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MALARIA PARASITAEMIA AND MORBIDITY AMONG STAFF OF THE NATIONAL OPEN UNIVERSITY OF NIGERIA (NOUN), VICTORIA ISLAND, LAGOS

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ABSTRACT

Malaria parasitaemia and morbidity have been a serious public health problem throughout the developing world. It has also been of great concern to governments and health care providers, hence the need for this study. The objectives of the study were to determine the prevalence of malaria parasitaemia and morbidity among staff of the National Open University of Nigeria; the age and sex prevalence; the predominant *Plasmodium* species infecting the workers in order to make appropriate recommendations. The cross-sectional descriptive study design was adopted and a total of 260 blood samples were randomly collected from different categories of staff of the National Open University of Nigeria, Victoria Island Lagos. The blood samples were examined for malaria parasites using the thick and thin blood film method. Of the 260 samples, 105 (40.4%) of the staff had malaria parasitaemia. Infection was highest among the junior staff; more females, 61 (46.9%) had the infection than their male counterpart 44 (33.8%) ($p<0.05$). While proportions of infected staff were highest within the 21-30(54.2%) and 31-40(53.8%) age cohorts, *Plasmodium falciparum*(94.3%) was the most predominant malaria species, while*Plasmodium malariae* (4.8%) trails behind.Moreso, malaria morbidity showed significant relationship with the junior staff status($p<0.05$) and this category of staff had complained more of fever, headache, fatigue and general debility than their senior counterparts.We advice that the University staff should be encouraged to make use of insecticide treated nets, residual in-house spraying of insecticide in their very locations as well as consume foods rich in vitamins A and Zinc such as spinach, tomatoes, eggs , meat ,fish, cereals and diary products.

Keywords: Malaria, Parasitaemia, Lagos, Staff, Morbidity

INTRODUCTION

Malaria is a parasitic disease affecting the red blood cells and a major cause of morbidity and mortality amongst vulnerable adults, children, pregnant mothers and other people in emergency situations. It ranks as the number one killer disease in Africa. Malaria is endemic in Nigeria as reported by WHO on Roll Back Malaria between 1990 and 1999 (Lagos State Ministry of Health, 2015).

In Nigeria also, malaria represents a substantial public health challenge. The country accounts for up to 25 percent of malaria burden in sub-Saharan Africa, which is globally reported as the region with the highest burden for malaria, (Nigeria Malaria Indicator Survey(MIS) Final Report, 2010). In terms of morbidity, malaria is responsible for around 110 million of clinically diagnosed cases, 30 percent of hospital admissions and 60 percent of out-patient visits each year (Mouzin Eric, 2012). Moreover, malaria is also responsible for 300,000 childhood deaths and 11 percent maternal deaths annually (Nigeria Malaria Indicator Survey(MIS) Final Report, 2010; Kyu et al, 2013; World Malaria Report(WMR), 2010).

In Tanzania, Hugh et. al., (2004) observed 46.1% in a study termed "Over Diagnosis of Malaria Parasitaemia in Patients with Severe Febrile Illness". In Nigeria, several studies on the prevalence, pattern and distribution of malaria have been variously reported. For instance, Abbas *et. al*., (2015) revealed a 6.4% prevalence of malaria in Lagos and 43.3% in Borno; while George *et. al*., (2015) reported 38.8% in North Central Nigeria. Dougnon et al (2015) had 22.0% prevalence in Nigeria, with males (63.33%) being more infected than their female (36.36%) counterparts. Elsewhere, in Northeastern Nigeria, Houben et al (2013) made a discovery of 24.5%, while Sam et al (2014) revealed a prevalence of 71.1% in their study of epidemiological factors in prevalence of malaria parasites in primary healthcare facilities

attendees in Ogun State, Nigeria and in their findings, *Plasmodium falciparum (95.6%) was the most frequent, followed by Plasmodium malariae (3.3%), Plasmodium ovale(0.7%) and P.vivax (0.4%)*; but Awoyemi (2003) reported 43.0% in his study of malaria morbidity amongst hospital workers in Illorin.

The most critical factors incriminated in the spread or eradication of malarial disease include human behaviours (shifting population centers; changing farming methods); living standards , and poverty as the predisposing factors associated with the disease (Worrall et al, 2003).The availability of numerous breeding places for malaria parasite vectors (mosquitoes), the incessant rainfall, unsanitary environmental conditions, ignorance, poor behavioral attitudes and inadequately planned socio-economic projects have made the Nigerian environment a fertile ground for the escalation of the malaria infection (*Anthonio-Nkonjio et al.,* 2006). Similarly, it has been observed that there is high level of malaria infestation in Lagos, Nigeria. The reason is due to the tropical and humid nature of Lagos state coupled with people's behavior, Lagos being a cosmopolitan area. These factors encourage the breeding of mosquitoes and thus increase human vector (that is mosquitoes) - contact which promotes the continuous transmission of infection. However, Lagos state government has been making concerted efforts at combating the malaria scourge even before the malaria eradication programme.

From the forgoing, it is evident that many publications have dealt extensively with prevalence of malaria in Africa, Nigeria and Lagos, but none has studied the role of malaria parasitaemia and morbidity in the frequent cases of ill-health amongst staff of National Open University of Nigeria, Lagos, and this is the rationale for this investigation.

OBJECTIVES OF THE STUDY

The purpose was to determine the prevalence of malaria parasitaemia and morbidity

among the staff of the National Open University of Nigeria in Victoria Island, Lagos.

The specific objectives were to:

1.Determine the age and sex-related prevalence of malaria parasitaemia amongst staff of NOUN

2.Determine the predominant *Plasmodium* species infecting the staff of NOUN.

MATERIALS AND METHODS

Study Area:

The study was carried out between April and September, 2015 at the National Open University of Nigeria (NOUN), a Federal Government institution situated in Lagos state, southwest geopolitical zone of Nigeria. Lagos is a cosmopolitan city with a population of 21 million (National Population Census, 2006). Victoria Island is an area in Lagos, surrounded by the Atlantic Ocean and the Lagos lagoon. Open gutters and drainages abound and empty cans litter around; all these serve as good breeding grounds for the biological vectors of malaria parasites. Some of the NOUN staffers, especially the junior staff, live in areas, with unsanitary environmental conditions where there are affordable houses. This renders such staff extremely vulnerable to mosquito bites which really are a sure route of malaria transmission.

Study Design:

This is a cross-sectional descriptive study of the staff of the National Open University of Nigeria Headquarters, Lagos.

Study Population:

Using convenience sampling technique, two hundred and sixty (260) staffers of NOUN, the target population, made up of 130 females and 130 males (comprising of 130 junior and 130 senior staff) who ranged between 21 to about 70 years of age and visited the University's Clinic with complaints of ill-health (fever, weakness, headache etc) were referred to the NOUN Diagnostic Laboratory and tested for malaria parasitaemia. Out of this number, 130 (50.0%) were junior staff,

while 130 (50.0%) remain the senior staff, both academic and non-academic.

Criteria: The patient must be a staff of NOUN ,with NOUN identy card and number. Oral interview was also used in knowing their positions in their various offices.

Ethical Clearance:
Ethical clearance was obtained from the Research Ethics Committee of the School of Health Sciences, National Open University of Nigeria. Subjects included in the study were adults working at the National Open University of Nigeria as either academic or non-academic staff who volunteered to participate in the study. Informed consent was obtained from the participants after explaining the purpose and what they will gain by participating.

Collection of Blood Samples
The blood samples of the patients were collected by a finger prick with sterile lancet, after swabbing or cleaning the fingertips of the patients with 70% alcohol or spirit (Ochei and Kolhatkar, 2008; WHO,2000).

Preparation of Blood Films:
Thick blood films: these were prepared by placing two drops of fresh blood sample on clean, dry, grease free slides. With a corner of another slide, the drops on each slide was mixed in a circular motion over an area of about two cm in diameter, this mixing was continued for about 30 seconds to prevent formation of fibrin strands that may obscure the parasites after staining. The films were allowed to dry in air at room temperature, (Ochei and Kolhatkar,2008; WHO, 2000)

Thin blood films: these were prepared in exactly the same way as the one used for a peripheral blood smear examinations, that is, as in differential blood films, allowed to dry, after drying, they were carefully dipped into absolute methanol (alcohol) to fix in order**to avoid** lysing of the red blood cells while staining. This was done in accordance with WHO, 2000 ; Ochei and Kolhatkar,2008.

Staining: This was done in accordance with the guidelines provided by WHO (2000, 2009; Ochei and Kolhatkar, 2008) using Giemsa stain, to ensure sensitivity, specificity and the production of clear, well stained slides, thereby reducing errors due to artifacts that could lead to inaccurate diagnosis of malaria.

The stained slides were allowed to dry under room temperature and examined microscopically using oil immersion objective lens at x100 magnification.

Criteria for Identification of Malaria Parasite: The presence of ring forms (Trophozoites) with blue cytoplasm, Schuffner's (red) or Maurer's (Red-mauve) dots is said to be positive for malaria parasite.

RESULTS:

Table 1: Gender-related Prevalence of Malaria Parasitaemia amongst Staff.

Gender	No Tested	No. Infected (%)	No. Uninfected (%)
Female	130	61(46.9)	69 (53.1)
Male	130	44 (33.8)	86 (66.2)
Total	260	105(40.4)	155(59.6)

Table 1 is the gender-related prevalence of malaria morbidity amongst staff. The overall prevalence of malaria parasitaemia amongst the staff was 105 (40.4%) with the females 61(46.9%) being more infected than their males 44 (33.8%) counterparts ($P<0.05$).

Table 2: Age-related Prevalence of Malaria Morbidity amongst the Staff of NOUN

Ages (years)	No. tested	No. Positive (%)	No. Negative (%)
21-30	48	26(54.2)	22(45.8)
31-40	52	28(53.8)	24(46.2)
41-50	54	20(37.0)	34(63.0)

51-60	54	18(33.3)	36(66.7)
61-70	52	13(25.0)	39(75.0)
Total	260	105(40.4)	155(59.6)

In Table 2, the pattern of spread of malaria morbidity amongst the staff of NOUN by age is indicated. The age group mostly affected were those within the 21-30 (54.2%) and 31-40 (53.8%) age cohorts, followed by 41-50 (37.0), 51-60 (33.3%) and 61-70 (25.0%) age brackets in that order.

Table 3: Staff Rank-Relation to Malaria Parasitaemia.

Staff status	No. Tested	No. Infected (%)	No. Uninfected (%)
Junior	130	65(50.0)	65(50.0)
Senior	130	40(30.8)	90(69.2)
Total	260	105(40.4)	155(59.6)

Table 3 demonstrates staff rank-related prevalence of malaria morbidity. Here, the junior staff, 65 (50.0%), had more parasitaemia than their senior staff, 40 (30.8%) counterparts ($P<0.05$).

Table 4: Distribution of Plasmodium Species in the Study.

Plasmodium species	Frequency (%)
Plasmodium falciparum	99 (94.3)
Plasmodium malariae	5 (4.8)
Plasmodium ovale	1 (0.9)
Plasmodium vivax	(0.0)

Table 4 shows the Plasmodium species frequency in the study. *Plasmodium falciparum*, 99 (94.3%) was the most frequent, followed by *P.malariae*,5(4.8%), *P. ovale*, 1(0.9%), and*P.vivax* (0.0%).

DISCUSSION

Malaria infection, throughout the world, has been a very

great concern and serious public health problem. The difficulty in eradicating, reducing or controlling it has equally remained a great challenge to the government of the day. In this cross-sectional descriptive study, the outcome shows a high prevalence of malaria parasitaemia amongst the staff of the National Open University of Nigeria (40.4%). This is not surprising because, malaria is endemic in Nigeria as in most other tropical countries; therefore, every Nigerian is at risk of contracting the infection, including staff of the National Open University of Nigeria (Awoyemi, 2003, Tropical Disease Research(TDR, 1997).

The prevalence of 40.4% (see Table 1) obtained in this investigation is high when compared with earlier results obtained in other parts of Nigeria including Lagos. For instance, in earlier studies in Lagos, Aina *et al*, (2013) recorded 14.7%, our result, however, agreed with Awoyemi, (2003) who in his study of malaria morbidity amongst hospital workers in IlorinTeaching Hospital reported 43.0%.It also, corroborated the findings of Abbas et al (2015) in Borno and Mwanziva et al (2008) in Tanzania who had 43.3% and 40.0% respectively in their studies. Nonetheless, the observation in this study ran contrary to the works of Sam et al (2014); and Hugh et al (2004) who revealed high prevalences of 71.1% and 80.4% in their separate reports.

The differences in the rates of these findings may be attributed to several factors among which include, the study area; skills and experiences of the investigators, for example, the laboratory personnel involved in the blood film preparation, staining, reading of the stained slides; and socio-economic condition of the study population. The involvement of this infection in febrile illnesses had earlier been established by some authors including Hugh *et al*. (2004) and Awoyemi (2003).

The gender result shown in Table 1 indicated that more females (46.9%) than their male counterparts (33.8%) were infected. The same

observation had been documented in a similar study in 2003 (Awoyemi, 2003), but was not in conformity with the works of Dougnon et al (2015) and Kalu *et al.* (2012), who variously reported males (63.13%) and females (36.36%); males (73.8%) and females (72.9%) respectively. These disparities could be as a result of the fact that more female staff of the University visited the University clinic and also suffered more illnesses including malaria than the male staff. This is in line with the works of Awoyemi (2003) and Pines *et al*. (1985). Other possible reasons for the disparity could be differences in the life styles of both sexes in their different environments as well as the personnel involved in the studies. However, most of the reports have it that the infection does not discriminate between sexes. This means that both sexes are susceptible to the same measure of malaria morbidity; and this agrees with the report of Sam *et al*., (2014).

The pattern of spread of malaria morbidity amongst the staff of the University by age is shown in Table 2. The group mostly affected was those within the 21-30 (54.2%) and 31-40 (53.8%) age cohorts and could be as a result of the fact that these age brackets leave in locations where mosquitoes frequently strikes or bites (WHO, 2002) due to availability of numerous breeding places for malaria vectors occasioned by the incessant rainfall, unsanitary environmental conditions and poor behavioural attitudes and inadequately planned socio-economic projects(Anthonio-Nkonjio et al.,2006, Robert et al., 2003). This finding is very noteworthy showing that malaria could also affect the productivity of these workers ,and at the highest level of healthcare delivery in the developing countries and by extension, it is an indication that the disease could sap energy from the most productive level of manpower of tropical countries resulting in low economic development (Awoyemi, 2003).

The staff rank-relation to malaria parasitaemia is shown in Table 3. The junior staff had

more infections (50.0%) than their senior cohorts (30.8%). The reasons for this sort of outcome, may be because their senior counterparts feed on better healthy foods, fruits and vegetables which build up their immunity and make it stronger than that of the junior ones, as nutritional status of a person or persons suffering from malaria is/are thought to be one of the biggest factors of host resistance and recovery (Caulfield et al., 2004). Others may include , more exposure to areas where mosquitoes can easily reach and bite them; level of income to enable the junior ones avail themselves of good quality medication as well as their lifestyles.

Furthermore, the frequency of Plasmodium species involved in this investigation is as presented in table 4 and shows that *Plasmodium falciparum* was the main agent of parasitaemia among the subjects studied. This result agrees with the findings of Sam et al (2014), who reported *Plasmodium falciparum*(95.6%), *lasmodium malariae*(3.3%), *Plasmodium ovale*(0.7%) , *Plasmodium vivax*(0.4%) in their studies and this corroborates the statement credited to Louis et al(1980) that *Plasmodium falciparum* is the most deadly and frequent of the species, while others especially *Plasmodium malariae,* trail behind. This finding further supports the assertion that *Plasmodium falciparum, Plasmodium malariae and Plasmodium ovale* are more frequent in Africa, while *Plasmodium vivax* is mostly found in Asia and Latin America (CDC,2012). Nevertheless, the pattern of frequency obtained in this study did not agree with the findings of Ivo et al (2009) who recorded *Plasmodium falciparum* (33.3%), *lasmodium vivax*(6.1%), *and Plasmodium ovale* (0.1%) respectively in Wosera area of Papua New Guinea. The variations witnessed could be due to environmental differences, the sensitivity and specificity of the processes and the dexterity of the personnel (microscopists) involved (Hugh et al, 2004).

In conclusion, the result of this study indicates that about 40.4% cases of morbidity and parasitaemia among the staff

of the National Open University of Nigeria(an Open and Distance Learning Institution), is caused by malaria. Moreover, sex and staff- rank are relevant factors of infection in the University. These findings stand to guide future research of this nature on prevention and control of malaria prevalence amongst staff.

We therefore advice and recommendthat the University staff should be encouraged to be making use of insecticide treated nets, and residual in-house spraying of insecticide in their various locations of abode as well as consume foods rich in vitamin A and Zinc such as spinachs, tomatoes, eggs, meat, fish, cereals and diary products to boost their immunities (SanJoaquin et al., 2009 and Black., 2003). Moreso, public enlightment and education on malaria prevention and control should occasionally be organized for the University community.

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