Prevalence of Malaria Infection among Students Attending Federal University Otuoke Health Centre, Bayelsa State, Nigeria

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Abstract: Malaria is a common disease with public health challenges affecting people particularly in tropical and subtropical regions of the world. A study of prevalence of malaria infection was carried out between April and July 2017 among students attending Federal University Otuoke Health Centre in Otuoke, Bayelsa state, Nigeria, to provide epidemiological data on the status of malaria infection for effective management programme. A total of 200 students were examined for malaria parasite, 111 (55.5%) males and 89 (44.5%) females, using the blood film staining method. The result of the study showed that 160 (80%) were infected. Males (90.99%) were more infected than females (66.29%). Students aged 16-20 years were more infected (100%) than those in other age groups. The result was statistically analyzed using chi-square method. Infection among students was due to *Plasmodium falciparum* as identified by microscopy. Malaria, as a public health concern it is, need prompt diagnosis and early treatment which will significantly reduce disease transmission and prevent death among students. Baseline information from this study will aid in planning and implementation of malaria control programmes in the area and state at large by governments, their agencies and individuals. There is also the need for the promotion of insecticide-treated bed nets (ITNs), intermittent preventive treatment and increased public awareness and campaigns for malaria prevention and treatment in the area. The need for improved accessibility to health facilities and government support is imperative to achieve the goal of malaria elimination in the area and Nigeria at large.

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INTRODUCTION

Malaria is a life-threatening disease of man caused by parasites of the genus Plasmodium and is transmitted exclusively by the bite of an infected female Anopheles mosquito (Mackey, 1992, WHO, 2017). However, cases also occur through exposure to infected blood product or transplanted organ, as well as through congenital transmission (CDC, 2012). Four species of the *Plasmodium* that commonly affect man include *Plasmodium malariae*, *Plasmodium vivax*, *Plasmodium ovale* and *Plasmodium falciparum* (Thayer and Hewetson, 1895; Garnham, 1966; Mackey,1992; Adeyemo *et al*., 2014). *Plasmodium falciparum* has a leading role in the causation of malaria in West Africa (Erhabor *et al.,* 2012).

Malaria distribution and prevalence depends mainly on climatic factor such as temperature, humidity and rainfall (CDC, 2017). Nigeria has more reported cases of malaria and deaths due to malaria than any other country in the world (Nigeria Malaria Fact Sheet, 2011). World malaria report indicated that Nigeria accounted for a quarter of all malaria cases in the 45 malaria endemic countries in Africa showing clearly the challenges of malaria in Nigeria (WHO, 2008). Malaria contributes greatly to the increase in hospital attendance across the six geo-political zones of Nigeria (Adeyemo *et al*., 2014).

The Federal Ministry of Health in Nigeria revealed that it accounts for 110 million clinical cases annually and that about N132billion is lost to the treatment and prevention of malaria (FMOH, 2005). Endemicity of malaria in Nigeria could be attributed to non-compliance on the part of Nigerians to the preventive measures and correct use of artemisinin-based combination therapy (Adeyemo *et al*., 2014). The intensity of transmission of this disease depends on factors related to the parasite, the vector, the human host, and the environment (WHO, 2014).

The onset symptoms are fever, headache, chills, fatigue, vomiting and loss of appetite (Olusegun-Joseph *et al*., 2016) which may be mild and difficult to recognize as malaria because other diseases present similar symptoms. However, malaria is preventable and curable, as early accurate diagnoses and effective treatment reduces the menace and prevent death (WHO, 2017).

Prevalence studies and other community-based malaria surveys are necessary for generating data on malaria epidemiology and transmission dynamics, and for the designing of effective intervention programmes at local and national levels to meet the need of individual communities or settings (Aina *et al*., 2013). Therefore, this study was designed to determine the current prevalence of malaria among students of the Federal University Otuoke, Bayelsa State and to proffer solution towards proper management of the disease.

MATERIALS AND METHODLGY
Study design / Population
A cross-sectional study was carried out between April and July 2017 among 200 students (111 males, 89 females) attending the Federal University Otuoke Health Centre, Otuoke, Bayelsa state, Nigeria. Demographic data such as age and gender of the students were collected via an oral interview.

Study Area: Federal University Otuoke Health Centre is situated in Otuoke, Ogbia local Government area, located approximately at Latitude 4^o49F North and Longitude 6^o20F East. Otuoke is bounded to the East by Emeyal 1 and Kolo, to the West by Onuebum and Otuogori and to the South by Otuaba and Ewoi communities, all in Ogbia Local Government Area of Bayelsa State. The study area lies in the high rainfall belt of Nigeria, which is characterized by short dry season from November to March, and rainy season from April to October. Harmattan occurs during December and January and it is characterized by low relative humidity and dust wind. The average monthly temperature is high throughout the year. A mean annual temperature of 32^oC is typical of the area. Otuoke Community is made up of indigenes (who are predominantly farmers and fishermen) and non-indigenes who are basically Civil Servants, Traders, Artisans and students.

Blood Sampling and Examination
Blood samples ($5\mu l$) were collected by venipuncture into a specimen container containing EDTA by a medical laboratory technician. Thick and thin blood films were prepared on a clean glass slide, labelled, air-dried horizontally and transported to the Microbiology Laboratory of Federal University Otuoke, Bayelsa state, for analysis. After Giemsa-staining, the films were microscopically examined for the presence of malaria parasites and result recorded appropriately. Film was considered negative if 100 microscopic fields under 1000× magnification showed no parasites (Cheesebrough, 2000). If positive, the film was read to determine the parasite specie. In this study, parasite density was not quantified.

Data Analysis: Chi- square (χ^2) test was used to establish any relationship between malarial infections and sex and age at 0.05 significant levels.

Ethical approval: The Chief Medical Director of the Federal University Otuoke Health Centre approved for the study and the students also gave their consent.

RESULTS
Two hundred (200) students were screened during the study period, 111 (55.5%) males and 89 (44.5%) females. A total of 160 (80%) students were found positive for *P. falciparum,* 101 males (90.99%) and 59 females (66.29%) (Table 1). The sex-prevalence of the infection showed more males being infected than females and this differed significantly ($p<0.05$).

However, there was no significant difference in prevalence among age groups ($p>0.05$), with those aged 16-20 years having the highest prevalence (100%), followed by those aged 21-25 years (66.25 %). The least prevalence of 25.00 % was recorded among students in the 31-35years age group (Table 2).

Table 1: Malaria Prevalence among Students according to Sex

Sex	No Examined	No positive (%)	No negative (%)	p- value
Male	111	101 (90.99)	10 (9.00)	
Female	89	59 (66.29)	30 (33.71)	0.004
Total	200	160 (80.00)	40 (20.00)	

Table 2: Malaria Prevalence among Students according to Age

Age Group (Years)	No Examined	No positive (%)	No negative (%)	Mean (±)	p-value
16-20	102	102 (100)	0 (0.00)	18.51	
21-25	80	53 (66.25)	27 (33.75)	22.16	
26-30	10	03 (30.00)	07 (70.00)	27.40	0.352
31-35	08	02 (25.00)	06 (75.00)	32.72	
Total	200	160 (80.00)	40 (20.00)	100.79	

DISCUSSION

The study recorded a high prevalence of malaria (80 %) among the students attending Federal University Otuoke Medical Centre. This result was found to be higher than the 43.1% prevalence recorded by Wogu *et al*., (2017) in University of Port Harcourt Teaching Hospital and other prevalence reports from the Southeast, Nigeria (Ezugbo-Nwobi *et al.*, 2011; Mgbemena *et al.,* 2016). This is an indication of the endemicity of malaria in Nigeria and Otuoke particularly, according to the report of World Health Organization (WHO, 2014)

This high prevalence could be attributed to poverty and non-compliance by the students to the preventive measures, such as keeping good sanitary conditions, avoiding of indiscriminate disposal of garbage and use of long-lasting insecticide treated nets (LLIN). Malaria and poverty are connected intimately, as malaria primarily affects low- and lower-middle income countries, where the poorest communities are affected most severely by malaria due to their poor socioeconomic and environmental status, and inadequate services for prevention, diagnosis, and

treatment (WHO, 2014). Hence, these endemic communities are trapped in a vicious cycle of poverty, underdevelopment, and disease (Gallup and Sachs, 2001). In addition, movement of non-immune individuals to this area for academic pursuit also could have contributed to the increased prevalence in this study. Similarly, students are prone to night class which in turn exposes them to the bite of the vector host. Major occupation carried out by Otuoke villagers is fishing. Many of these fish farmers create ponds which serve as breeding sites for the mosquito vector. According to Anumudu *et al.,* (2006), agricultural practices around dwellings increase the risk of mosquito bites. Farming activities which takes place mostly during the rainy season period of the year favour the breeding of mosquitoes and this makes the effects of malaria apparently noticeable in rural areas due their proximity to farmlands (Aribodor *et al*., 2003, WHO, 2000).

The study also revealed males being more infected (90.99%) than females (66.29%) and the prevalence differed significantly ($p<0.05$). This agrees with

findings of Adeyemo *et al.* (2014) and Mgbemena *et al.* (2016) which also recorded that male students had higher prevalence than the female students.

However, the result of this study contradicts the findings of Oyinlola *et al.,* (2015) that female individuals have a higher risk of being infected with malaria compared to the male participants. Males being more infected than the females, as recorded in this study, could be because of the disparity in the sample size. Males also expose their body during hot weathers and predominantly sleep outside insecticide-treated net. This increases the chances of being bitten by the mosquito vector. In some settings, males utilize health care service less than the females, as they may assign a low priority to their health, making them reluctant to spend much time walking to health Centre even when malaria is suspected (Muller, 1998). There could also be possibility that the body of males produce more chemical attractant to the mosquito. Earlier observations on the biting behaviour of *Anopheles gambiae* on humans have resulted in the discovery of a remarkable attractant for this important malaria vector (Knols and De Jong, 1996). This vector is attracted to a combination of various compounds emanated by humans such as heat, CO_2, ammonia, lactic acid and carboxylic acids (Barnard *et al.,* 2000). Some of these compounds have largely synergetic effect on attractiveness (Sukumaran, 2016) while different dosages of each of these compounds also bring about varied responses (Meijerink *et al.,* 2001). Females on the other hand are usually not naked and they tend to stay indoor doing the house chores, reducing their contact with malaria vector. Ezugbo-nwobi *et al.,* (2011) opined that variations in the frequency and intensity of exposures to the mosquito vector responsible for the transmission of Plasmodium parasites affect infection rate. Ukpong *et al.,* (2015). asserted that the attitude and activities of humans also enhance human-vector contact and as such affect the prevalence of infection. Studies and further research have shown that females have better immunity to
parasite disease and this was attributed to genetic and hormonal factors (Zuk and Mckean, 1996). The production of estrogen by females have been shown to augment anti-plasmodium immune response whereas testosterone suppresses anti-plasmodium immune response (Krucken *et al.,* 2005).
The 100% prevalence recorded among those aged 16-20 years when compared with other age groups indicates that younger populations have low and weak immune system and are easily susceptible to infections (Ani, 2004). Similarly, Mgbemena *et al.,* (2016) reported highest prevalence among students of age 16-22 years. However, the difference among age groups in this study was not statistically significant ($p > 0.05$). Mackey (1992) stated that malaria which is a major cause of morbidity affects all age groups.

CONCLUSION AND RECOMMENDATIONS

Malaria is still a public health concern in the world and its endemicity in Nigeria is established by various studies. The result of the study revealed a high prevalence (80%) of malaria among students attending the university Health Centre in Otuoke, which depicts the endemicity of the infection in the area. Environmental factors help breeding of the mosquito vectors as observed in the area. There is need for prompt diagnosis and early treatment which will significantly reduce disease transmission and prevent death among students. Baseline information from this study will aid in planning and implementation of malaria control programmes in the area and state at large by governments, their agencies and individuals. There is also the need for the promotion of insecticide-treated bed nets (ITNs), intermittent preventive treatment and increased public awareness and campaigns for malaria prevention and treatment in the area. The need for improved accessibility to health facilities and government support is imperative to achieve the goal of malaria elimination in the area and Nigeria at large.

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Authors' contributions:

ECO designed, supervised the study and wrote the paper, ICJ conducted the sampling and analysis. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.