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The Malaria situation, perception of cause and treatment in a Nigerian University

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Human malaria remains a serious cause of morbidity and mortality in Nigeria. In Lagos State University (LASU) Nigeria, a non–student residential campus, a study was carried out among 600 students (330 males and 270 females). These students were randomly selected, 100 each from six faculties. The study was carried out in the rainy season from May-July, 2007. Blood was obtained from students by venous puncture and finger pricking. Giemsa stains on thin blood films indicated an overall prevalence of 83.3%. The percentage of females infected was more than males. Stained thick blood films revealed that *P. falciparium* trophozoites form a greater percentage of the blood parasite stages (90%). Of these 500 students with asymptomatic malaria, 49.6% had Packed Cell Volume (PCV) of less than 30%. Data from the LASU health centre indicated that an average of 12 students per day was treated for symptomatic malaria during this period. Structured questionnaires administered to each participant, revealed that they were mainly aged 22-23 years, in their second year, Blood group O, haemoglobin genotype AA and in Faculty of Arts. The test on knowledge of Malaria indicated that 41.7% of these students still have erroneous perceptions about the cause of malaria. Health education on malaria is therefore advocated.This study not only confirms that malaria is one of the causes of student's absenteeism, but that asymptomatic malaria matters.

Keywords: Asymptomatic malaria, Nigeria, University, perception, school absenteeism.

INTRODUCTION

Human Malaria is a parasitic disease caused by protozoan of the phylum apicomplexan, class sporozoan and subclass coccidian. These haemosporinas or haematozoans of the family plasmodidae and genus *Plasmodium* are exclusively parasitic and without locomotory organelle. Four species of *Plasmodium* parasitizes man, of which *P. falciparium* is the most virulent of the malaria parasite (Najera and Hempel, 2006).

Malaria has remained a deadly scourge in Africa (Docampo, 2002). Malaria is no respecter of persons, so all groups of people are exposed to the infectious bites of the female *Anopheles* mosquito, which breeds in stagnant water (Hay et al 2000). The disease is transmitted by the infectious bites of female *anopheles* mosquitoes. These mosquitoes carry infective sporozoites in their salivary gland, which they transfer to the blood stream of man during a blood meal (Najera and Hempel, 2006).

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To conquer this formidable foe is a great challenge to the whole world. The global malaria picture is still very disturbing, because today, more than 80% of the global malaria burden is restricted to sub Saharan Africa (Annon, 2009).

Malaria is holoendemic in Nigeria, accounting for 25% infant mortality and 30% childhood mortality (Annon, 2003). Several species of *Anopheles* especially *An. gambiae* and *An. funestus* can transmit malaria in Nigeria (Awolola et al 2002, 2003, 2005). Malaria is well known in Nigeria and a household name and a big contributor to economic burden (Onwujekwe et al, 2000). The disease is a serious impediment to economic and social development in Nigeria (Okwa, 2003a, Okwa et al 2009). Salako (2002) stated that malaria is the commonest cause of work and school absenteeism in the country. It is the commonest cause of outpatient attendance in Nigeria (Salako, 2001). The commonest complaint of students for absenteeism has always been malaria. In a study, school absenteeism due to malaria was as high as 28% (Najera and Hempel, 2006). In another study in Kenya, primary school students miss 11% of school days per year due to malaria and secondary school miss 4.3% of school days (Leighton and Foster 1993). Another study

attributed 13-50% of medically related school absenteeism to malaria (Sachs and Malaney, 2002). Leighton and Foster (1993) also reported that Nigerian school children miss an estimated 3-12 schooldays per year which is 2-6 % of school year.

Apart from the incapacitating effect of malaria attack, the direct economic costs of malaria that result from absence from school and treatment are enormous if quantified and the overall economic impact is likely to be more substantial (Greenwood and Mutabingwa, 2002). This is in terms of cost of drugs and treatment, school absenteeism which could affect general performance and lead to poor grades. The effect on investment in education should not be undermined. Loss in lecture days represents a huge loss on academic standard and loss on the family, community and nations investment in education. Fernando et al (2003) reported that malaria has adverse impact on school performance. Cost of illness is represented by cost of treatment and time loss by the patient and the caregiver and psychosocial costs are difficult to compensate.

Asymptomatic malaria has long been a problem that should not be neglected; otherwise the real burden of malaria will never be quantified (Greenwood, 1987). Ntoumi et al (1995) in a study in Senegal found 77% prevalence among 65 asymptomatic residents, in a high transmission season. Salako et al (1990) detected asymptomatic malaria among rural and urban school children in South West, Nigeria. Verhoef et al (2001, 2002) in two different studies in Kenya detected increased erythropoiesis as a result of malarial anaemia in children with asymptomatic malaria.

Knowledge, attitude and practices (KAP) are essential for control programmes. Elzubier et al (1997) reported that there existed wrong misconceptions about malaria, even among students. In another study by Ndawala et al (2000), rurality and lack of education accounted for more exposure and incidence of malaria. Fawole and Onadeko (2001), found a correlation between level of education and malaria status. In their study, uneducated people constituted the majority of those who visited traditional healers or use local remedies. Okwa (2003b) reported that the KAP of literate pregnant women about malaria was encouraging. In a study by Peetermanns and Winjingaerden (2001), all students were aware of malaria prophylaxis guidelines. Muala and Chimalizeni (2004) reported that the KAP of Malaria among school pupils in Malawi was encouraging. Matta et al (2001) reported inadequate KAP about malaria among symptomatic outpatients.

The present study aims at finding out the status of malaria, in asymptomatic and symptomatic students of the Lagos State University (LASU), who are adolescents and young adults. The study also covered sociodemographic factors and KAP associated with malaria among these students.

MATERIALS AND METHODS

Study area

Lagos State University (LASU) main campus is in Ojo local government of Lagos State, Nigeria. It is a non residential campus along the Badagry expressway. Majority of the students live in private hostels around the campus, which are walkable distances to the campus. LASU has two semesters called the harmattan (first) and rain (second) semesters. The study was carried out in the rain semester (May-July, 2007). The environmental conditions in the hostels were characterized by thick grasses, stagnant pools, swampy soils with footprints and blocked drainages.

Informed consent and ethical approval

The Deans of faculties, Heads of Departments and Students representatives were informed of the ongoing research. The entire student participant volunteered to be part of the study. Ethical committee of the Lagos State University College of medicine gave ethical approval.

Selection and inclusion criteria of participants

The participants were 600 LASU students. The study does not therefore provide a picture of malaria in the general population. One hundred were randomly selected from each faculty. The Faculties are Arts, Education, Social sciences, Sciences, Law and Engineering. The faculties were used as selection criteria because it aided the random selection of students from different academic background into the study, as this can influence their KAP about malaria. The students were all healthy at the time of the study and this was the inclusion criteria. A total of 330 males and 270 females were requited.

Parasitological diagnosis of Malaria

Blood was obtained by finger pricking and venous puncture with the assistance of a medical laboratory technician. Thin and thick blood films were made on clean slides properly labelled for each participant. The blood collected by finger pricking was used in making thin blood films for species identification while the thick blood films were used for parasite count, densities and stages identification. The films were fixed in methanol for few seconds. Buffered giemsa stains (10% giemsa in phosphate buffer Ph.7.2 for 30 minutes) was used in staining the blood samples, air dried and observed under oil immersion (x100) objective. The number of asexual *P.falciparium* and other species per 200 leukocytes were counted and if 10 or more parasites were identified, then the number was recorded, assuming a mean leukocyte count of 6000ml of blood according to World Health Organization (WHO) (1995 & 1998). The parasite count in relation to the leukocyte count was converted to parasite per microlitre of blood using this mathematical formula;

$$\frac{\text{Number of parasites} \times 6000}{\text{Number of leukocytes,}} = \text{Parasite per microlitre of blood.}$$

A blood sample was regarded as negative if the examination of thick films failed to show the presence of asexual parasites. The species and different stages, forms (rings and gametocytes) of the parasites present were counted and recorded by a trained medical technician. The results were confirmed by the researcher. All ethical protocols were observed.

Table 1. Malaria status of participants (Students) from 100 each from six faculties (330 males and 270 females)

Faculties	Infected No (%)	Male No (%)	Female No (%)	Uninfected No (%)	Male No (%)	Female No (%)	Male/female P values P > 0.05
Science	74 (14.8)	41(55.4)	33(44.5)	26(26)	23 (28.7)	03 (15)	P = 0.86
Engineering	86 (17.2)	43 (50)	43 (50)	14 (14)	12 (15)	02 (10)	P = 0.00
Soc. Sciences	70 (14)	33(47.1)	37(52.8)	30 (30)	28 (35)	02 (10)	P = 0.22
Education	84 (16.8)	50 (59.5)	34(40.4)	16 (16)	10 (12.5)	06 (30)	P = 0.34
Arts	96 (19.2)	46(47.9)	50(52)	04 (4)	02 (2.5)	02 (10)	P = 0.16
Law.	90 (18)	37(41.1)	53(58.8)	10 (10)	05 (6.25)	05 (25)	P = 2.84
Total.	500 /600 (83.3 %)	250/500 (50%)	250/500 (50%).	100 /600 (16.7%)	80/100 (80)	20/100 (20).	

DF= 5 P > 0.05**.** P = 1.128 (infected population between faculties**)**

Haematology

This was assessed with the help of medical laboratory personnel in the LASU health centre. Finger pricking blood samples were collected into Pack cell volume (PCV) capillary tubes for PCV determination. They were spinned at 1500 revolution per minute using haematocrit centrifuge and read by Hawksley haematocrit reader. Anaemia was defined as PCV of less than 30%.

Administration of questionnaires

Structured questionnaires were administered to the students. The questionnaires were first pretested and validated among the students and adjusted accordingly before the actual administration. A pilot study assisted in refining the questions. The questions confirmed their asymptomatic status; ascertain their haemoglobin genotypes and blood groups. Socio demographic parameters as age, religion, marital status and tribe were also elicited. The questionnaires also ascertain the Student's KAP regarding malaria.

Health centre records

LASU health centre records were examined with the assistance of the Chief record officer. The records were examined for the daily report and treatment of symptomatic malaria. These were not necessarily the same students selected as participants for the study.

Data collection and analysis

All data were entered into the computer and analysis was done using EPI-INFO software. Analysis of variance (ANOVA) and Chi square test was used for analysis of findings at P< 0.05. The results are displayed in figures and tables.

RESULTS

Status of Malaria

The test for malaria parasites showed that 100 (16.7 %) of the students participants were uninfected while 500 (83.3%) had malaria parasites. Faculty of Arts had the highest infected, 96 (19.2%) of the 100 participant. Faculty of Social Science had the least infected participant with 70 (14%) prevalence. The highest prevalence of infected males was from faculty of education 50/84 (59.5%), while the highest prevalence of infected females was from faculty of law 53/90 (58.8%). (See Table 1) Overall, a total of 250 males (50%) were infected and 250 females (50%) also infected. Out of the 330 males selected, 250 (75%) were infected while of the 270 females, 250 (92.5%) were infected. This indicated that a higher proportion of females were infected than the males. No significant differences occurred in the prevalence between male and female participants in each faculty (P> 0.05). Figure 1 shows the overall prevalence of infected and uninfected participants.

Parasitology

P. falciparium was the prominent species found with a proportion of 90% (51.1% in males and 48.8% in females). *P. malariae* was 5.4% of the population of species found and predominantly in males (62.9%) and mixed infections with both *P. falciparium* and *P. malariae* was 4.6% and was predominantly in females (86.9%) (Figure 2). No other species was found. *P. falciparium* trophozoite was the predominant stage (74.9%) found in the thick blood film and this was higher in males (50.2%) than females (49.7%). *P. falciparium* schizont (9.16%) and gametocytes (8.84%), *P. malariae* trophozites and gametocytes (7.07%) were also found.

Haematology (Packed Cell Volume count)

Almost half, 49.6% of the infected participants had PCV of less than 30 % with males having a higher proportion of PCV less than 30%. However the proportion of participants with PCV more than 30% was statistically insignificant when compared to those with PCV of less than 30% (Table 2).

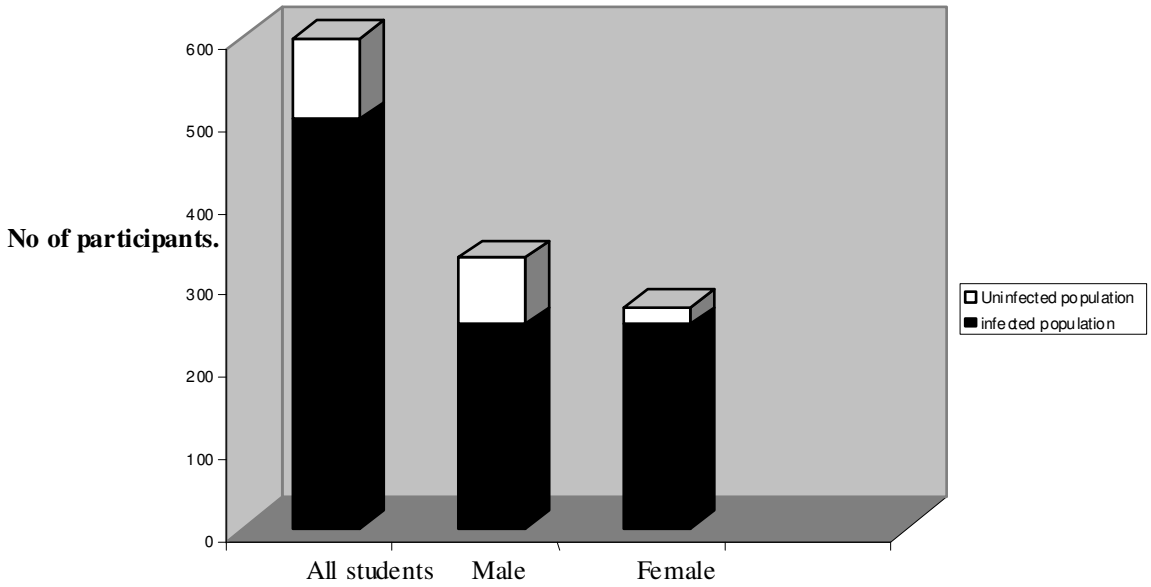

Figure 1. The prevalence of infected and uninfected participants

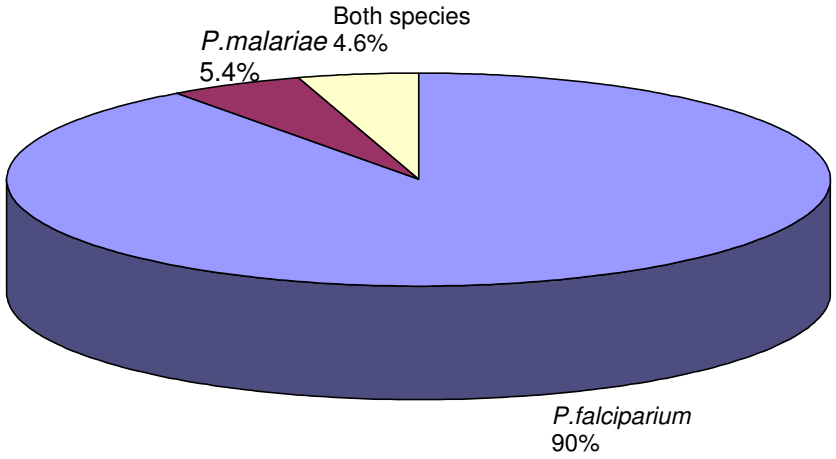

Figure 2. The proportion of *Plasmodium* species found in the samples

Table 2. Packed cell volume (PCV) counts of infected participants.

Sex	No (%) with PCV > 30%	No (%) with PCV < 30%	Total infected No (%)	P values
Male	128(51.6)	122(48.4)	250 (50)	P = 0.14 P >0.05
Female	120(48.3)	130(51.5)	250(50)	P = 0.4. P > 0.05
Total	248(49.6)	252 (50.4).	500(100)	P =0.54. P>0.05

Df =1 P > 0.05.

Blood group and haemoglobin genotype

The relationship between blood group, haemoglobin genotype (Hb) and malaria infection was compared. Most of the infected participants were in blood group O, 220 (44%) followed by blood group A, 190 (38%). Males with blood group O, 124 (56.3%) were more infected than females 96 (43.6%). Females in blood group A, 129

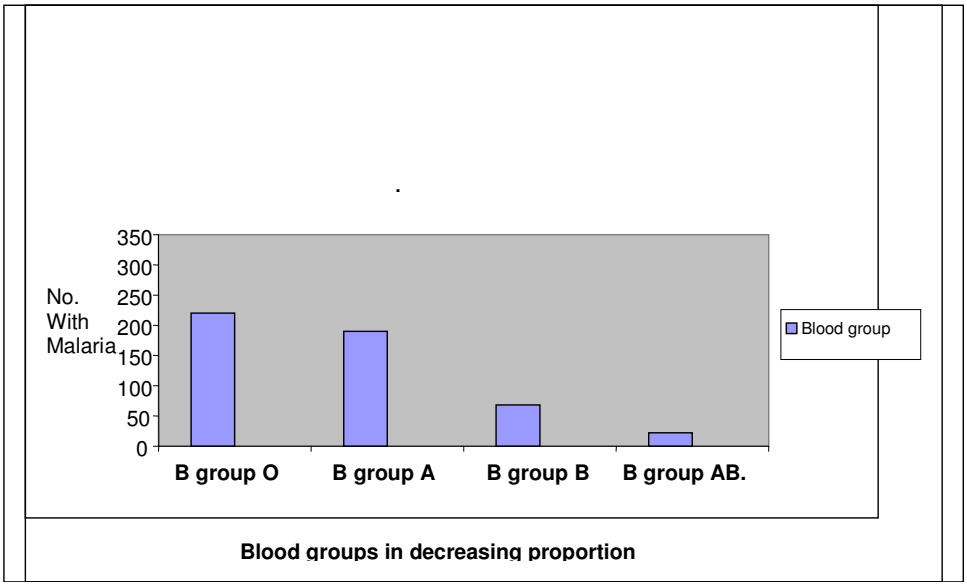

Figure 3. B group to Blood group

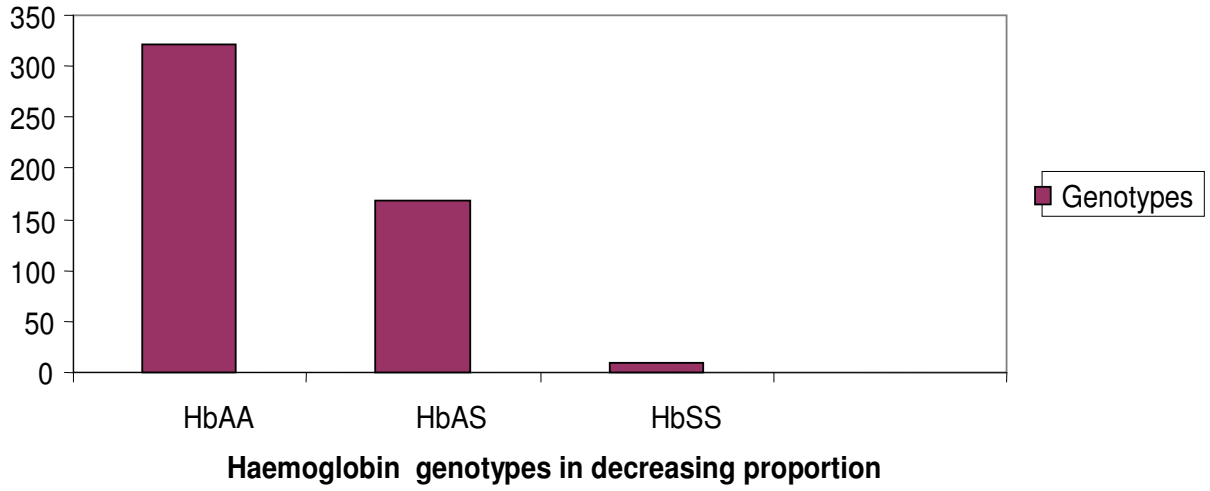

Figure 4. The relationship between haemoglobin genotype and malaria status

(67.8%) were more infected than males 61 (32.1%). Of the students with Hb AA, 321 (64.2%) were the predominant group with malaria. Males with genotype HbAA, 213 (66.3%) were more infected than females 108 (33.6%). The genotype HbSS was the least common, although 8 (80%) of females with this genotype were infected with malaria. (See figures 3 and 4).

Data records of symptomatic students

Overall more males (57%) visited the health centre than the female students (42.9%). The monthly difference between the visitation of male and female students to the health centre was statistically insignificant. It was only in the month of July that more female (51%) visited the health centre than the males (49%), but this was statistically insignificant**.** An average of 12 students visited the centre in a day (Table 3).

Sociodemography and Malaria

Majority of the infected student participants were aged 22-23years (40%) with more females (40.8%) infected. All the students participants aged below 20 had malaria parasites. Majority of the infected students were in their second year (42.2%) with females (44.8%) having a

Table 3. Monthly data of symptomatic Students visiting health centre for malaria.

Month	Males No. (%)	Females. No (%)	Total. No (%)	P values
May	224 (62.2)	136 (37.7)	360 (32.9)	0.96 (P>0.05)
June	218 (60)	145 (40)	363 (33.2)	0.4 (P>0.05)
July	181 (49)	188 (51)	369 (33.7)	0.075 (P>0.05)
Total.	623 (57)	469 (42.9)	1092 (100)	1.43 (P>0.05)
Average /day	6.9	5.2	12.1	

Df= 2 P>0.05

Table 4. The relationship between Socio demographic parameters and Malaria status.

Ages. Df = 4 P= 582.1 P < 0.05	Infected No (%)	Males No (%)	Females No (%)	Uninfected. No (%)	Males. No (%)	Females. No (%)
Below 20	66 (13.2)	22 (8.8)	44 (17.6)	0 (0)	0 (0)	0 (0)
20-21	121 (24.2)	50 (20)	71(28.4)	08 (08)	05 (6.25)	03 (15)
22-23	200 (40)	98 (39.2)	102(40.8)	35 (35)	31 (38.75)	04 (20)
24-25	56 (11.2)	24 (9.6)	32 (12.8)	35 (35)	30 (37.5)	05 (25)
26 and above	57 (11.4).	56 (22.4)	01(0.4)	22 (22)	14 (17,5)	08 (40)
Year of study. Df = 4. P= 103.7 P < 0.05						
First	123(24.6)	60 (24)	63(25.2)	0 (0)	0 (0)	0 (0)
Second	211(42.2)	99 (39.6)	112 (44.8)	23 (23)	20 (2.5)	03 (15)
Third	100 (20)	66 (26.4)	34 (13.6)	37 (37)	28 (35)	09 (45)
Fourth	51(10.2)	23 (9.2)	28 (11.2)	30 (30)	26 (32.5)	04 (20)
Fifth	15 (3)	02(0.8)	13 (5.2)	10 (10)	06 (7.5)	04 (20)
Religion. Df =2 P= 3.86 P < 0.05						
Christian	304 (60.8)	185 (74)	119 (47.6)	56 (56)	50 (62.5)	06 (30)
Muslims	191(38.2)	57 (22.8)	134 (53.6)	34 (34)	26 (32.5)	18 (90)
Others	05 (1)	03 (1.2)	02 (0.8)	10 (10)	04 (5)	06 (30)
Marital status Df =2. P=115.5 P < 0.05						
Single	419(83.8)	250(100)	169 (67.6)	88 (88)	80 (100)	20 (100)
Married	81 (16.2)	0 (0)	81 (32.4)	12 (12)	0(0)	0(0)
Tribe Df =2.P= 193.3 P < 0.05						
Yoruba	125 (25)	75 (30)	50 (20)	36 (36)	27 (33.75)	09 (45)
Igbo	50 (10)	35 (14)	15 (6)	13 (13)	10 (12.5)	03 (15)
Egun	167(33.4)	59 (23.6)	108 (43.2)	26 (26)	23 (28.75)	03 (15)
Awori	150 (30)	75 (30)	75 (30)	25 (25)	20 (25)	05 (25)
Others	08 (1.6)	06 (2.4)	02 (0.8)	0 (0)	0 (0)	0 (0)

larger percentage. All the participants in the first year were infected. Of the infected students (60.8%), were Christians and predominantly males (74%). Of the infected students (83.3%), were single and predominantly males (100%). Of the infected students 33.4% were from the Egun tribe of Badagry, Lagos and predominantly females (43.2%).The differences between the social parameters and malaria status were highly significant (See Table 4).

Table 5. Knowledge, attitude and practices (KAP) of 600 asymptomatic Student's participant regarding Malaria

		No (%)	P values
Cause of malaria	Mosquitoes bites	350 (58.3)	
	Sunlight	150 (25)	
	Stress/ overwork	75 (12.5)	P= 10.38
	Others	25 (4.16)	P < 0.05
Most obvious sign of malaria when ill.	Headache	298 (49.6)	
	Fever chills.	134 (22.3)	P = 12.1
	Weakness	101(16.8)	P < 0.05
	Loss of appetite	50(8.3)	
	Thirst	15 (2.5)	
	Nausea and vomiting	02 (0.3)	
Prevention of malaria	Insecticide treated nets	213 (35.5)	
	Window /door nets	137 (22.8)	
	Environmental	102 (17)	
	Repellants	112 (18.6)	P = 9.5
	Prophylaxis	13 (2.16)	P< 0.05
	Protective clothing	12 (2)	
	Insecticide spraying	11 (1.83)	
Best cure for malaria	Drugs	376 (62.6)	
	Local remedies	180 (30)	P = 12.8
	Prayers.	44 (7.33)	P < 0.05
Antimalarials	Artesunate	199 (33.1)	
	Artemisinin	103 (17.1)	
	Halofanthrine (Halfan)	97(16.1)	
	Fansidar, Amalar, Maloxine	90(15)	P= 18.1
	Chloroquine, Nivaquine,Camoquine	33 (5.5)	P< 0.05
	Metakelfin	22 (3.66)	
	Armatem	20 (3.33)	
	Daart.	19 (3.16)	
	Local remedies	15 (2.5)	
	Others	2 (0.33)	
Local remedies	Lemon grass	12 (2)	
	Agbo iba	02 (0.33)	P= 14.8
	Others.	01 (0.16)	P < 0.05

Knowledge, attitude and practices (KAP) of Students regarding Malaria

Out of the 600 asymptomatic participants, 58.3% knows the cause of malaria while the remaining 41.7% do not know and gave several causes, of which sunlight was most mentioned (25%) (Table 5). The most obvious sign of malaria to the students when they fell ill due to malaria was headache (49.6%). Insecticide treated nets was the major precaution mentioned against mosquito bites (35.5%). The best cure mentioned for malaria was the use of chemotherapeutic drugs (62.3%), but 30% of the students believe local remedies are the best while 7.33% believed in prayers. Artesunate (33.1%) was the most mentioned, among the nine drugs mentioned. The local remedies mentioned were lemon grass and *agbo iba* (local brew for malaria).

DISCUSSION

Malaria is holoendemic in Nigeria, especially in the rural areas, but could be hyperendemic in urban areas (Annon, 2003, Onwujekwe, 2000). Morbidity and mortality due to malaria have been increasing due to deterioration in health system, growing drug and insecticide resistance, periodic changes in weather pattern and human migration and population displacement (Najera and Hempel, 2000). In Nigeria, the epidemiology of malaria is relatively uniform throughout the year, but sometimes high at the rainy season (Annon, 2003).

This study was carried out in the rainy season (May-July) when there are more breeding sites of mosquitoes and this could lead to high peak transmission. This no doubt had contributed to the high prevalence of malaria (83.3%) among asymptomatic students in this study. This

is similar to the high prevalence of 98.5% obtained among university of Benin, Nigeria students as reported by Adams- Campbell et al (1998).

P. falciparium was the predominant species and any other specie seen was *P.malariae* in this present study.

This is similar to the results of Amajoh et al 2002, Awolola et al, 2002; Nebe et al.2002 Okwa, 2004 and Umeaneto et al 2006

The participants were asymptomatic at the time of the study, even though they had the malaria parasite in their blood. This is similar to the study of Bruce Chwatt (1970) in a longitudinal study of asymptomatic malaria in African students. Ntoumi et al (1995), Salako et al (1990) and Verhoef et al (2001) reported same. Okwa (2004b) also reported that pregnant women who never complained of the symptoms of malaria tested positive when diagnosed. According to Greenwood and Mutabingwa (2002), parasite, host genetics and socioeconomic factors are all likely to have a role in asymptomatic malaria. Olumese et al (1997) had also observed that malaria was less common among the well nourished, who usually appeared asymptomatic. Brabin (1985) was of the opinion that malaria infections are largely controlled by the immune system and such may be clinically unrecognized unless diagnosed.

The percentage of parasitaemia is higher in females than males in this study. This contrasts sharply with other studies (Afolabi et al, 1997, Babalola and Lamikanran 2007; Pelletier et al, 1995) but is similar to the results of Nebe et al (2002), in a study of malaria among coastal dwellers of Lagos State and Umeaneto et al (2006) in Nnewi, Anambra State, Nigeria. There is no concrete explanation for this higher prevalence in females, however studies have shown that females are expected to have better immunity to malaria and a variety of other parasitic diseases and this has been attributed to genetic or hormonal factors (Brabin and Brabin , 2005).

Brabin and Brabin (2005) observed that in Sub-Saharan Africa, the highest overlap between Malaria and Human immunodeficiency Virus (HIV) occurs in female adolescents. Malaria and HIV was identified as responsible for much of the disease burden affecting female adolescents (Lalloo, 2004). Control activities have however been channeled mainly to children and pregnant women who are the high risk group. According to Lalloo et al (2006) the problem of malaria in adolescent and young adults has been overshadowed by the huge burden in young children.

Malaria has long been recognized as one of the major causes of anaemia (Najera and Hempel, 2006). The drop in PCV values can be attributed to nutritional status (Nebe et al 2002). Students in blood group O and genotype AA appears to be more susceptible. Hill (1996) had suggested that the haemoglobin genotype AA individuals are very susceptible to malaria because the Red blood cells are conducive for the growth and development of *Plasmodium* species. Alouch (1997) reported that there is higher resistance to *P. falciparium* infection in patients with homozygous sickle cell disease. In his study, malaria parasites were found more in HbAA and least in HbSS. This is in line with the results of this study. He also reported that where HbS and malaria co – exist, a higher proportion of HbAA will seek treatment for malaria. HbSS patients are however not exempted from great risk for increased morbidity and mortality from malaria (Okwa, 2004a).This is due to inherent HbSS complication (Alouch, 1997).

Surprising, 41.7% of the participants do not link mosquitoes to malaria. This is in line with the study of Elzubier et al (1997) who reported that there existed wrong misconceptions about malaria even among students. This is however in contrast to the study by Ndawala et al (2000). This study was conducted among students in an urban setting and is similar to the results of Matta et al (2001) that KAP is poor even in persons residing in urban areas. The study by Peetermanns and Winjingaerden is also in contrast to this study. In this study, religion and tribe influences KAP of malaria. The 44 (7.33%) of students that believed that prayer is the best cure for malaria were all Christian students. Those that believed in local remedies were predominantly Muslims from the Awori tribe. Most of the infected students were from Faculty of law, while the least infected were from social sciences and sciences. Students with scientific background have better KAP than those without and are able to therefore prevent and control malaria better.

In this study, socio-demographic factors had some influence on malaria status and KAP. Singles were more infected than married. They are the groups that usually move around the campus and hostels in the evenings unlike the married ones. Christians were more infected than Muslim. This could be because the Muslim exposes less of their body to mosquito bite because of the mode of dressing. The older students and final year students were less affected. Ntoumi et al (1995) found that asymptomatism was age dependent and that age increase was associated with decreased parasite load and decreased complexity of infection. This could mean they had been exposed to the environment for a longer time and better immuned. Fawole and Onadeko (2001) had found a correlation between level of education and low malaria status

Artesunate was the most mentioned drug in this study. This is not surprising as there is currently no evidence for clinically relevant Artemisinin resistance. Artemisinin and its derivatives like Artesunate, artemether, arteether and dihydroartemisin are now in use. The limitations of these groups of drugs are the short duration of antimalarial activity and high recrudescence rate. However, there is low toxicity and they are highly potent and rapidly metabolized (Babalola and Lamikanran, 2007).

Students should be given health education to make use of the University health services when they suspect the

symptoms of malaria. In this study, students were conversant with the symptoms they used to have whenever they had malaria; headache was the most common symptoms recognized by participants, whenever they had malaria. Malaria is often accompanied by headache and the symptoms may at first look like mild flu, so that the patient may not seek medical attention until critically ill. It was observed that the students had the habit of tolerating the malaria symptoms and embarking on self medication, until they become critically sick and have to be taken by their colleagues to the health centre. This is similar to the observation by Matta et al (2004) that outpatients in New Delhi did not approach the doctor ,until three days critically ill with fever.

For prevention, students need access to bednets, information to use them and when to report for malaria. Services must be available for malaria monitoring and treatment. Brabin and Brabin (2005) stated that behavioral change including appropriate health seeking practices is essential for disease reduction and failure to prioritize adolescent and young adults' health may seriously limit the success of disease programs. According to (WHO, 1999); The enjoyment of the highest attainable standard of health is a fundamental human right. Good health is an essential foundation for social and economic development and access to basic health care is a human right (Heggenhougen et al, 2003).

The Lagos State University as an educational institution should enlighten the students by educating them on their health, avoiding mosquito bites, prompt and early reporting of malaria symptoms and proper use of malaria drugs. Students need to be reminded to clear bushes and stagnant pools around their hostels. This study has emphasized that malaria constitute a threat to the health and academic status of students. The study still reveals that the fight against malaria is a big challenge to public health today.

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REFERENCES

Adams-Campbell LL, Nwankwo MU, Omene JA, Ukoli FA (1998). Assessment of cardiovascular risk factors in Nigerian students. Arteriosclerosis, thrombosis and vascular biol. 8:795-796.

Afolabi BM, Sodeinde O, Audu RU (1997). Malaria in early infancy on the Atlantic coast of Lagos, Nigeria. Nig. J. Med. Res. 1 (2) :32-36.

Alouch JR (1997). Higher resistance to *P.falciparium* infection in patients with homozygous sickle cell disease in western Kenya. Trop. Med. Int. Health. 2 (6):568-571.

Amajoh CN, Odukoko AB, Mosanya ME (2002). Preliminary investigations on malaria in the atlantic coastal margin of Ibeju-lekki, Lagos State, Nigeria. J. Mal. Afri. Trop. 1 (1) 17-19.

Annonymous (2009). Amanet commemorates World Malaria Day. Dar es Salaam Tazania. WHO document.

Annonymous (2003) .African Malaria Report (A.M.R) (2003). Executive summary on Malaria. http:/ www.rbm.who.int.

Awolola TS, Ibrahim K, Okorie T, Koekomoer LL, Hunt RH, Coetzee M (2003). Species composition and biting activities of anthropophilic *Anopheles* mosquitoes and their role in malaria transmission in a holoendemic area of south - western Nigeria. Afr. Entomol. 11: 227-232.

Awolola TS, Okwa OO, Hunt RH, Ogunrinade AF,Coetzee M (2002). Dynamics of the malaria vector populations in coastal Lagos, South-western Nigeria. Ann. Trop. Med. Parasitol. 96: 75-82.

Awolola TS, Oyewole IO, Koekemoer LL, Coetzee M (2005).Identification of three members of the *Anopheles funestus* (*Diptera: Culicidae*) group and their role in malaria transmission in two ecological zones in Nigeria. Trans. Roy. Soc. Trop. Med. Hyg. 99:525-531.

Babalola OO, Lamikanran A (2007). The response of students to malaria and therapy in a university in south western Nigeria. Res. Soc. Admin. Phar. 3(3) 351-362.

Brabin BJ (1985). Epidemiology of infection in pregnant women. Rev. infect. Dis 7:579-525

Brabin L, Brabin BJ (2005). HIV, Malaria and beyond: reducing the disease burden of adolescents. Mal. J. 4:2-18.

Bruce Chwatt LJ (1970). Imported malaria, a growing problem. Trans. Roy. Soc. Trop. Med. 64 (2) 201-209.

Docampo, R (2002). Recent Infectious Disease: Re-emerging parasitic diseases. Emerg. Infect. Dis. 8(9):1009.

Elzubier AG, Ansari EHH, Nour El MH (1997). Knowledge and misconceptions of malaria among secondary school students in Kassala, Eastern Sudan. J. Roy. Soc. Prom. Health.117(6) 381-385.

Fawole OI, Onadeko MO (2001). Knowledge and home management of malaria fever by mothers and care givers of fewer than five children. West. Afr. J. Med. 20:152-157.

Fernando SD, Gunawardena DM, Bandara D, De Silva R, Carter KN, Mendis KN, Wickermasinghe AR (2003). Am. J. Trop. Med. Hyg. 69(6):582-588.

Greenwood B.M (1997). Asymptomatic malaria infections- do they matter? Parasitol today 3 (7): 200-214.

Greenwood BM, Mutabingwa T (2002). Malaria in 2002. Nature. 415:670-671

Hay SI, Rogers DJ, Toomer JF, Snow RW (2000). Annual *Plasmodium* entomological inoculation rates across Africa. Literature survey, internet access and review. Trans. Trop. Soc. Med. Hyg. 94:113-127.

Heggenhougen HK, Hackenthal V, Pramila V (2003). The behavioral and social aspects of malaria and its control. An introduction and annotated bibliography. 2003, TDR/SEB Research: UNDP/World Bank/WHO. pp. 214

Hill AV (1996) Genetic susceptibility to malaria. Ann. Trop. Med. Par. 112 (suppl) 573-584.

Lalloo D.G, Oluloya P and Olliaro P (2006). Malaria in Adolescents. Burden of disease, consequences and opportunities for intervention. Lancet. Infect. Dis.6 12, 780-793.

Lalloo DG (2004). Malaria in adolescence. Issues in adolescents and development. Department of child and Adolescent health and development. WHO Geneva. pp. 20

Leighton C, Foster, R (1993). Economic impact of malaria in Kenya and Nigeria. Applied Research Paper No. 6. Abt Associates Inc. In collaboration with Vector Biology Control Project, Medical Services Corporation International

Matta S, Khokhar A, Sachdev TR (2004). Assessment of knowledge about malaria among patients reported with fever: a hospital based study. J. Vect. borne Dis. 41:27-31.

Muala AS, Chimalizeni Y (2004). Knowledge, attitudes and practices towards malaria among primary school pupils in Ndirande, Malawi. Trop. Doct. 34(2) 90-93.

Najera JA, Hempel J (2006). The burden of Malaria. CTD/Mal/ 96.10. pp. 35.

Ndawala J, Kalanda G, Mahy, M (2000). Malawi MDHS. Data analysis.

Malawi National Statistics Office. http:// www.nso.malawi.net/.
Nebe OJ, Adeoye GO, Agomo P.U (2002). Prevalence and clinical profile of Malaria among the coastal dwellers of Lagos State, Nigeria. Niger. J. Parasit. 23, 61-68.
Ntoumi F, Contamin H, Rogier C, Bonnefoy S, Trape, J and Odile M.P (1995) Age dependent carriage of multiple *Plasmodium falciparium* merozoite surface antigen -2 alleles in asymptomatic malaria infections. Am. J. Trop. Med. 52(1) 81-88.
Okwa OO (2004a) .Preliminary investigations on malaria in sickle cell patients among pregnant women and infants in Lagos, Nigeria. Niger. J. Parasit. 25:81-85.
Okwa OO (2004b). The status of malaria among pregnant women. A study in Lagos, Nigeria. Afr. J. Reprod. Health 7(5)77-83.
Okwa OO, Akinmolayan IF, Carter V, Hurd H (2009). Transmission dynamics of malaria in Nigeria. Ann. Afr. Med. 8 (1):1-9.
Olumese PE, Sodiende O, Ademowo OG, Walker O (1997). Protein energy malnutrition and cerebral malaria in Nigerian children. J. Trop. Pediatr. 43:217-219.
Onwujekwe O, Chima R, Okonkwo P (2000) Economic burden of malaria illness on households versus that of all other illness episodes: A study in five malaria holo-endemic Nigerian communities. Health policy. 54:143-159.
Peetermanns W.E and Wijingaerden E.V (2001). Implementation of pre travel advice. Good for malaria; bad for diarrheoa. Acta Clin. Belg. 56-5, 284-288.
Pelletier D.L Frongillo E.A, Schroeder D.G and Habicht J.P (1995) The effects of malnutrition on child mortality in developing countries. Bull. WHO 73(4): 443-448.
Sachs J, Malaney P (2002) The economic and social burden of Malaria. Nature. 415:680- 685.
Salako LA (2001). Treatment of childhood fevers and other illnesses in three rural Nigerian communities. J. Trop. Pediatr. 47:230-238.
Salako LA (2002) National Malaria day: Malaria awareness walk 2002, Abuja, Nigeria . Text of an address. April, 2002.
Salako LA, Ajayi FO, Sowunmi A, Walker O (1990). Malaria in Nigeria. A revisit. Ann.Trop. Med. Parasitol. 84(5):435-45.
Umeaneto PU, Ekejindu IM, Ifeanyichukwu MO (2006) Prevalence and intensity of malaria in blood donors at NAUTH Nnewi, Anambra State, Nigeria. Niger. J. Parasit. 27:11-15.
Verhoef H, West CE, Kraijenhagen SM, Nzyuko R, King MM, Mbandi S, Van laatum R, Hogervorst C, Schep P, Kok FJ (2002). Malarial anemia leads to adequately increased erythropoiesis in asymptomatic Kenya children. Blood. 100 (10) :3489-3494
Verhoef H, West CE, Ndeto P, Burema J, Beguin Y, Kok FJ (2001). Serum transferrin receptor concentration indicates increased erythropoiesis in Kenyan children with asymptomatic malaria. Am. J. Clin. Nutr.74 (6): 767- 775.
World Health Organization (WHO) (1995). Methods of counting malaria parasites in thick blood films. Bench Aids for the diagnosis of malaria .Pp. 1-8
World Health Organization (WHO) (1998). Examining blood films for malaria parasites. Bench Aids for the diagnosis of malaria. Pp.1-8
World Health Organization (WHO). Fact sheet No. 94: Malaria; October (1999) statistics.