Research Article

Knowledge and practice of malaria prevention among nonmedical students of higher institutions in Ondo State, Nigeria

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Abstract

Background: Malaria is a vector-borne infectious disease caused by eukaryotic protists of the genus *Plasmodium* and transmitted by female *Anopheles* mosquitoes. Mostly those living in poorest countries of the world are at risk of malaria as it is more endemic in the tropical and subtropical regions. The spread of malaria has been linked to environmental changes, malaria vector dynamics, host immune status, and individual or community factors such as the socioeconomic status, knowledge of malaria, and the protective behavior.

Objectives: To assess knowledge and practice of malaria prevention among nonmedical students of higher institutions in Ondo State, Nigeria.

Materials and Methods: An open-ended structured questionnaire was administered consecutively to 1420 consenting nonmedical students by interviewer at various higher institutions. The cross-sectional survey questionnaire comprised sections on sociodemographic data, knowledge about causes of malaria, and knowledge about malaria prevention and practice.

Results: The mean age (SD) was 22.0 (6.9) years; 621 respondents (43.7%) were men whereas 799 respondents (56.3%) were women. Regarding knowledge on malaria, 1379 students (97.1%) stated that malaria can be prevented; 686 (48.3%) reported that malaria is more common in the tropical region; 1251 (88.0%) reported malaria to breed more during the rainy season; and 384 (27.0%) reported female *Anopheles* mosquito to be responsible for malaria.

Conclusion: Nonmedical students have relatively reasonable knowledge about malaria preventive measures and practices. However, certain aspects are still not well understood, probably because of the scope of their educational curricula. Hence, there is a need to intensify malaria public enlightenment programs and promote affordable preventive measures.

KEY WORDS: malaria, student, mosquito, prevention

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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 protists of the genus *Plasmodium*. It is transmitted by female *Anopheles* mosquitoes, which carry the infective sporozoite stage of *Plasmodium* parasite in their salivary glands.[1] The spread of malaria has been linked to environmental

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changes, host immune status, and factors such as the socioeconomic status, knowledge of malaria, and the protective behavior.[2] The global burden of malaria is reported to be between 350 and 550 million, with over 80% deaths occurring in Africa. Uncomplicated malaria may be treated with oral medications. The most effective strategy for *Plasmodium falciparum* infection is the use of artemisinins in combination 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 the respondents stated that malaria is caused by mosquito, although without fully defining it as the female *Anopheles* mosquito. The study then further reported that the participants possessed an adequate knowledge of malaria-related issues and preventive strategies,[5] while a study in 2014 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%, although not reflecting their practice, which was quoted as 16%.[6] Another research work in 2010 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 among the study subjects.[7]

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

Inadequate knowledge and misconceptions about the transmission and preventive measures of malaria have been reported among various strata of the society including students, especially those in nonmedical courses, and this can adversely affect malaria control measures. This study is, therefore, designed to assess the knowledge and practice of malaria prevention among the nonmedical students of higher institutions in Ondo State, Nigeria.

Materials and Methods

Study site/subject selection/study design

The cross-sectional survey study utilizing both qualitative and quantitative methods of data collection was conducted at various higher institutions across Ondo State, Nigeria. Participation was voluntary, and an informed consent was obtained by the participants signing the consent form attached to the questionnaire. The names of the participants were not included in the information requested. The structured questionnaire was administered consecutively to 1420 consenting nonmedical students by an interviewer in each of the institutions. Simple random sampling was used to randomly select the required number of participants (students not in any medical-related field) till the required number of willing participants is recruited. The questionnaire contained sections including sociodemographic 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 Statistically Package for the Social Sciences (SPSS) software, version 20.0. Frequency counts were generated for all variables, and statistical tests of significance were performed with χ^2-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 and 0.02 precision and prevalence rates. A study in 2011 on the malaria morbidity in Akure revealed that 87.32% of the sampled populations in Akure township experienced malaria.[11] The following is the formula for sample size when population is more than 1000: $n = Z^2PQ/d^2$.[12,13]

Results

Sociodemographic data

A total of 1420 consenting higher institution students located within the state participated in the study. The mean age (SD) was 22.0 (6.9) years; 1149 students (80.9%) were aged between 18 and 25 years. Six hundred twenty-one (43.7%) students were men while 799 (56.3%) women; 1084 (76.3%) of the students were Christians and 336 (23.7%) students Muslims. Regarding subjects studied by the students, 243 (17.1%) students were in the English Language Department, 211 (14.9%) in Animal Health and Production, 165 (11.6%) in Accounting, 141 (9.9%) in Computer Science, 113 (8.0%) in Banking and Finance, 103 (7.3%) in Economics, 102 (7.2%) in Science Laboratory Technology, 100 (7.0%) in Mathematics, and 100 (7.0%) in Business Administration.

Knowledge about malaria prevention

Regarding malarial knowledge, 1379 students (97.1%) stated that malaria can be prevented, 33 (2.3%) students reported that malaria cannot be prevented, while 8 (0.6%) students gave no response. The methods listed to prevent malaria by the students who stated that malaria can be prevented included reducing exposure to mosquitoes by the 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

Table 1: Practice of prevention of malaria

	Yes		No		No response	
	Frequency	%	Frequency	%	Frequency	%
Bushes around residence	738	50.2	632	44.5	50	3.5
Stagnant water around residence	344	24.2	997	70.2	79	5.6
Household wastes disposed in available open space or drainage channel	535	37.7	773	54.4	112	7.9
Drainage system in vicinity is adequate	690	48.6	588	41.4	142	10.0
ITN available in room	474	33.4	911	64.1	35	2.5
Sleep under ITN	300	21.1	1064	75.0	56	3.9
Anti-mosquito sprays (e.g., insecticides preferred to ITNs)	801	56.4	548	38.6	71	5.0
Combination of anti-mosquito spray and sleeping under ITNs	459	32.3	882	62.1	79	5.6

ITN, insecticide-treated net.

environment by ensuring bush in surroundings are cleared and drainages cleaned up, use of preventative drugs, and health education, with most respondents mentioning at least one method. Seven hundred seventy-four (54.5%) students have heard about IRS, 589 (41.4%) have not heard about IRS, whereas others gave no response.

Knowledge about causes of malaria

That malaria is more common in the tropical region was reported by 686 (48.3%) students, while 80 (5.6%) students said it is more in the temperate region, with 540 (38.0%) students reporting the disease to occur at the same rate in both the regions. Only 189 (13.3%) students know the cause of malaria in humans to be *Plasmodium*; 1251 (88.0%) students reported that malaria-spreading mosquito breed more during the rainy season, while 118 (8.3%) students said it breeds more during the dry season. The majority [1309 (92.1%)] of the students reported malaria to be a mosquito-borne infectious disease, and 384 (27.0%) students reported female *Anopheles* mosquito as the type of mosquito responsible for malaria.

Practice of prevention of malaria

The average percentage knowledge score based on the total number of correct responses by respondents divided by the total number of available options/questions gave a score of 55% [Table 1]. The study methodology rating scale of percentage knowledge score classified an average score below or equal to 39% as poor knowledge, 40%–49% as fair knowledge, 50%–59% as average knowledge, 60%–69% as good knowledge, while 70% and above as excellent knowledge. On the basis of this rating, the students were rated as having an average knowledge about the prevention of malaria and the practice of the disease prevention.

Relationship between academic level and information about IRS

The relationship between academic level and information about IRS is statistically significant at $P < 0.05$ [Table 2].

Table 2: Relationship between academic level and information about indoor residual spray (IRS)

Academic level	Information about IRS			
	Yes	No	No response	Total
First year	128	90	11	229
Second year	106	131	11	248
Third year	207	115	20	342
Fourth year	23	23	50	96
Fifth year	14	19	40	73
Ordinary National Diploma (OND)	167	21	9	197
Higher National Diploma (HND)	129	90	16	235
Total	774	489	157	1420

$\chi^2 = 137.563$, $P = 0.001$.

Discussion

Our finding that 97.1% respondents said malaria can be prevented is corroborated by a 2011 study that reported 86% respondents believed malaria can be prevented.[5] In addition, 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] More than half of the respondents who have heard about IRS know that it is a process of spraying insecticides on the walls inside a home. That malaria is common in the tropical region as reported by 48.3% students is logical because the proportion, which is about half of the respondents, may have the knowledge as they experienced it in their environment and understood their neighborhood to be a hot or tropical one. This scenario also applies to the 88% proportion of the students who reported malaria to breed more during the rainy or wet season.

A 13.3% proportion of students knowing the cause of malaria in humans to be *Plasmodium* and only 27.0% students stating that female *Anopheles* mosquito to be responsible for malarial transmission show that the majority of them have a knowledge gap in these aspects. These findings are in contrast to a study in 2011 among migrant farmers, which revealed that 75% of respondents stated that malaria is caused by mosquito, although 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 possessed an 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%, although not reflecting their practice, which was quoted as 16%.[6] Moreover, another research in 2010 in Tanzania also 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] Another Indian study in 2010 reported that the respondents revealed a partially correct understanding of malaria transmission and prevention.[9]

Our research outcome also showed that 33.4% of the students reportedly possessed ITNs, with only 21.1% sleeping under the net. The outcome is slightly similar to that of a study in 2013, which stated that 40.9% of the community members assessed use 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. Furthermore, another study among migrant farmers reported that 88% of respondents sleep inside ITNs.[5] The variations could be mainly because of the differences in the design of study methodology. The study outcome also showed that 56.4% of the students use anti-mosquito sprays such as 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 of the students in our study reported the presence of bushes around their residences, with about one-quarter reporting stagnant water presence around their residences, which are major factors responsible for 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 malariainfection, information about *Plasmodium* and its species, issues concerning ITNs, 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 because the majority of the students either 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.

The strength of this study is that the knowledge and practice of malaria prevention among this set of individuals (students not in any medical-related course) were well assessed. The limitation of this study is that some financial constraints that did not allow the study to be extended to the other states of the country.

Conclusion

In conclusion, nonmedical students have relatively reasonable knowledge about malaria preventive measures and practices, although certain aspects such as information regarding IRS, ITNs, particular type of mosquito causing the disease, *Plasmodium* and its species, among others, are still not well understood, probably owing 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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