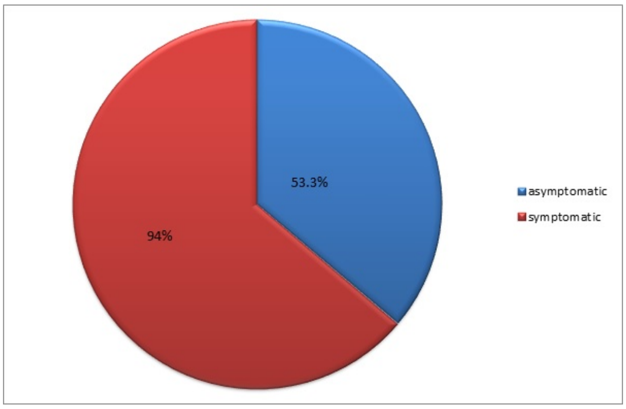

Figure 1: Percentage Distribution of asymptomatic and symptomatic malaria.

The prevalence of infection in relation to gender shows that for asymptomatic and symptomatic subjects males 49 (59.0%) and 68(94.4%) were more infected than the females 31(46.3%) and 73(93.6%) respectively.

However there was no significant difference (X^2 = 0.62) between the sex of the asymptomatic and symptomatic students (Table 1).

Table 1: Frequency and Distribution of asymptomatic and symptomatic malaria in relation to Gender.

Asymptomatic			**Symptomatic**			X^2 = 0.62
Gender	**No Tested**	**No Positive (%)**	**Gender**	**No Tested**	**No Positive (%)**	
Male	83	49(59.0)	Male	72	68(94.4)	
Female	67	31(46.3)	Female	78	73(93.6)	
Total	150	80		150	141	
X^2 = 0.39			X^2 = 0.97			

Table 2 shows the prevalence of infection in relation to age, age group <20 recorded the highest positive cases (68.4%) while the least was in age group 25-27 for asymptomatic students. Among the symptomatic students, almost all the age groups recorded high prevalence while age group 25-27 also recorded the least. Between the two groups, there was no significant difference in the age groups (X^2 = 0.60).

Table 2: Frequency and Distribution of asymptomatic and symptomatic malaria in relation to Age.

Asymptomatic			**Symptomatic**			X^2 = 0.60
Age	**No Tested**	**No Positive (%)**		**No Tested**	**No Positive (%)**	
< 20	38	26(68.4)		30	30(100)	
20-22	42	21(50.0)		44	42(95.4)	
23-25	29	13(44.8)		31	30(96.8)	
25-27	28	12(42.9)		26	20(76.9)	
27-29	10	6(60.0)		13	13(100)	
> 29	3	3(100)		6	6(100)	
Total	150	80		150		
X^2 = 0.80			X^2 = 0.99			

Table 3 shows that the prevalence of asymptomatic malaria among students who were overweight (40%) was lower than those for normal weight (53.7%) and underweight (55.5%) and there was no significant difference (X^2 = 0.87). For symptomatic malaria subjects, normal weight students (96.3%) were more than the overweight (75.0%). Also, there was no significant difference (X^2 = 0.94). However, there was a significant difference between the body mass index of asymptomatic and symptomatic students (X^2= 0.01).

Table 3: The Effects of Body mass index on Asymptomatic and Symptomatic Malaria.

Asymptomatic			**Symptomatic**			X^2 = 0.01
Weight	**No. Tested**	**No. Positive (%)**	**Weight**	**No. Tested**	**No. Positive (%)**	
Under weight	60	33(55.0)	Under weight	66	61(43.3)	
Normal weight	80	43(53.8)	Normal weight	80	77(96.3)	
Over weight	10	4(40.0)	Over weight	4	3(75.0)	
Total	150	80		150	141	
X^2 = 0.87			X^2 = 0.94			

Out of the 150 asymptomatic students, 42.0% were using insecticide treated net (ITN) while 58.0% were not using, but the former were more positive (61.9%) against the latter (47.1%) to malaria. From 150 symptomatic subjects, 47.3% said yes to ITN while 52.7% said no. The students using ITN recorded higher prevalence (94.4%) against (93.7%) of those not using ITN. There was no significant difference (X^2 = 0.86) (Table 4).

Table 4: Relationship between usage of Insecticide Treated Net and Asymptomatic and Symptomatic Malaria.

Asymptomatic			**Symptomatic**			X^2 = 0.86
	No Tested	**No Positive (%)**	**Response**	**No Tested**	**No Positive (%)**	
Response						
Yes	63	39(61.9)	Yes	71	67(94.4)	
No	87	41(47.1)	No	79	74(93.7)	
Total	150	80		150	141	
X^2 = 0.32			X^2 = 0.96			

Discussion

The distribution and efficiency of the insect vectors, climatic and environmental factors, acquired immunity and the behavior of the human population are some of the variables in malaria infection [12]. A prevalence of 80.3% of both asymptomatic and symptomatic malaria among the students was observed in the study. In a similar study conducted among first year students of Nnamdi Azikiwe University, Awka, Southeastern Nigeria, a prevalence of 80.0% was reported [13]. These findings further confirm the endemicity of this infection even among the students, population. Despite the advances in the understanding of the pathogenic and clinical aspects of malaria, it is not well known why some people tolerate malaria infection with few or no symptoms whereas others are severely affected [14]. In this study, 53.3% of the150 students of the Federal University of Technology, Akure who were tested had malaria parasites yet they are asymptomatic. The prevalence recorded in asymptomatic subjects is higher than the previous results of 50.5% and 33.5% in Ipogun, Ondo State and Benin City respectively [12,15]. Bites of the same mosquito species or the same strain of plasmodium can create more chance of infection.

The result also shows a higher prevalence (59.0%) and (94.4%) among the male students than the female students with prevalence of 42.9% and 93.6% respectively in both asymptomatic and symptomatic students, although there was no significant difference (p>0.05). The higher prevalence (59.0%) observed for the asymptomatic males in this study is in disagreement with findings of [13,16] but in agreement with the findings of [17-19] who found higher prevalence among the males than the females. However, there appears to be no scientific evidence linking malaria prevalence to gender [20].

The highest prevalence of malaria for the two categories was in age group <20 years while the least prevalence was among age group 25-27 years. This result agrees with the finding of [21] that parasite density falls as age increases suggesting age-dependent immunity to Plasmodium among adults.

In this study, Body Index Mass (BIM) did not significantly (P=0.87) affect the prevalence of asymptomatic and symptomatic (P=0.94). However, there is a significant difference (P= 0.01) between BIM in the two categories of students. Excess weight contributes to several health related complications which may include diabetes, cancers, kidney disease and hypertension [11]. It is indicated that obesity resulted in decreased immune counts and functions [22].

The use of Insecticide Treated Nets (ITNs) did not affect the prevalence of both types of malaria. For asymptomatic students using ITNs, 39 (61.9%) were positive for malaria parasites while for symptomatic students, 67 (94.4%) were also positive. There was no significant difference ($p > 0.05$). Low, infrequent and improper use of ITNs in a malaria endemic community may have contributed to its less efficacy in this study as previously reported by [23, 24]. Detection of the parasite in asymptomatic subjects could be as a result of acquired immunity in the subjects due to repeated exposure to mosquito bites. The subjects included in this study are students who must have come from different environments ranging from urban to rural areas and different background and status.

Conclusion

The results of this study suggest that fever is not always indicative of the presence of malaria parasite and that subjects with asymptomatic infection must be regarded as a significant reservoir of transmissible malaria parasites within the study environment. It is important to note that for malaria control measures to be effective, both asymptomatic and symptomatic individuals must be included in the management strategies.

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