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### A SURVEY OF MALARIA PREVALENCE AND ANTIMALARIAL PREVENTIVE MEASURES AMONGST STUDENTS OF UNIVERSITY OF LAGOS, NIGERIA

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#### ABSTRACT

The prevalence of malaria parasite and antimalarial preventive measures among students of University of Lagos, Nigeria was carried out between November 2014 and February 2015. Blood samples were collected from 400 students (with age ranging from 15-46year) by finger pricking and analyzed microscopically and by Rapid Diagnostic Test kit. Semi-structured questionnaire probing into their knowledge of the cause of malaria, ability to recognize signs and symptoms, treatment seeking behaviour was distributed to the respondents. The prevalence of *Plasmodium falciparum* by microscopy was significantly lower ( $p=0.0000042$ ). More than three quarters of the respondents (88.5%) had a good knowledge of the cause of malaria and were able to identify signs and symptoms of malaria which included headache (51.5%), fever (26%), dizziness (9.5%). Also more than half of the students (202) visit hospital when they recognize such signs while others visit Pharmaceutical outlets (130), drug hawkers (37) or use herbal remedy (31). Malaria preventive measures employed by students ranges from the use of Long-Lasting Insecticide Treated Bednets (74), topical mosquito repellent cream (65) to cleaning the environment (54). Furthermore, half of the students (50%) reported having malaria bouts twice per year, 35% once annually while 15% could not remember how often they have it. These bouts of various frequencies resulted in 360 (90%) of the students being absent from school from less than 10 days to more than 20 days. Proactively placing preventive measures would negate cascades of effects amongst the students. Continuous studies should be carried out to assess the prevalence of malaria in different foci of Nigeria and the level of awareness on the benefits of use of preventive measures should be emphasized among community members if Nigeria and Africa as a whole will meet the elimination target by 2030.

### UNE ENQUETE SUR LA PREVALENCE DU PALUDISME ET DES MESURES PREVENTIVES ANTIPALUDIQUES PARMIS LES ETUDIANTS D'UNIVERSITE DE LAGOS, NIGERIA

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#### RESUME

La prévalence du parasite du paludisme et des mesures préventives contre le paludisme parmi les étudiants d'université de Lagos, Nigeria, a été réalisée entre novembre 2014 et février 2015. Echantillons de sang ont été recueillis de 400 étudiants (avec l'âge de 15 à 40 ans) par piqure au doigt en utilisant un kit de test de diagnostic rapide microscopique. Une semi-structuré questionnaire cherchant leur connaissance de la cause du paludisme, la capacité à reconnaître signes et symptômes, le traitement, comportement de recherche a été distribué. La prévalence du paludisme à la suite d'une infection par *Plasmodium falciparum* était significativement plus faible (0,0000042) par microscopie. Plus de trois quarts de répondants (88,5%) avaient une bonne connaissance de la cause du paludisme et pouvaient identifier les signes et symptômes du paludisme qui inclut le mal de tête (51,5%), la fièvre (26%), le vertige (9,5%). Egalement, plus de la moitié des étudiants (202) visitent l'hôpital quand ils reconnaissent tels signes tandis que d'autres visitent points de vente pharmaceutiques (130), les colporteurs de médicaments (37) ou utilisent une tisane (31). Mesures préventives contre le paludisme employées par les étudiants varient de l'utilisation de long terme moustiquaires traitées (74), crème anti-moustique topique (65), au nettoyage de l'environnement (54). En outre, la moitié des étudiants (50%) ont déclaré d'avoir des épisodes de paludisme deux fois par an, 35% une fois par an, tandis que 15% ne pouvaient pas se rappeler combien de fois ils l'ont. Ces épisodes de différentes fréquences ont donné lieu à 360 étudiants étant absent de l'école de moins de 10 jours à plus de 20 jours. De manière proactive, plaçant des mesures préventives

annulerait cascades d'effets parmi les étudiants. Des études continues devraient être menées pour évaluer les différents foyers du Nigeria et le niveau de sensibilisation de membres de la communauté devrait être augmenté afin de prioriser des stratégies de contrôler et de répondre à l'objectif d'élimination avant 2030.

## INTRODUCTION

Malaria is the world most widely spread disease, caused by infection with single celled parasites of the genus *Plasmodium*. It is usually transmitted through the bite of female *Anopheles* mosquitoes (1).

It is the most prevalent tropical disease resulting in high morbidity with its consequent economic and social loss. Malaria accounted for an estimated 207 million cases in 2012 with 627 000 deaths occurring in same year, 90% of these deaths occurred in sub-Saharan African (2). Malaria is the single most important cause of ill-health and poverty in sub-Saharan Africa (3).

Malaria is widespread in many part of the world mainly in tropical and subtropical regions but extending into some of the temperate areas. Most malaria endemic regions are characterize by warm temperature and rainfall both of which are suitable for mosquito breeding.

Symptoms of malaria include fever, headache, vomiting and loss of appetite (4, 5). Malaria can also result to anaemia, cerebral malaria and acidotic condition (6). *Falciparum* malaria is responsible for most of the serious or even lethal forms of the disease which in most cases result to anaemia which is seen in the rupturing of 5-10% of the red blood cell by schizont, disturbance of the central nervous system (resulting to coma and confusion), or respiratory disease, muscle pain, fatigue, and elevated temperature of 104 -106°F. Malaria infection impairs physical and mental development in children and as a result of this, it is a major cause of death due to anaemia in young children. More so, malaria is known to have a negative impact on learning in children resulting in absenteeism and ultimately leading to poor academic performance (7, 8).

In areas of high and stable transmission, people tend to develop immunity following repeated infections, so that the population at greater risk of malaria are young children who had not yet had multiple exposures. In those areas such as Nigeria, infection during pregnancy is estimated to cause as many as 10,000 maternal deaths each year, 8-14% of all low birth weight babies and 3-8% of all infant deaths. (9, 10, 11, 12).

Evidence from Nigeria shows that malaria incidence throughout the country had been on the increase over the years ranging between 1.12 million at the beginning of 1990, 2.25 million by the turn of the millennium 2000 and 2.61 million in 2003 (13).

Four major problems are associated with the management of malaria, the most important is that the parasite are resistance to the most widely,

affordable and safest drugs which were used as the first line treatment such as chloroquine and fansidar (sulphadoxine-Pyrimethamine) and even the most recently introduce artemisinin combination therapy (3, 14). Secondly, the overall control of the mosquitoes which transmit malaria is made difficult by their resistance to wide range of insecticides. The third is a new and rapidly developing problem which is the widespread production of fake antimalarial drugs (15). Lastly many countries in Africa lack the infrastructures and resources to manage and control malaria (10). Effective control of malaria entails a detailed assessment of the prevalence in order to allow priority distribution and allocation of control tools to most deserving area as well as analysis of various methods that have proved effective in formally holoendemic areas.

This study was therefore designed to determine the status of malaria among the students of University of Lagos, Nigeria as well as assess the preventive measures employed by the students.

## MATERIALS AND METHODOLOGY

### Study area

The study was carried out at the University of Lagos (UNILAG), Lagos Akoka, Medical centre, Yaba, Lagos state. The school presently has three campuses in Yaba and Surulere, with two of its campuses located in Yaba (the main campus in Akoka and the recently created campus at the former school of Radiography). Its College of Medicines is located in Idi-Araba, Surulere. The main campus is largely surrounded by the scenic view of the Lagos lagoon on 802 acres of land in Akoka, Lagos. The University is located within the latitude and longitude 6°31'0"N 3°23'10"E/6.51667°N 3.38611°E southwestern part of Nigeria (16).

### Sample and data Collection

Blood samples were collected from students by finger prick with the application of little pressure. The first drop of blood was cleaned off with cotton wool soaked in 70% ethanol and subsequent drops of blood were collected on clean microscopic slide for the preparation of thin and thick blood films and also on the rapid diagnostic test kit (SD Bioline, South Korea; Batch number: 0823521). Semi-structured questionnaire was administered to the students probing into their knowledge of the cause of malaria, ability to recognize malaria symptoms, treatment seeking behaviour and preventive measures used.

### Smear Preparation

Thick and thin blood films were prepared according to the technique outlined by the World Health Organization (17). A drop of blood was spread on a grease free microscopic slide to a moderate thickness and allowed to air dry and stained with 10% Giemsa stain. The stain was allowed to stay for 10 minutes before washing off with clean water. The slide was then placed vertically and allowed to dry, after which a drop of immersion oil was placed on the slide and examined under the microscope with  $\times 100$  magnification.

Thin film was prepared by immediately placing the smooth edge of a spreader slide on a drop of blood, adjusting the spreader to an angle of  $45^\circ$  and then smearing the blood swiftly and steadily along the surface. The film was then allowed to air dry, fixed with 70% ethanol and stained with 10% Giemsa for 10 minutes before washing off with clean water. The slide is then allowed to air dry in a vertical position and examined under oil immersion microscope (18, 17).

Presence of ring forms of *Plasmodium falciparum* trophozoites indicates positive results. A blood smear is considered negative if no parasite is seen after 10 minutes of examination or examination of 100 fields.

All slides were read and the parasite density was estimated by counting the number of asexual parasites per 200 leukocytes in the thick blood films and assuming white blood cells (WBC) count of 8,000 parasite/ $\mu\text{l}$  (17, 19).

### Rapid Diagnostic Tests (RDT)

All kits components were acclimatized to room temperature prior to testing. The flat surface used was swabbed with cotton wool dipped into 70% of ethanol in order to sterilize it. Test cassettes were removed from foil pouch, placed on a flat, dry surface. Blood (0.1ml) was pipetted into the sample hole of the RDT cassette. About 2 - 3 drops of diluents buffer was added and left for 15 minutes before reading the result of the slide.

### Data Analysis

Prevalence of *Plasmodium falciparum* was calculated as the proportion of sampled persons with positive blood smear divided by the number of persons who provided blood. Descriptive statistics (Mean  $\pm$ SD; chi-square) with SPSS package 2007 was used to analyze the data obtained, P- value  $< 0.05$  was taken as statistical variable of relevance.

### Ethical Consideration

Approval for this study was sought from Head of the Department of Medical laboratory of the University of Lagos Medical Centre. All participants gave their inform consent before enrolling for the study.

## RESULTS

### Socio-demographic background of the respondents

The study recruited 400 students which include male and female from the University of Lagos, Akoka Yaba Lagos. Three hundred and forty of the respondents (85%) were undergraduate students while 60 (15%) were postgraduate students. Females were significantly ( $p=0.0013$ ) higher (232) than males (168). More than three-quarters of the students (342) were single at the time the study was conducted while 58 were married.

### Malaria prevalence

The prevalence of malaria by microscopy (2%) and Rapid Diagnostic Test kit (3%) was significantly lower ( $p=0.0000042$ ) (Figure 1 A and B) and the species of *Plasmodium* implicated in this study as revealed by microscopy is *Plasmodium falciparum*.

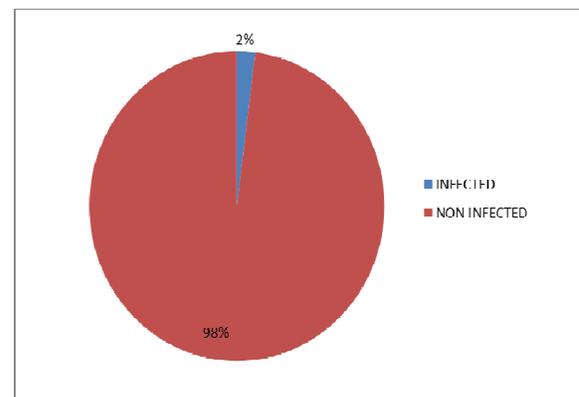


FIGURE 1 A: MALARIA PREVALENCE BY MICROSCOPY

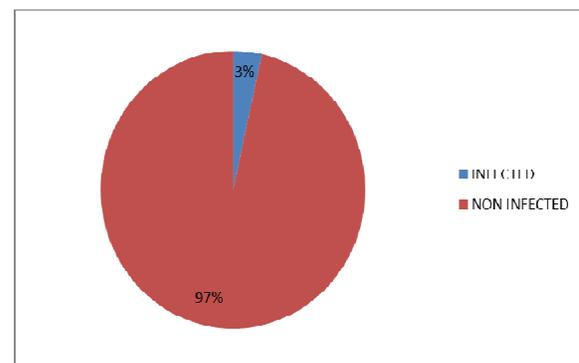


FIGURE 1 B: PREVALENCE OF MALARIA BY RDT

**Knowledge of malaria**

Majority of the respondents 354(88.5%) ascribed the causes of malaria to receiving bite from a female *Anopheles* mosquito, about 20(5%) said it is caused by extended duration under the sun while others mentioned poor hygiene 12(3%), dirty environment 6(1.5%) and poor diet 8(2%).

Probing further on their ability to recognize signs and symptoms revealed that headache 206(51.5%) was the most recognized signs followed by fever 104(26%), dizziness 38(9.5%) and vomiting 24(6%) (Table 2).

TABLE 1: SOCIO-DEMOGRAPHIC BACKGROUND OF RESPONDENTS

	CATEGORY	FREQUENCY
ACADEMIC LEVEL	Undergraduate	340(85%)
	Postgraduate	60(15%)
GENDER	Male	168(42%)
	Female	232(58%)
AGE	15-20	80(20%)
	21-25	140(35%)
	26-30	80(20%)
	31-35	62(15.5%)
	36-40	30(7.5%)
	41-46	8(2%)
ETHNICITY	Yoruba	220(55%)
	Igbo	87(21.8%)
	Northerners	23(5.7%)
	South-South	70(17.5%)
MARITAL STATUS	Single	342(85.5%)
	Married	58(14.5%)

TABLE 2: IDENTIFICATION OF THE CAUSE OF MALARIA AND ITS SYMPTOMS

Variables	Responses	Frequency
<b>Cause of malaria</b>		
	Mosquito bite	354(88.5%)
	Poor hygiene	12(3%)
	Dirty environment	6(1.5%)
	Sun	20(5%)
	Poor diet	8(2%)
<b>Signs and symptoms of malaria</b>		
	Headache	206(51.5%)
	Fever	104(26%)
	Dizziness	38(9.5%)
	Vomiting	24(6%)
	Body Pain	20(5%)
	Loss of appetite	8(2%)

**Treatment seeking behaviour**

More than half of the respondents (202) visit the hospital when any sign of malaria is suspected while 130 respondents patronize pharmaceutical outlets, drug hawkers (37) or use traditional remedy (31) Figure 2.

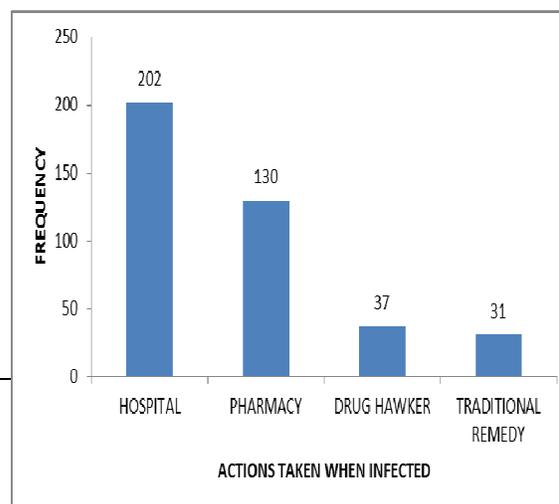


FIGURE 2: TREATMENT SEEKING BEHAVIOUR OF RESPONDENTS

### Malaria Preventive measures employed by respondents

More than half (239) of the respondents claimed to possess Long Lasting Insecticide Treated Bed Nets (LLIN), sixty-five (16.2%) use various kinds of topical mosquito repellants, while 54 (13.5%) try to keep their various rooms clean as a way of preventing the breeding of mosquito. Of the total respondents that possess LLIN, only 74 use it consistently, the others either use it occasionally (62) or do not use it at all (103) Table 3.

### Burden of malaria amongst the respondents

Very few of the respondents (4) reported to have had malaria in the last three days preceding the survey. Probing into the frequency of malaria bouts amongst the respondents revealed that, half (50%) usually have malaria twice every year, 35% have it once every year while 15% could not remember how often they do have it. More than three-quarters (360) said they have been absent from school at one point in time or the other as a result of malaria. Of the total number of respondents absent from school, more than half (240) were absent for less than 10 days while 80 were absent for more than 10 days.

Only 140 (38.9%) of the respondents have been hospitalized as a result of malaria and 15% (60) of the respondents were aware of malaria related deaths in the school community (Table 4).

**TABLE 3: MALARIA PREVENTIVE MEASURES USE BY RESPONDENTS**

Variables	Responses	Frequency (%)
Type of preventive measure employed	Long Lasting Insecticide Bed Net(LLIN)	239(59.8%)
	Insecticide	42(10.5%)
	Removal of dirty plates from the room	54(16.2%)
	Use of mosquito skin repellent	65(16.2%)
	Consistency of LLIN use	
	Always	74(31%)
	Occasionally	62(25.9%)
	Never	103(43.1%)

**TABLE 4: BURDEN OF MALARIA AMONGST THE RESPONDENTS**

	RESPONSE	FREQUENCY (%)
Have you had malaria in the last three days	Yes	4(1%)
	No	396(99%)
How often do you have malaria	Once a year	140(35%)
	Twice a year	200(50%)
	Do not remember	60(15%)
Ever absent from school due to malaria	Yes	360(90%)
	No	40(10%)
Number of days absent	Less than 10 days	240(66.7%)
	More than 10 days	80(22.2%)
	Above 20 days	40(11.1%)
Were you hospitalized	Yes	140(38.9%)
	No	160(44.4%)
	No response	60(16.7%)
How long were you hospitalized	Less than 10 days	95(67.9%)
	More than 10 days	35(25%)
	Above 20 days	10(7.1%)
Any knowledge of malaria related death in this community	Yes	60(15%)
	No	340(85%)

## DISCUSSION

Approximately half of those countries with ongoing malaria transmission are on track to meet the World Health Organization's target of reaching the elimination stage by year 2030 (20). In order to achieve this target in Nigeria, there is need to evaluate the occurrence of malaria in different foci vis-à-vis preventive measures and treatment options.

This present study recruited more undergraduates than the post-graduates. In like manner, majority were females with few males and were in their early twenties and it is understandable that more than half of the respondents were Yorubas, perhaps due to the geographical location of the school.

The prevalence of malaria in this study area is very low as detected by both techniques used. This could be due to a number of reasons such as time of survey (carried out in the dry season), regular fumigation of the school hostels to destroy mosquito breeding habitats amongst others. The findings of this study is in contrast to that reported in other studies carried out in Universities in South eastern (7, 21) and western parts of the country (22) where more than half and almost half of the students were found infected with falciparum malaria respectively. This disparity in prevalence could be due to difference in effort put towards clearing the vegetation around the hostels or the period of the survey.

It is interesting to know that the students in this survey have a good knowledge about the cause of malaria, ascribing it to mosquito bite, though very few of them still mentioned sun and poor hygiene as probable cause of malaria. It is very important that awareness be carried out so as to enlighten everyone about the transmission and cause of malaria as this would make more of the populace utilize more malaria preventive options. This good knowledge was also demonstrated in their ability to identify signs and symptoms of malaria as more than half of them mentioned headache, others were able to associate fever, dizziness and vomiting to malaria. Although fever is a symptom of malaria, it is very important to emphasize that it could also result from other non-malarial illnesses, therefore the importance of malaria diagnosis should be emphasized in order to prevent non-specific drug use.

Probing further to know what action is taken as soon as they suspect malaria revealed that, majority of the students quickly visit the University Medical Centre,

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while others prefer to go to pharmaceutical outlets, drug hawkers or use traditional remedy. Visiting the pharmaceutical outlet should not be a cause for alarm if the cause of infection has been prior ascertained or perhaps there is a resident Pharmacist to prescribe the drug not just by indiscreet buying of drugs which could contribute to the problem of drug resistance.

Furthermore, the study revealed that more than half of the students claim to possess LLIN, however not up to half of these students regularly sleep under the treated net. This is another area calling for sensitization as many possessor of LLIN keep it unused in their homes. This is one of the preventive strategies the World Health Organization has outlined, other measure such as Indoor Residual Spraying of the hostel environment and use of chemoprophylaxis amongst others could be successfully implemented in such academic setting where the populace is small compare to larger communities (20, 23).

Very few students reported to have had malaria episodes in the three days preceding survey, although it was not made known if the episode was self-ascertained or laboratory-determined. Half of the students reported having two malaria bouts in a year, while more than one-quarter reported one bout per year and others could not remember the frequency. These repeated malaria bouts resulted in absenteeism by more than three quarters of the students leading to valuable loss of time in academic work and even performance as majority of them spent less than 10->20 days in hospital, an appreciable amount of time that could have been spent on their academics. Therefore, proactively placing preventive measures would have negated these cascades of effects amongst the students. Continuous studies should be carried out to assess the prevalence of malaria in different foci of Nigeria and the level of awareness of the foci community members should be assessed in order to prioritize control strategies and meet the elimination target by 2030.

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