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Prevalence of Malaria Parasite Among Students of Federal University Wukari, Taraba State, Nigeria

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Abstract

This study examined the prevalence of malaria parasite among students of Federal University Wukari, Taraba state, Nigeria. This study adopted experimental (survey) design, Primary data was obtained from the Students of Federal University Wukari to access the prevalence of Malaria infection, and the sample size calculated approximately to be 400 as the baseline sample size of our study to avoid bias in the selection of the tertiary students. Chi-square test was used to determine the mean differences in prevalence between age groups and gender at 95% confidence level using Statistical Package of Social Sciences at P-values less than 0.05 were considered as significant. The findings of the study revealed that the prevalence of malaria infection among the students examined was 57.0%, P. falciparum (57.90%) is more incident species infecting the student, it is also indicated that the males have a higher prevalence rate (57.0%) than their female counterparts (43.0%) and the difference in age do not vary significantly in the infection of malaria rather the prevalence is a function of exposure rather than age. Therefore, the enforcement of the rule on frequent public sanitation within the university hostels by the university management is essential and recommended, and he university management should periodically educate students on the need to use a mosquito bed net, fumigation, and indoor residual spray in their surroundings among other recommendations.

Keywords: Mosquito, Malaria, Parasite, Blood, Prevalence, Infection and Wukari

INTRODUCTION

Malaria is a serious public health problem caused by the *Plasmodium* parasite of the Apicomplexans family (Awosolu *et al.,* 2021). The *Plasmodium* species of Malaria include; *Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae,* and *Plasmodium ovale* are the four primary malaria parasites that cause infection in humans, whereas *Plasmodium knowlesi* is a zoonotic species prevalent in Southeast Asia (Awosolu *et al.,* 2021). *P. falciparum* is the most pathogenic and, together with *P. vivax,* causes most death, while *P. ovale* and *P. malariae* cause a milder form of malaria that is rarely lethal (Beare *et al.,* 2006; Gething *et al.,* 2012). The disease is transmitted from one person to another through the bite of female *Anopheles* mosquitoes (Cox, 2010). It primarily infects people worldwide in tropical and subtropical areas, mainly in Sub-Saharan Africa (Ezihe *et al*., 2019). Malaria caused the majority of worldwide morbidity and mortality, with nearly 3.1 billion dollars spent on malaria control and elimination projects in Sub-Saharan Africa in 2017 (WHO, 2018).

The breeding of mosquitoes especially the main malaria transmitting vector (Anopheles Gambiae) and the spread of malaria are aided by the environmental conditions of tropical and subtropical African countries, such as constant high temperature, humidity and copious stagnant waters due to poor drainage systems (Ogomaka, 2020). An estimated 3.2 billion individuals worldwide are at risk of acquiring malaria each year (Awosolu *et al*., 2021). Furthermore, in 2017, nearly 219 million cases were reported in 87 countries, resulting in approximately 435,000 deaths (WHO, 2018).

Malaria spread all year in Nigeria, where more than 194 million people are at risk of contracting malaria disease. As a result, Nigeria had the highest malaria prevalence worldwide in 2007 (FMOH, 2009). Malaria significantly contributes to the rise in hospital visits throughout Nigeria's six geo-political zones (Adeyemo *et al*., 2014). The Nigerian Federal Ministry of Health estimated 110 million clinical malaria cases each year, costing the country NGN 132 billion in treatment and preventative costs (FMOH, 2009). The intensity of malaria transmission is determined by demographic (age and gender) and environmental factors (presence or absence of bushes and forests that enhance mosquito

breeding). Climate elements such as temperature, humidity, and rainfall, which may favour mosquito vectors' rapid growth and development, are also risk factors for malaria transmission. These factors have been well reported in previous studies in Nigeria (Gunn *et al.*, 2015; Morakinyo *et al.*, 2018).

Most malaria studies and interventions in Nigeria have focused on pregnant women (Agomo *et al.*, 2009; Fana *et al.*, 2015) and infants (Morakinyo *et al.*, 2018; Olasehinde *et al.*, 2010). It is challenging to create risk-based preventive interventions in academic settings like universities. University students frequently engage in late-night or early-morning activities, whether academic or otherwise, putting them at risk of Plasmodium-infected mosquito bites and thus malaria infection. Aside from mortality, the effects can include disruptions in school attendance, performance, and student absence. However, despite the high prevalence of malaria infection reported from various high institutions of learning in Nigeria (Adepeju, 2017; Ezugbo-Nwobi *et al.*, 2011; Ibekwe *et al.*, 2009; Udeze *et al.*, 2013) and other parts of the world (Bamou and Sevidzem, 2016; Solomon and Teklu, 2019), there is still a dearth of information on the prevalence of malaria infection among students in the present study area. Therefore, this study was designed to determine the status of malaria among the students of Federal University Wukari, Taraba State.

Statement of the Problem

Malaria is a mosquito-borne infection of human caused by genus plasmodium. 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, born on health and socio-economic attitudes. The environment where most Nigeria students of tertiary institution live are below standard educational environment, either off campus or within the campus. This could aid the breeding of Anopheles gambiae being spread widely and very difficult to control and can be attributed to unconducive environment which are breeding sites for mosquitoes, the malaria vector (Adeyemo et al., 2014). This unconducive environment is characterized by stagnant water, bush, poor drainage, indiscriminate dumping of refuse, poor building structure, unhygienic living and unkempt environment. This might make the students living in such environment to be prone to malaria infection. A number of studies have revealed the effects of malaria on class attendances and learning performances in educational institutions in Nigeria (Thuilliez, 2009; Adeyemo et al., 2014). Therefore, this

study aim to investigate the prevalence of malaria parasitic infection among the students of Federal University Wukari, Taraba State, Nigeria.

Justification of the Study

The prevalence of malaria parasites among students of Federal University Wukari holds significant implications for both individual health and the university community as a whole. Malaria is a widespread and potentially serious infectious disease, and understanding its prevalence among students can help shape targeted health interventions and awareness campaigns.

Assessing the prevalence of malaria parasites provides valuable insights into the health status of the student population. This knowledge can guide the development of tailored strategies for prevention, early detection, and treatment.

MATERIALS AND METHODS

Area of Study

The study was carried out in Federal University Wukari, The Federal University, Wukari was established in 2011 by the federal government of Nigeria led by the then President, Goodluck Jonathan, The area is geographically located between latitude 7°51'N North of the Equator and 9°47'E East of the Greenwich meridian in Taraba State, Nigeria. The town is located in the tropical rain forest zone of Nigeria with network of streams and other water bodies that favor the breeding of the mosquito vectors.

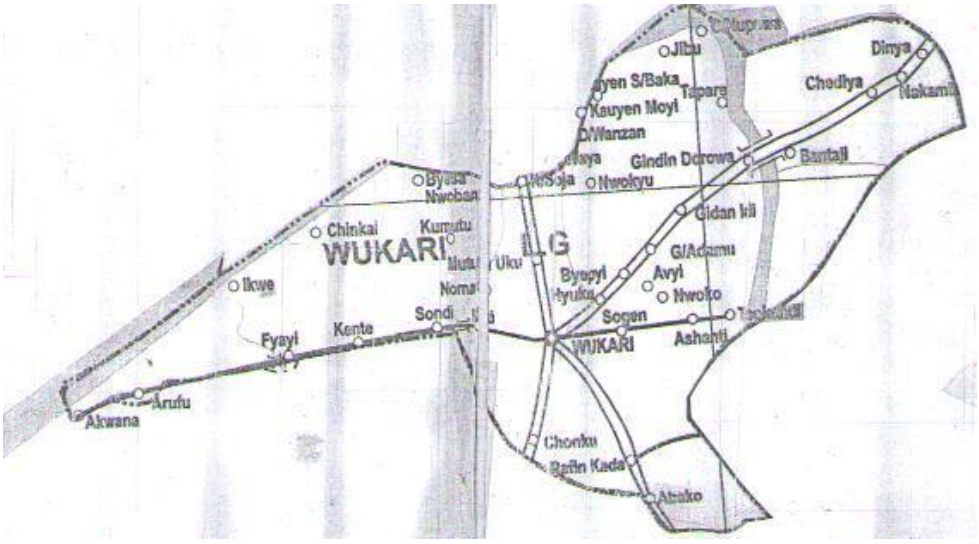

Fig. 1: Map of Wukari Local Government Area

Population and sample size determination

The population of this study will cover the entire undergraduate students of Federal University Wukari, Taraba State. Simple random sampling was used to determine the sample size of students in Federal University Wukari. According to Thrusfield (2018), the sample size was calculated with an expected prevalence of 50% at a 95% confidence level, and 5% desired absolute precision for the study area.

$$n = \frac{(z^2 \times p)\ (1-p)}{d^2}$$

Where: n = required sample size, P is the expected prevalence, and d is the desired absolute precision at z-value = 1.962 for the 95% confidence level. The expected prevalence was assumed to be 50% because no previous study had been conducted in the study area. This gave us a minimum sample of approximately 400. However, the sample size calculated is 400 as the baseline sample size of our study to avoid bias in the selection of the tertiary students.

Sample collection and Laboratory Analysis

The blood sample was obtained from the Students of Federal University Wukari with help of the Medical professional in the school Clinic. The students' fingers were prick using a careful aseptic procedure. Firstly, by swabbing the finger with 70% alcohol and allowed to dry before pricking. Subsequent drops of blood was collected on a clean microscopic slide to make the thick blood films, after which all slides were label accordingly. The thick blood films were prepared in accordance with the World Health Organization-recommended technique (Organization and Control, 2010).

Data Analysis

The chi-square test was used to calculate the differences in prevalence between age groups and gender at 95% confidence level using Statistical Package for Social Sciences at P-values less than 0.05 were considered significant. A simple percentage was employed to determine the level of species prevalence, thereby, the results is presented in table and chart.

RESULTS

The result of the study showed that the prevalence of malaria infection among university students of Federal University Wukari was 228 (57.0%), out of the 400 students examined; as reflected in Table 1. Fig 2 shows the prevalence of Malaria parasite species composition of *Plasmodium* infections among federal university students, the result revealed that majority of the students were infected by *P. falciparum* Specie 132(33%), followed by *P. malariae* which infected 76(19%) of the students, 2(0.5%) were infected by *P. ovale* while *P. falciparum* + *P. malariae* infected 18(4.5%) of the positive samples. Therefore, the most incident of *Plasmodium* specie is *P. falciparum* and the least incident *Plasmodium* specie is *P. Ovale.*

Table 2 indicates the distribution of students on the basis of gender and age examined with their prevalence of malaria infection. The highest prevalence was observed in the male students, 130(35.5%) and the female had 98(24.5%). The observed differences in the prevalence of malaria infection among gender vary significantly ($\chi^2 = 9.155$, $P < 0.05$). In terms of the prevalence of infections based on the students' age categories. 126 of the university students were between the age group of 18-20 years, 100 were between the age group of 21-23 years, 78 were between the age group of 24-26 years, 70 were between the age group of 27-29 years and 28 of the students are between the age group of 30 and above were enrolled in this study. The highest prevalence of malaria infection was recorded among the category of 21-23 age group with 60(15%) prevalence and the least prevalence were observed in age group 30 years and above 16(4.0%). However, the result showed no statistically significant difference in the prevalence of malaria infection within the age groups ($\chi^2 = 11.216$, $P = 0.24$).

Table 1: Prevalence of malaria infection among university students

Students	**Frequency**	**Percentage (%)**
Positive	228	57.0%
Negative	172	43.0%
Total	**400**	**100%**

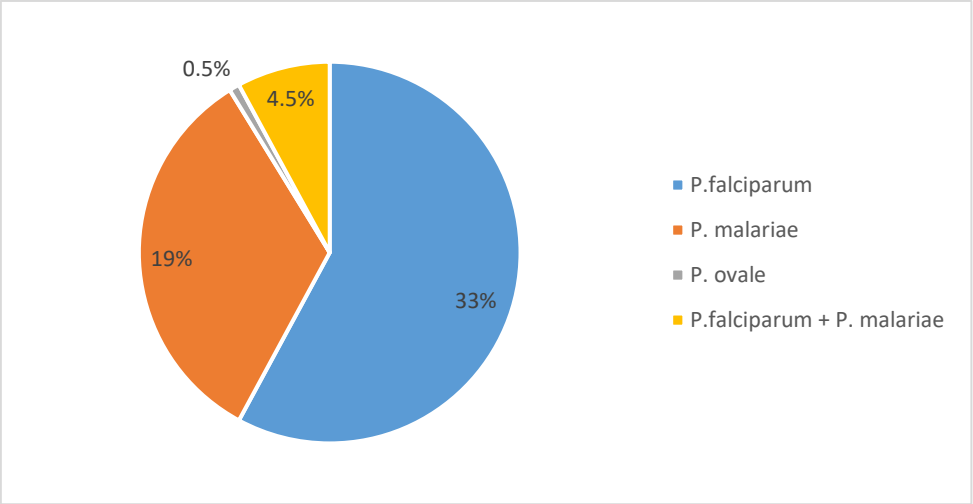

Figure 2: Percentage distribution of *Plasmodium* species composition that infected the University students

Table 2: Demographic features specifically gender and age of students' and their prevalence of Malaria infection

Variable	Frequency	Percentage	No. Positive (%)	No. Negative (%)	χ^2	p-value
Gender						
Male	200	50%	130 (32.5%)	70 (17.5)	9.155	0.002
Female	200	50%	98 (24.5)	102 (25.5)		
Age (Years)						
18-20	126		58(14.5)	66(16.5)	11.216	0.24
21-23	100		60(15)	42(10.5)		
24-26	78		44(11)	32(8)		
27-29	70		50(12.5)	20(5)		
30>	28		16(4)	12(3)		
Total	400		228(57%)	172(43%)		

DISCUSSION

The results obtained in the study showed a high prevalence of malaria among Federal University Wukari (FUW) students living in both on and off campus. The prevalence of malaria infection among the students examined was 57.0%. This revealed that the students were infected with malaria at a significant rate. The findings were similar to those reported by Simon-Oke and Akinbote (2020) among University students in Akure, Nigeria, who

discovered 60.5 percent of malaria infection. This is in accordance to the report of Onyiri (2015) which concur that, recent malaria risk maps, malaria prevalence in Nigeria ranged from less than 20% in certain places to over 70% in others. The result from the present study was relatively higher than what was reported by Mukhtar *et al.* (2020), who recorded a 26.0% prevalence of malaria infection among some undergraduate students in Kano state, northwest Nigeria. Other reported prevalence that concur with the present findings were that of Awosolu *et al.* (2020) who found a substantially higher frequency of malaria (84.20%) among students at the Federal University of Technology, Akure South-west Nigeria. Likewise, Ibekwe *et al.* (2009) in Nnamdi Azikwe University in Awka, South-Eastern, Nigeria, and Adepeju (2017) in Federal University of Technology, Akure, south-west, Nigeria reported 80.3 % and 80.0% malaria prevalence among their students, respectively. The high prevalence of malaria observed might be linked to the presence of bushes and stagnant water around their vicinities which is in line with the comment of most students participant in this study accord to this explanation. Stagnant water and bushes environment were among the risk factors of malaria infections. They increase mosquitoes breeding in the environment and, resulting in infection transfer to people living in such locations. On the other hand, the high malaria infections prevalence could be ascribed to student activities such as night reading in class, which is commonly practiced by most students and is generally done in the open, exposing them to mosquitos' bites.

The findings also revealed that *P. falciparum* (33.0%) is the most incident species infecting the students' this concur with the results of Beare *et al.*, (2006) and Gething *et al.*, (2012) who reported that *P. falciparum* is the most pathogenic and, together with *P. vivax,* causes most death, while *P. ovale* and *P. malariae* cause a milder form of malaria that is rarely lethal. *P. falciparum* malaria is the most dangerous form of the disease resulting in life threatening complications such as anaemia, cerebral malaria, renal disease, black water fever, pulmonary edema and dysenteric malaria (Markell and Voge, 1992). Onah *et al.*, (2017) asserted that the most infectious of the malaria parasites is *P. falciparum* and it is the most widespread and constitutes major threat in sub-Saharan Africa and Houmsou *et al.,* (2011) reported that Plasmodium falciparum is the overarching dominant Plasmodium specie in Nigeria which impacts negatively on commerce, economy and tourism in the affected locale.

From our findings, the males have a higher prevalence rate (32.5%) than their female counterparts (24.5%). The high percentage prevalence observed in the male students'

agrees with what was reported by Ezihe *et al.* (2019) and Ezugbo Nwobi *et al.* (2011) among Azikiwe's University students. Similarly, Adepeju (2017) reported a high prevalence among Federal University of Technology students, Akure. However, the findings of this study contradict those of Oyinlola *et al.* (2015), who found that female participants (31.2%) have a higher chance of contracting malaria than male participants (27.7%). The fact that males were more infected than females in the present study could be due to the fact that during warmer weather, males expose their bodies and prefer to sleep outside under insecticide-treated nets; therefore, the likelihood of being bitten by the mosquito vector increases. Males in some settings use health care services less than females because they may prioritize their health less, making them hesitant to go long distances to health centres even when malaria is suspected (Müller *et al.*, 1998). On the other hand, females are rarely nude and prefer to stay indoors doing housework, limiting their exposure to Malaria vectors. Variation in the frequency and intensity of exposures to the mosquito vector responsible for Plasmodium parasite transmission affects the infection rate (Ezugbo-Nwobi *et al.*, 2011).

The prevalence of malaria infection due to age groups categories, it was reveal that age 21-23 had the highest prevalence of (26.3%), the findings agrees with the observation work of Adesina (2013) and Ntoumi *et al.* (1995). Similarly, the findings were consistent with those of Richard *et al.* (2019), who concluded that prevalence is a function of exposure rather than age. This conclusion, however, did not support the findings of Ani (2004), who found a higher frequency among the youngest age group (16-20). They said the younger generation has a weakened immune system and is more prone to illnesses. Therefore, the differences in parasite density found between age groups could be linked to an individual's level of immunity, which varies with age and lifestyle.

CONCLUSION

Malaria is endemic in Wukari, Taraba state, and this is glaring evidence indicating malaria is a public health challenge even among the students of Federal University Wukari. Major risk factors influencing transmission include the student residence and non-use of mosquito nets in the study area. Therefore, the university management should periodically educate students on the need to use a mosquito bed net, fumigation, and indoor residual spray in

their surroundings. The university student should also be enlightened about mosquito breeding site identification and removal on and off-campus.

Recommendations

i. The enforcement of the rule on frequent public sanitation within the university hostels by the university management is essential and recommended.

ii. There should be a pragmatic approach by the management of the university to increase public awareness and enlighten seminars and workshop for the students.

iii. The government and other stakeholders should equip the health facility of higher institutions with enough drugs, including antimalarial drug and also make sure each student have access to mosquito nets.

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