



Osun state non-medical students' perceptions and practice of malaria prevention

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ABSTRACT

Background: Malaria is a vector-borne infectious disease caused by eukaryotic protist of genus *Plasmodium* and transmitted by female *Anopheles* mosquitoes. Those living mainly in the world's poorest countries are at risk of malaria as it is more endemic in the tropical and sub-tropical regions. Malaria spread have been linked to environmental changes, malaria vector dynamics, host immune status as well as individual or community factors such as the socio-economic status, knowledge of malaria, and the protective behavior. **Objectives:** To assess knowledge and practice of malaria prevention among non-medical students of higher institutions in Osun State, Nigeria. **Materials and Methods:** An open-ended structured questionnaire was administered consecutively to 1420 consenting non-medical students by the interviewer at various higher institutions. The cross-sectional survey questionnaire comprised sections on socio-demographic data, knowledge about causes of malaria, and knowledge about malaria prevention and practice. **Results:** The mean age (standard deviation) was 22.8 (12.7) years. 733 respondents (61.3%) are male while 462 respondents (38.7%) are female. 1124 students (94.1%) stated that malaria can be prevented. Out of those that stated that malaria can be prevented listed methods to prevent malaria to include reducing exposure to mosquitoes by use of insecticide treated mosquito nets and indoor residual spraying. 570 students (47.7%) reported that malaria is more common in the tropical region. Only 181 (15.1%) students know the cause of malaria in humans to be *Plasmodium*. 1013 (84.3%) reported malaria to breed more during the rainy season and 473 (39.6%) students reported female *Anopheles* mosquito to be responsible for malaria. **Conclusion:** Non-medical students have relatively reasonable knowledge about malaria preventive measures and practices, although, certain aspects are still not well-understood, probably due to the scope of their educational curricula. Hence, there is a need to intensify malaria public enlightenment programs and promote affordable preventive measures.

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INTRODUCTION

Malaria, one of the most important causes of morbidity in the world, is a vector-borne infectious disease caused by a eukaryotic protist of the genus *Plasmodium*. The disease is transmitted by female *Anopheles* mosquitoes, which carry infective sporozoite

stage of *Plasmodium* parasite in their salivary glands [1]. Malaria spread have been linked to environmental changes, host immune status, and factors such as the socio-economic status, knowledge of malaria, and the protective behavior [2]. Malaria burden is reported worldwide to be between 350 and 550 million, with over 80% occurring in Africa. Uncomplicated

malaria may be treated with oral medications. The most effective strategy for *Plasmodium falciparum* infection involves the combination of artemisinins with other antimalarials (known as artemisinin-combination therapy), which reduces the ability of the parasite to develop resistance to any single drug component [3]. The 2014 study on knowledge and perceptions toward malaria prevention among vulnerable groups in Buea, Cameroon, reported that insecticide treated nets (ITNs) are used mainly for protection against malaria [4]. The 2011 study on the knowledge and the preventive strategies of malaria among migrant farmers in Ado Ekiti Local Government Area, Nigeria, revealed that 75% of respondents stated that malaria is caused by mosquito, though, without fully defining it as female *Anopheles* mosquito. The study then further reported that the participants had adequate knowledge of malaria-related issues and preventive strategies [5], while a 2014 study on knowledge, attitude, and practices on malaria among the rural communities in Aliero, Northern Nigeria, reported that knowledge about malaria prevention measures was high, as much as 90%, though, not reflecting their practice, which was quoted as 16% [6]. Another 2010 research work on the knowledge, attitudes, and practices about malaria and its control in Rural Northwest Tanzania, reported a reasonable knowledge on malaria and its preventive measures [7].

In Colombia, a 2014 study on knowledge, attitudes, and practices of malaria, stated that despite the high level of knowledge in the regions studied, significant gaps persisted relating to practices [8]. Another 2010 Indian study on attitude, knowledge, and practices regarding malaria prevention and treatment, reported that the respondents had partially correct understanding of malaria transmission and prevention [9]. Furthermore, a 2013 study on knowledge, attitude, and management practices on malaria in Anambra State, Nigeria, stated that 40.9% of the community members assessed use of ITNs [10].

Inadequate knowledge, misconceptions about the transmission as well as preventive measures of malaria are habitually believed to be common among various strata of the society including students, especially those in non-medical courses and this can adversely affect malaria control measures. This study is therefore designed to assess the knowledge and practice of malaria prevention among non-medical students of higher institutions in Osun State, Nigeria.

MATERIALS AND METHODS

Study Site/Subject Selection/Study Design

The cross-sectional survey study utilizing both qualitative and quantitative method of data collection using open-ended and close-ended questions was conducted at 10 randomly selected higher institutions (colleges of education, polytechnics, and universities) across Osun State, in South-Western Region of Nigeria. The institutions were randomly selected because the needed respondents would be found there. Participation was voluntary, and informed consent was obtained by participants' signing the consent form attached to the questionnaire. Names of

participants were not included in the information requested. The structured questionnaire was administered consecutively to 1195 consenting non-medical students by the interviewer in each of the institutions. Simple random sampling was used to randomly select the required number of participants or respondents (students not in any medical related field) till the required number of willing participants is recruited. The questionnaire contained sections including socio-demographic data, knowledge about malaria prevention, knowledge about causes of malaria, and practice of malaria prevention. The data collected through the questionnaire were statistically analyzed using Statistical Package for the Social Sciences by Windows version 20.0 software. Frequency counts were generated for all variables and statistical tests of significance were performed with Chi-square test. Significance was fixed at $P < 0.05$ and highly significant if $P < 0.01$.

Sample Size

Sample size calculation was done using 95% confidence interval, 0.02 precision, and prevalence rate. A 2011 study on the malaria morbidity in Akure revealed that 87.32% of the sampled populations have experienced malaria [11]. The formula for sample size, when the population is more than 1000, is: $n = Z^2PQ/d^2$ [12,13].

RESULTS

Socio-Demographic Data

A total of 1195 consenting higher institution students located within the state participated in the study. The mean age (standard deviation) was 22.8 (12.7) years. 981 students (82.1%) are between ages 18 and 25 years. 733 (61.3%) are male while 462 (38.7%) are female.

Totally, 945 (79.1%) of the students are Christians with 250 (20.9%) being Muslims. 239 (20.0%) students are in accounting department, 199 (16.7%) in law, 194 (16.2%) in civil engineering, 167 (14.0%) in computer science, 156 (13.1%) in economics, 81 (6.8%) in mathematics, 80 (6.7%) in agricultural economics and extension, as well as, 60 (5.0%) in science laboratory technology.

Knowledge about Malaria Prevention

A total of 1124 students (94.1%) stated that malaria can be prevented, 44 (3.7%) reported that malaria cannot be prevented, others gave no response. Out of those who stated that malaria can be prevented, 1087 (91.0%) listed methods to prevent malaria to include reducing exposure to mosquitoes by use of ITNs and indoor residual spraying (IRS) as a way of bite prevention, spraying the home with insecticides to help kill mosquitoes that find their way in, keeping a clean environment by ensuring bush in surroundings are cleared and drainages cleaned up, use of preventative drugs as well as health education, with each of the 91.0% respondents mentioning at least one method [Table 1]. 534 (44.7%) have heard about IRS. 571 (47.8%) have not heard about IRS while others gave no response [Table 2].

Table 1: Practice of prevention of malaria

Prevention of malaria	Yes		No		No response	
	Frequency	%	Frequency	%	Frequency	%
Bushes around residence	748	62.6	359	30.0	88	7.4
Stagnant water around residence	323	27.0	755	63.2	117	9.8
Household wastes disposed in available open space or drainage channel	506	42.3	463	38.7	226	19.0
Drainage system in vicinity is adequate	599	50.1	402	33.6	194	16.3
ITN available in room	631	52.8	447	37.4	117	9.8
Sleep under ITN	479	40.1	601	50.3	115	9.6
Anti-mosquito sprays e.g., insecticides preferred to ITNs	619	51.8	372	31.1	204	17.1
Combination of anti-mosquito spray and sleeping under ITNs	271	22.7	718	60.1	206	17.2

ITN: Insecticide treated nets

Table 2: Relationship between academic level with information about IRS

Academic level	Information about IRS			Total
	Yes	No	No response	
1 st year	137	138	27	302
2 nd year	106	116	11	233
3 rd year	110	142	19	271
4 th year	39	38	13	90
5 th year	30	33	4	67
OND	39	38	9	86
HND	73	66	7	146
Total	534	571	90	1195

$\chi^2=109.354$, P value=0.001. The relationship between academic level and information about IRS is statistically significant at $P<0.05$.
 OND: Ordinary National Diploma, HND: Higher National Diploma, IRS: Indoor Residual Spray

Knowledge about Causes of Malaria

A total of 570 students (47.7%) reported that malaria is more common in the tropical region while 119 (10.0%) said it is more in the temperate region, with 355 (29.7%) reporting the disease to occur at same rate in both regions. Only 181 (15.7%) students know the cause of malaria in humans to be *Plasmodium*. 1013 (84.3%) reported malaria to breed more during the rainy season while 116 (9.7%) said it breeds more during the dry season. Massive 1034 (86.5%) students reported malaria to be a mosquito-borne infectious disease. 473 (39.6%) students reported female *Anopheles* mosquito as the type of mosquito responsible for malaria.

In summary, the average percentage knowledge score based on the total number of correct responses by respondents divided by the total number of available options/questions, in percentage gave an average score of 55%. The study methodology rating scale of percentage knowledge score, classified an average score below or equal to 39% as poor knowledge, 40-49% rated fair knowledge, 50-59% rated average knowledge, and 60-69% rated good knowledge, while 70% and above is classified as excellent knowledge. Based on this rating, the students are rated as having average knowledge about the prevention of malaria as well as the practice of the disease prevention.

DISCUSSION

Our finding that 94.1% respondents said malaria could be prevented is corroborated by a 2011 study that reported

86% respondents believed malaria could be prevented [5]. Furthermore, the findings on the ways by which malaria can be prevented, are very similar to that reported by 2014 research among vulnerable groups in Buea, Cameroon, which reported that ITNs are used mainly for protection against mosquito bites and protection against malaria [4]. About half (47.8%) of the respondents, who have heard about IRS, know that it is a process of spraying insecticides on the walls inside a home. As 47.7% reported that malaria is common in the tropical region is logical since the proportion which is about half of the respondents, may have the knowledge because they have experienced it in their environment and understand their neighborhood to be a hot or tropical one. This scenario also applies to the 77.9% proportion of the students that reported malaria to breed more during the rainy or wet season.

A 15.1% proportion of students knowing the cause of malaria in humans to be *Plasmodium* as well as only 39.6% students stating that female *Anopheles* mosquito as the mosquito responsible for malaria, shows that majority of them have knowledge gap in these aspects. These findings are in contrast to a 2011 study among migrant farmers, which revealed that 75% of respondents stated that malaria is caused by mosquito, though, without fully defining it as female *Anopheles* mosquito, which in our study was very specific, to depict the fact that not all mosquitoes transmit malaria infection. The study then further reported that the participants had adequate knowledge of malaria-related issues and preventive strategies [5]. It is also not in agreement with the 2014 study in Aliero, Northern Nigeria, which reported knowledge about malaria prevention measures was high, as much as 90%, though, not reflecting their practice, which was quoted as 16% [6], as well as another 2010 research work in Tanzania, which reported a reasonable knowledge on malaria and its preventive measures [7]. Our findings in this area is slightly corroborated by a 2014 Colombian study, which stated that despite the high level of knowledge in the regions studied, significant gaps persisted relating to practices [8], as well as another 2010 Indian study that reported that the respondents had partially correct understanding of malaria transmission and prevention [9].

Our research outcome also revealed that 52.8% of the students reportedly have ITNs, with 40.1% sleeping under the net. The outcome is slightly similar to that of a 2013 study, which stated that 40.9% of the community members assessed use of ITNs [10]. This is, however, in contrast with the 2014 Colombian study that

indicated 93.5% and 94.3% in the two areas evaluated used ITNs, as well as another study among migrant farmers that reported 88% of respondents sleeping inside ITNs [5]. The variations could be mainly due to the differences in the design of study methodology. The study outcome also showed that 51.8% of the students use anti-mosquito sprays like mosquito insecticides, which is marginally related to that reported by a Nigerian study, which stated 85% participants were using mosquito insecticides [5]. Slightly above half (62.6%) of the students in our study reported the presence of bushes around their residences, with little over one-quarter reporting stagnant water presence around their residences, which are major factors responsible that could cause the breeding of mosquitoes regardless of the season.

Major aspects of the knowledge and practice of malaria prevention that the students seem to have done poorly include the particular type of mosquito responsible for malaria infection, information about *Plasmodium* and its species, among others, as substantial number of students have some knowledge gap in these areas. This was largely responsible for the eventual average knowledge outcome. This could be due to the fact that majority of the students either have such knowledge gap because they do not have a science-based background or have not given more attention to the issue of malaria infection, especially as their courses curricula do not cover the field.

CONCLUSION

Non-medical students have relatively reasonable knowledge about malaria preventive measures and practices, although, certain aspects such as information regarding IRS, particular type of mosquito causing the disease, *Plasmodium* and its species, among others, are still not well-understood, probably due to the scope of their educational curricula. Hence, there is a need to intensify malaria public enlightenment programs and promote affordable preventive measures.

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