



Malaria Prevention Strategies and Associated Challenges among College Students in Anambra State, Nigeria

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Abstract: Malaria is an endemic disease in Nigeria with high cost of treatment and economic burden with its prevention better than cure. This is a descriptive study that determined the malaria preventive strategies and associated challenges among College students in Anambra State, Nigeria. A Sample of 365 respondents was proportionately and randomly drawn from a population 4,135 College students for the study. A 29-item structured questionnaire that was tested for internal consistency with 0.87 reliable index via Spearman-Brown Coefficient Correlation was used for data collection. Data were collected through face-to-face administration and presented in tables. Descriptive and inferential statistics were applied in data analysis using SPSS Version 23 IBM. Chi-square was used to test the hypothesis at 0.95 alpha. Results from the study revealed poor implementation of preventive strategies against malaria among the College students. Students that implement the strategies go by sewage disposal (80.1%), environmental sanitation (71.5%), and keeping windows and doors closed at night (51.3%). The major challenges faced by the students in the implementation of the strategies are: sweating too much while sleeping under ITN (80.1%) and allergic reactions to insecticide sprays (67.3%). The study also revealed that year of study, gender, and course of study are associated with practice of malaria prevention strategies among the college students as students at higher level do not implement the prevention strategies.

Keywords: Malaria prevention, Preventive strategies, Challenges, College students

INTRODUCTION

Malaria is an acute febrile illness caused by Plasmodium parasites, which spreads through the bites of infected female Anopheles mosquitoes (World Health Organization, 2022). In the opinion of Brooke (2022) Malaria is primarily caused by *Plasmodium falciparum* with very small contributions from *Plasmodium ovale*, *Plasmodium malariae*, and *Plasmodium vivax*. According to Fitri, *et al.*, (2022), humans can be infected by five types of parasites, which are *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, and *Plasmodium knowlesi*, and the first four species are considered true parasites of humans, while *Plasmodium knowlesi* is still considered zoonotic malaria, among these species, *Plasmodium falciparum* and *Plasmodium vivax* are the most prevalent worldwide, in which the most common complications of severe malaria occur in *P. falciparum* infection.

Angupale, *et al* (2023) posited that malaria is a treatable disease but life-threatening, causing acute febrile illness.

According to National Health Service (2022), there is usually an increased risk of getting seriously ill from malaria among pregnant, young children, people aged over 65, people with the weak immune system, people with no spleen, people living in certain parts of the world especially those in tropical regions. McDonnell, (2022) posited that Sub-Saharan Africa (SSA) carries the heaviest malaria burden, with an estimated 234 million cases (95%) and 593,000 deaths (96%) in 2021, and the top 16 most malaria-affected countries, by cases, are all in SSA and Nigeria alone carries 26.6% and 31.3% of all malaria cases and deaths globally while young children, particularly African children with limited access to healthcare, are disproportionately at-risk of malaria: 76% (470,000) of all malaria deaths in 2021 were children under the age of 5 and pregnant women are also at heightened risk: In 2021, there were an estimated 40 million pregnancies across 38 malaria-endemic African countries, of which 13.3 million (32%) were exposed to malaria infection during pregnancy.

According to Ogbulafor, *et al.*, (2023), Nigeria accounted for 27% of the world's malaria cases and 32% of deaths caused by malaria worldwide in 2020, according to World Health Organization (WHO) estimates, most of this burden being in young children. Despite the fact that widespread control and elimination measures are being implemented through international and national malaria control programs, malaria continues to be the most important parasitic disease worldwide (Al-Awadhi, *et al.*, 2021).

According to the Centre for Disease Control and Prevention (2022), many of the countries affected by malaria, is a leading cause of illness and death. In areas with high transmission, the most vulnerable groups are young children, who have not developed immunity to malaria yet, and pregnant women, whose immunity has been decreased by pregnancy. In the entire scenario of the disease, cases of students affected by the diseases has been recorded and cases of the disease have been recorded among college students in Nigeria.

Despite more than a century of malaria research, malaria remains a major public health concern in Africa and it is estimated that about 241 million people across the world suffer from malaria yearly, with 627,000 associated deaths registered in 2021 (Chouakeu, *et al.*, 2023).

Ng'ang'a, *et al.*, (2021) postulated that the global decline in malaria cases since 2000 has mainly been attributed to the use of insecticide-treated nets (ITNs), particularly LLINs, indoor residual spraying (IRS), and improved malaria case management. Despite the efforts made through the implementation of malaria prevention strategies, there seems to be challenges encountered regarding their judicious implementation which has kept the disease on increase with its attendant negative effects to those affected. Talipouo, *et al.*, (2019), posited that household surveys conducted in different parts of the country identified several factors hindering the use of bed nets, such as feeling hot when sleeping under mosquito nets, sleeping under damaged nets, sleeping outdoors, and not using nets regularly.

Prompt treatment of malaria involves the use of artemisinin-based combination therapy (ACTs) especially in settings where falciparum malaria is endemic with artemether-lumefantrine being the most widely used ACT in Africa as stated by (Jagannathan & Kakuru, 2022). They further stated that IPT with sulfadoxine-pyrimethamine (SP) given at the time

of routine vaccination in infants has been shown to be safe and modestly effective against malaria in the first year of life.

Due to recursive interactions between humans, mosquitoes, and the parasites that cause malaria transmission, existing control methods might not be effective in the sense that they target either mosquitoes or the parasites (Savi, 2022). Other preventive strategies that can be implemented at the household level to reduce mosquito density include improving housing quality to limit mosquito entry, minimizing the presence of mosquitoes in houses by the use of insecticide sprays (Musoke, *et al.*, 2023).

According to World Health Organization (2023), malaria can be prevented by avoiding mosquito bites or by taking medicines such as chemoprophylaxis in order to lower the risk of getting malaria by avoiding mosquito bites, the following measures could be taken:

- Use of mosquito nets when sleeping in places where malaria is present.
- Use of mosquito repellents after dusk
- Use of coils and vaporizers
- Wearing protective clothing
- Use of window screens

The use of an appropriate combination of non-chemical and chemical methods of malaria prevention has been recommended by World Health Organization and a combination of malaria prevention strategies has been shown to have a greater impact than single methods while this integrated malaria prevention describes the innovative approach that advocates the use of several malaria prevention measures in a holistic manner at household and community levels (Musoke, *et al.*, 2023).

Savi (2022) recommended vector control which involves the use of indoor residual spray (IRS) and insecticide-treated bed nets (ITNs) and the main chemical component of ITNs and IRS is synthetic pyrethroids, a lethal compound that repels mosquitoes, remains in the environment and is harmless to mammals. These controls include physical, biological or chemical changes to the vector's environment. As part of the physical modification, breeding sites are removed and the sources of larvae are managed using drainage and weeding. Prevention of malaria is currently based on two complementary methods: chemoprophylaxis and protection against mosquito bites (European Center for Disease Prevention and Control, 2019).

Many challenges have been identified as a threat to malaria prevention and these are climatic factors, health system factors, and movement of people, imported malaria and asymptomatic infections (Tsoka-Gwegweni, 2022). Going further, climatic factors, especially rainfall and temperature, were found to be associated with an increased burden of malaria because the same conditions were regarded as conducive for promoting the abundance of mosquito populations that transmit malaria (Tsoka-Gwegweni, 2022). Limited access to higher-level health facilities, especially for populations living in remote areas, resulting in treatment delays of several hours or even days constitutes a challenge too (Okitawutshu, *et al.*, 2022). Poor financial resources and socio-cultural factors hinder the preventive practice measures (Odinga, 2020; Oladimeji, *et al.*, (2018). In the findings of de Sousa Pinto, *et al.*, (2021), community dialogue sessions help in understanding how to prevent malaria. Ibrahim, *et al.*, (2023), reported lack of formal education among the

determinants of asymptomatic *Plasmodium falciparum* infection. Therefore, the role of education in the prevention of malarial cannot be overemphasized. Talipouo, *et al.*, (2019) stated that less than 50% of their study population are using good practices in the prevention of malaria and a few of them reported sensation of suffocating when sleeping under a net ITN which hindered their usage of the net to prevent mosquito bite.

Statement of the Problem

Regardless of the fact that malaria is one of the oldest recorded deadliest infectious diseases in human history, more than half of the world's population is still threatened by the disease, especially in Africa (Phillips, *et al.*, 2017). There has been reports of greater number of the College students admitted at the institution's Medical Center because of malaria disease than other health problems. These admissions may have in one way or the other affected the students' academic activities. The researchers were therefore poised to embark on this study to determine the malaria prevention strategies and associated challenges among these students knowing that a day out of College school is quite challenging. Questions that bother the researcher revolve on whether these students do not see the necessity to implement the preventive strategies against malaria or that there are barriers to such action. This study, therefore, determines malaria prevention strategies and associated challenges among College students in Anambra State, Nigeria.

Objectives of the Study

1. To ascertain the extent of implementation of the prevention strategies among the students.
2. To identify the challenges faced by the students of the College of Health Sciences in the prevention of malaria.
3. To determine the influence of demographic variables such as year of study, gender and course of study on the practice of malaria prevention strategies among the College students.

Hypothesis

Demographic variables of the students such as year of study, gender and course of study, do not significantly influence the practice of malaria prevention strategies among the College students.

MATERIALS AND METHODS

Research Design

A descriptive survey design was employed in this study. Pinto, *et al.*, (2021), used this design in a study on Malaria prevention knowledge, attitudes, and practices in Zambezia Province, Mozambique. The appropriateness of this design in this study was based on the argument that data on the preventive measures and associated challenges on malaria among the College students were collected without control.

Area of Study

This study was carried out in the College of Health Sciences (CHS), Nnewi, Anambra State, Nigeria, a training institution for medical and allied health sciences students. Located in a remote city of Nnewi, CHS harbours thousands of students in different disciplines and diverse academic levels who are resident in private hostels within the community with possibility of exposure to mosquito bites.

Population for the Study

The study population consists of the students in the College of Health Sciences Nnewi, Anambra State, who are resident within and around the Campus and on regular academic programme.

Sample and Sampling Technique

Sample of 365 respondents was drawn study from a population of 4,135 students using Taro Yamane's formula for sample size calculation. Stratified simple random sampling technique was proportionately applied in selecting the respondents for the study.

Inclusion and Exclusion Criteria

The study involved only students in 200-500 level who were not on clinical posting at the time of the study. Students who were not on clinical posting but were involved pre-clinical, professional or semester examination within the period of the study were excluded from the study.

Instrument for Data Collection

A 29 item researchers' structured questionnaire used for data collection was based on previous studies and in-depth literature review. Face, content and construct validity were done by experts in Community Health Nursing, and Measurement and Evaluation. It was pilot-tested for internal consistency using a related population. Data collected for the pilot testing were analyzed through split-half method with reliable index of 0.87 (Spearman-Brown's Coefficient Correlation-calculated).

Procedure for Data Collection

Data collection was through face-to-face administration of the questionnaire and in line with research and ethics observances. The respondents were met during their break and lecture-free hours for data collection. Items that needed further explanations on the request of the respondents were duly handled. Data collection and retrieval lasted six months and a total of 365 copies of questionnaire were administered with return rate of 100%.

Method of Data Analysis

The data collected from the study were tallied and presented in tables, frequencies and percentages. Analysis was done through descriptive and inferential statistics using IBM SPSS Version 25. Chi-square at 0.05 level of significance was used for hypotheses testing.

Ethical Considerations

Ethical approval was obtained from the Research and Ethics Committee of the Faculty of Health Sciences and Technology of CHS with Ref number *FHST/REC/023/392* for the study. Consent and cooperation of the respondents were solicited with assured confidentiality of information and anonymity before the administration of the questionnaire. Only the respondents that were willing to participate in the study.

RESULTS

Socio-demographic Data of the Respondents

Table 1: Socio-demographic data of respondents. n = 365

| Items | Category | Frequency (n) | Percentage (%) |
|----------------|------------------------------|---------------|----------------|
| Age | 18 - 25 | 275 | 75.3 |
| | 26 - 30 | 81 | 20.1 |
| | 30 years and above | 9 | 4.6 |
| Gender | Female | 234 | 64.1 |
| | Male | 131 | 35.9 |
| Marital status | Single | 300 | 82.1 |
| | Married | 65 | 17.9 |
| Religion | Christianity | 360 | 98.7 |
| | Islam | 3 | 0.8 |
| | Traditional | 2 | 0.5 |
| Department | Anatomy | 46 | 12.6 |
| | Physiology | 31 | 8.5 |
| | Medicine and Surgery | 49 | 13.4 |
| | Nursing Science | 43 | 11.8 |
| | Medical Laboratory science | 52 | 14.2 |
| | Medical Rehabilitation | 50 | 13.7 |
| | Radiography | 62 | 17.0 |
| | Environmental health science | 32 | 8.8 |
| Level of study | 200 level | 45 | 12.3 |
| | 300 level | 97 | 26.6 |
| | 400 level | 206 | 56.5 |
| | 500 level | 17 | 4.6 |

Table 1 shows that a greater number of the students (75.3%) were within 18-25 years and a greater number of the students (64.1%) were females.

Table 2: Extent of implementation of the prevention strategies among the students of College of Health Sciences. n = 365

| Item | Always(%) | Sometimes (%) | Rarely (%) | Never(%) | Mean |
|--|-----------|---------------|------------|-----------|------|
| Use of insecticide treated nets | 82(22.4) | 123(34.0) | 80(21.8) | 80(21.8) | 2.0 |
| Indoor residual spray | 96(26.3) | 182(50.0) | 47(12.8) | 40(10.9) | 2.9 |
| Environmental sanitation | 274(75.0) | 80(21.8) | 11(3.2) | 0(0) | 3.7 |
| Use of chemoprophylaxis | 30(8.3) | 124(34.0) | 103(28.2) | 108(29.5) | 2.2 |
| Keep windows and doors close at night | 187(51.3) | 141(38.5) | 26(7.0) | 11(3.2) | 3.4 |
| Use of mosquito coil | 31(8.3) | 110(30.1) | 94(25.6) | 110(30.1) | 2.1 |
| Sewage disposal | 293(80.1) | 54(14.7) | 18(0.5) | 26(0.7) | 3.8 |
| Wearing of long clothes that properly cover the body | 80(21.8) | 215(59.0) | 40(10.9) | 30(8.3) | 2.9 |
| Use of insect repellent | 47(12.8) | 152(41.7) | 75(20.5) | 90(25.0) | 2.4 |
| Effective hand washing | 281(76.9) | 68(18.7) | 16(4.4) | 0(0) | 3.8 |
| Constant body bath | 325(89.1) | 30(8.3) | 0(0) | 10(2.6) | 3.8 |
| Use of antibiotics | 47(12.8) | 204(55.8) | 82(22.4) | 32(9.0) | 2.7 |
| Use of screens on windows and doors | 131(35.9) | 108(29.6) | 70(19.2) | 56(15.3) | 2.9 |

Decision Rule: Good implementation (Score of 70-100%); Average implementation (Score of 50-69%); Poor implementation (Score of 49% and below).

The table above revealed that the extent of implementation of the correct preventive measures was poor 96(26.3%). The major preventive measure that is always implemented by the respondents was: sewage disposal 293(80.1%), environmental sanitation 261(71.5%), and keeping windows and doors closed at night 187(51.3%). The least preventive measure implemented by respondents is use of chemoprophylaxis 30(8.3%).

Table 3: Challenges faced by students of College of Health Sciences in the implementation of malaria prevention practices

| Item | Frequency (n) | Percentage (%) |
|--|---------------|----------------|
| Seasonal weather | 288 | 78.8 |
| Lack of financial resources | 229 | 62.8 |
| Inadequate environmental sanitation | 236 | 64.7 |
| Financial constraints | 227 | 62.2 |
| Non availability of vaccines | 131 | 35.9 |
| Inadequate transportation to a health facility | 232 | 63.5 |
| Non-availability of essential drugs (prophylaxis) at school clinic | 248 | 67.9 |
| Cost of insecticide bed nets | 201 | 55.1 |
| Inconsistent use of insecticide treated nets | 292 | 80.1 |
| Cultural and social norms | 303 | 83.3 |
| Delay in seeking medical care | 246 | 67.3 |
| Distance of health facilities | 232 | 63.5 |
| Mosquito resistance to insecticides | 183 | 50.0 |
| Poor knowledge of malaria prevention measures | 201 | 55.1 |

The major challenges faced by the respondents are: seasonal weather 288(78.8%), Inconsistent use of insecticide treated nets 292(80.1%), Inadequate environmental sanitation 236 (64.7%), Cultural and social norms 303 (83.3%), Delay in seeking medical care 246 (67.3%), Distance of health facilities 232 (63.5%), financial constraints 227 (62.2%).

Table 4: Cross tabulation of year of study, gender, course of study and malaria prevention strategies

| Year of study | Practice of malaria preventive strategies | | |
|------------------------------|---|------------|-----------|
| | Yes | No | Total |
| 200 level | 8(17.8%) | 37(82.2%) | 45(100%) |
| 300 level | 30(30.9%) | 67(69.1%) | 97(100%) |
| 400 level | 54(26.2%) | 152(73.8%) | 206(100%) |
| 500 level | 4(23.5%) | 13(76.5%) | 17(100%) |
| Gender | | | |
| Male | 31(23.7%) | 100(76.3%) | 131(100%) |
| Female | 65(27.8%) | 169(72.2%) | 234(100%) |
| Course of study | | | |
| Anatomy | 6(13.0%) | 40(87.0%) | 46(100%) |
| Physiology | 8(25.8%) | 23(74.2%) | 31(100%) |
| Medicine and Surgery | 32(65.3%) | 17(34.7%) | 49(100%) |
| Nursing Science | 20(45.5%) | 23(53.5%) | 43(100%) |
| Medical Laboratory Science | 13(25.0%) | 39(75.0%) | 52(100%) |
| Medical Rehabilitation | 7(14.0%) | 43(86.0%) | 50(100%) |
| Radiography | 7(11.3%) | 55(88.7%) | 62(100%) |
| Environmental Health Science | 3(9.4%) | 29(90.6%) | 32(100%) |

The table above shows that about majority of the respondents were from 400 and 300 level. Respondents from 400 level 152(73.8%) do not practice malaria preventive strategies and respondents from 300 level 67(69.1%) do not practice malaria preventive strategies. The table also show that the female respondents 169(72.2%) do not practiced malaria preventive strategies more than the male respondents 100(76.3%). Finally, the table show that majority of respondents that practiced malaria preventive strategies are from Medicine and surgery 32(65.3%) and Nursing science 20(45.5%).

Hypothesis

Table 5: Chi Square table of year of study, gender, course of study, and malaria prevention strategies

| | Value | Df | Asymp. Sig. (2-sided) |
|--------------------|---------|----|-----------------------|
| Pearson Chi-Square | 228.816 | 3 | .000 |
| N of Valid Cases | 365 | | |

Table 5 shows high Chi square value of 228.816 and P value of 0.000 (P-value < 0.05) This shows that year of study, gender, and course of study are associated with practice of malaria prevention strategies. Therefore, the Null was rejected as year of study, gender

and course of study, significantly influence practice of malaria prevention strategies among the College students.

DISCUSSION

Extent of Implementation of the Prevention Strategies Against Malaria among the College Students

The study revealed that the extent of implementation of the correct preventive measures is poor (26.3%). The major preventive measures implemented by the students of the College of Health Sciences include: sewage disposal (80.1%), environmental sanitation (71.5%), and keeping windows and doors closed at night (51.3%). The least preventive measure implemented by the students is use of chemoprophylaxis (8.3%). The result of this study is not consistent with the study of Tshivhase *et al.*, (2022) whose findings reported that major preventive measure that is always implemented by their respondents are: use of mosquito coils and wearing long-sleeved clothes in their household to avoid mosquito bites. Findings from the study also disagree with that of Talipouo, *et al.*, (2019).

Challenges Faced by College Students in Anambra Students in the Application of Prevention Strategies against Malaria

The study revealed that majority (78.8%) of the College students face challenges in the prevention of malaria. The major challenges faced by the students are: sweating too much when under bed nets (80.1%), climatic factor (78.8%), non-availability of essential drugs at school clinic (67.9%) and allergic reactions to insecticide sprays (67.3%). The least challenge faced by students is cultural factor (35.9%). This finding agrees with Tsoka-Gwegweni (2022), whose results showed that climatic factors, is one of the major malaria prevention strategies. This notwithstanding the finding does not agree with the findings of Oladimeji, *et al.*, (2018). It should be important to note that place of study may likely have affected the relatedness of the findings of the present study and that of other researchers.

Influence of Year of Study, Gender, and Course of Study on Malaria Prevention Strategies among the Students

Chi square value of 228.816 and P-value of 0.00 (p-value < 0.05) were obtained which shows that year of study, gender, and course of study are associated with practice of malaria prevention strategies. The year of study, gender and course of study, significantly influence practice of malaria prevention strategies. 300, 400 and 500 level students have greater number of students that do not implement the preventive measures with (69.1%), (73.8%) and (76.5%) respectively. A greater number of female college students (82.2%) do not use preventive measures. Students in Medical Rehabilitation and Radiography departments showed more indifference in malaria prevention practices. Generally, the students do not implement malaria prevention strategies. This may be linked to the busy nature of the students in the college who may be burdened by busy academic activities and tend to care less about malaria prevention practices. This may not be the best as their health status should not be sacrificed at the altar of academic seriousness. There is need to balance the two all-important issues.

Implication of the Findings for Nursing

Based on the findings of the study, students' poor implementation of malaria prevention strategies. This seems disheartening considering the fact that these students in their respective academia programmes should have good information on the devastating effects of malaria disease to in this part of the world. Majority of the students face diverse challenges in the implementing malaria preventive strategies which may have affected their prevention practices. Efforts should be put in place by the government the College management to deal with those challenges to improve practice of malaria strategies which will possibly bring about better focused students in their academic programme.

CONCLUSION

This study showed a relatively poor implementation of preventive strategies against malaria among College students. Many challenges that possibly hinder them from implementing the malaria prevention strategies were identified. This notwithstanding, it is source concern that College students who are trained to take care of their health and that of others do not give time to implement malaria prevention strategies. The need to surmount the challenges becomes inevitable and more health education on this should be undertaken to avoid malaria infestation among the students with its attendant negative effects.

Limitations of the Study

This study took up descriptive survey design in an institution making it difficult to generalize the findings.

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Conflict of Interest

Authors declare that there was no conflict of interest in the course of this study.

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