
ORIGINAL ARTICLE**Non-adherence to malaria treatment plan among university undergraduate population in Nigeria: Evaluations of the overarching barriers**

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Abstract

Background: Nigeria accounts for a major percentage of the global burden of malaria despite its aggressive multi-sector control measures. **Aim and Objectives:** The study was designed to determine the barriers responsible for non-adherence with malaria treatment plan among undergraduates of University of Delta, Agbor, Nigeria. **Material and Methods:** The descriptive survey recruited 350 undergraduates using stratified simple random sampling. Data collection was through structured questionnaire. **Results:** Six out of 10 undergraduates who participated in the study were females. Ninety-seven percentage of the participants reported history of malaria infection. The level of non-adherence with malaria treatment plan among undergraduates was estimated as 63%. Also, the findings revealed that 66%, 79%, 60% and 66% of undergraduates were non-adherent with malaria treatment plan due to personal barriers, social barriers, knowledge-related barriers and religious barriers, respectively. Among all barriers responsible for non-adherence to malaria treatment plan, social barriers showed the highest but insignificant negative association with malaria history (OR = 0.103, $p > 0.05$). **Conclusion:** Social factors were the major contributor to non-adherence to malaria treatment plan among the undergraduates. Authorities at various levels should intensify efforts on awareness dissemination regarding malaria, its treatment and complications to increase student's knowledge about the disease and its treatment.

Keywords: Malaria, Malaria infection, Treatment plans, Malaria treatment, Undergraduates

Introduction

Malaria is a life threatening disease and a significant health concern over the years [1]. As a principal public health challenge, it affected an estimated 247 million individuals globally in the year 2021 and accounted for 6,10,000 deaths in the year 2024 [2,3]. Nigeria accounts for more than 25% of global malaria cases and about 27% of global malaria deaths [4]. Female Anopheles mosquitoes are reputedly the primary vector for transmitting single-celled plasmodium species [5]. Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, Plasmodium ovale and Plasmodium knowlesi are the known species of plasmodium

with Plasmodium falciparum being the most lethal and prevalent in the Sub-Sahara Africa. Anopheles culicifacies and Anopheles darlingi thrive in South Asia and South America respectively [6]. In Sub-Sahara Africa, Anopheles gambiae and Anopheles funestus are relatively more effective due to their long lifespan and great preference for human beings [7]. Over the years, malaria control strategies have remained a cornerstone for reducing disease prevalence and severity. The use of long-lasting insecticide treated nets, larval source management and indoor residual spraying has led to significant reductions in contacts between the mosquitos and

humans [8-10]. In Africa, the use of long-lasting insecticide treated nets is a cardinal means of vector control, however, its effectiveness is marred by inconsistencies [11]. Larval source management and indoor residual spraying are effective but their costs of implementation are high [12,13]. Other preventive options such as malaria vaccines, intermittent preventive treatments and seasonal malaria chemoprevention are highly important especially for vulnerable individuals but they are challenged by funding deficits, weak health infrastructures, community hesitance, logistics and ever changing drug resistance [14,15].

Besides antimalarial drug resistance, poor access to diagnostic testing and health facilities, and widespread use of counterfeit medications, malaria treatment plan faces a dilemma of non-adherence in African countries, most especially Nigeria. This non-adherence originates from systemic healthcare gaps, socioeconomic challenges and dangerous behavioral patterns paving the way for parasite mutation, drug resistance, treatment relapse and chronic illness [16,17]. Among the local indigenous communities in Nigeria, the primary orchestrators of non-adherence to malaria treatment plans have been shown to include preponderance of over the counter malaria medications, self-medication, reliance on unstandardized herbal formulations, illiteracy, counterfeit medications, non-completion of medication cycle, drug side effects, missed doses and poverty [18].

Moreover, psychological stress and emotional exhaustion are underlying factors attributable to non-adherence to malaria treatment plan. Among the University members, fresh undergraduate students are known to be high risk group for stress, burnout, and mental health challenges [19]. However, there is dearth of information about

factors causing non-adherence to malaria treatment plan among this local indigenous population. Therefore, the study was designed to determine the barriers responsible for non-adherence with anti-malaria treatment plan among undergraduates of University of Delta, Agbor, Nigeria.

Material and Methods

Research design

The descriptive survey research design aligned with the ethical principles of the Edo State University Ethical Committee and Declaration of Helsinki for the protection of human subjects and data integrity. The study area was University of Delta, Agbor, Delta State (UNIDEL). UNIDEL was selected because of its high population of undergraduate students in Delta State. University of Delta, Agbor, Delta State is located in a serene and academic-friendly environment in Agbor, the Administrative Headquarter of Ika South Local Government Area of Delta State, in South-South geopolitical zone of Nigeria at about 6.2530° N latitude and 6.2058° E longitude.

Population of the study

The study recruited University undergraduates in their first year (100 level) from all the eight faculties (Arts, Education, Engineering, Environmental Science, Computing, Law, Management & Social Science and Science) using students' registers.

Sample and sampling technique

The sample size was obtained using Taro Yamane formula [20].

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = Sample size

N - Population size (3265)

e = Level of precision (assumed to be 0.05 at 95% confidence level)

Thus, $n = 356$; out of which 6 students were lost to follow up

Therefore, $n = 350$ students

Sampling technique

Stratified simple random sampling technique was used in this study. The subjects were divided into subgroups called strata based on shared characteristics.

Inclusion criteria

Undergraduates attending University of Delta, Agbor, Delta State; undergraduates in level 100 in University of Delta, Delta State.

Instruments for data collection

The research instrument used for data collection in this study was a structured, close-ended, adapted, interviewer-administered questionnaire. The questionnaire consisted of a total of 37 items in seven sections. Section A elicited information on socio-demographic data of the respondents, section B assessed the challenges undergraduates face with anti-malaria treatment plan in the university. Section C determined the level of non-adherence with anti-malaria treatment plan among undergraduates in the university. Section D identified personal factors affecting non-adherence with anti-malaria treatment plan among undergraduates. Section E identified social factors affecting non-adherence with anti-malaria treatment plan among undergraduates. Section F assessed knowledge-related factors affecting non-adherence with anti-malaria treatment plan among undergraduates and Section G centered on religious factors affecting non-adherence with anti-malaria treatment plan among undergraduates. Section B through section G were assessed with a dichotomous response of “yes” or “no”. A score of 1 or 0 was given to correct and wrong answers

respectively. A cut off of 50% was designated as acceptable. A score of $< 50\%$ was regarded as non-adherent and a score of $> 51\%$ and above regarded as adherent.

Validity of instrument

The validity of instrument was done by a Nurse Educator from the College of Nursing Agbor, Delta State. It was scrutinized for grammatical error. The corrected version was submitted to the project supervisor for approval.

Reliability of instrument

Instrument reliability was done using a test-retest method; thirty-five (35) copies of questionnaire which represents 10% of the sample size was administered to participants, two weeks later, thirty-five (35) copies of the questionnaires were administered using the same group of respondents. Spearman-Brown's Alpha formula was used to determine the reliability coefficient. The score of 0.85 was obtained and considered reliable.

Ethical consideration

A written ethical approval from Ministry of Higher Learning, Asaba, Delta State was obtained. The Dean of Students' Affairs of University of Delta, Agbor, Delta State was informed with a supporting formal letter and permission were granted. Participation was voluntary.

Method of data analysis

Analysis of data was done from a descriptive perspective using the Statistical Package for Social Sciences software version 22. The analysed data were reported in the form of frequency, percentage and pie chart. Relational analysis was done using binary logistic regression. Statistical significance was accepted at $p < 0.05$.

Results

Socio-Demographic data of participants (Table 1)

Majority (85.7%) of the respondents were within the age bracket of 15-19 years, 11.7% of the respondents were within the age bracket of 20 to 24 years, and 2.6% of the respondents were 25 years and above. Majority (71.4%) of the respondents were females while 28.6% were males. Thirty percent of the respondents were of Igbo tribe, 15.7% were Yoruba tribe, 4.3% are Hausa tribe, and 50% were from other tribes. Majority (57.1%) of the respondents were Christians, a few were Islamic religion 4.3 %, and 38.6% practiced traditional African religion. Majority (98.6%) were single, all the respondents were in their 100 level with majority of them (97%) having had history of malaria.

Challenges faced by undergraduates in University of Delta, Agbor, Delta State with malaria treatment plan (Table 2)

Majority (71.4%) agreed that taste of malaria drugs was a challenge with malaria treatment plan, 62.9% disagreed that duration of treatment was a challenge, 85.7% of the respondents agreed that fear of side effect was a challenge with malaria treatment plan, 28.6% agreed that nature of patient illness was a challenge with malaria treatment and majority (84.3%) agreed that price of malaria medication was a challenge with malaria treatment.

Level of non-adherence with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State (Table 3)

Majority (80.0%) of the respondents stopped taking malaria drugs as soon as symptoms subsided, 89.1% respondents took only half of the prescribed drugs, 83.1% took more than one dose, 72.3% took herbal concoction and oral malaria drug(s) concurrently,

74.6% took vitamin C tablet even when on malaria drug, minority (14.3%) completed the prescribed dose of the malaria treatment regimen and only 28.6% took the prescribed dose of the malaria drugs at the right time.

Overall, the level of non-adherence with anti-malarial treatment plan among undergraduates in UNIDEL was high (63%).

Contributions of personal barriers to noncompliance with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State (Table 4)

Majority (79.1%) of the respondents discontinued treatment because of the unpleasant taste of malaria drug, 74.3% discontinued because of the adverse reaction, 51.4% discontinued because they felt sick and sluggish when on malaria drugs, 57.1% stopped taking malaria medication (ACT) because of many quantities of the drug, and 68.6% of the respondent discontinued with malaria medication because it took too long to complete the dose. Figure 3 shows that 66% undergraduates in UNIDEL were non-adherent with anti-malarial treatment plan due to personal factors.

Contributions of social barriers to non-adherence with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State (Table 5)

Majority (82.9%) of the respondents stopped taking prescribed malaria drugs because they could not afford the full course of treatment, 61.1% of them discontinued because their friends saw them as a sickly person, 85.7% of the respondents reported they stopped taking the medication due to forgetfulness, 87.4% stopped taking medication because it restricted their movement and socializa-

tion with friend's while 78.3% discontinued the prescribed drugs because they believed by virtue of origin and ancestry, they are resistant to malaria infection.

Contributions of religious barriers to non-adherence with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State (Table 6)

Majority (85.7%) the respondents discontinued taking malaria drug because it is against their religious belief, 71.4% of the respondents believed in the ultimate power of God for their healing so they stopped taking the prescribed malaria drug, 57.1% claimed malaria vanished from their body when asleep in the church, 71.4% of the respondents stopped taking malaria drug because it made them look like an "unbeliever", 56.3% believed "Holy water" was more potent than malaria drugs and 55.4% of the respondents believed malaria infection was punishment from the gods and that only the gods could cure it.

Contributions of knowledge-related barriers to non-adherence with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State (Table 7)

Majority (68.6%) of the respondents agreed that non-adherence to malaria treatment regimen could not cause recurrent malaria infection, 57.4% of the

respondent said herbal drugs were more effective to treat malaria that was why they abandoned malaria drugs, 45.7% of the respondents understood that malaria was not caused by poor nutrition or drinking dirty water, there is need to take prescribed ant-malaria drug, 60.0% of the respondents agreed that malaria drugs caused more harm to the body, 65.7% felt malaria medication were ineffective, 70% of the respondents did not know that poorly treated malaria infection could cause numerous health complications, 80% agreed that herbal preparations were better, cheaper and readily available than malaria drugs, 28.6% understood the benefits of taking malaria drugs, and 54.3% of the respondents claimed they discontinued taking malaria drugs because they did not receive enough information about malaria drug usage from health care providers.

Relationship of malaria history with non-adherence with malaria treatment plan and its associated barriers (Table 8)

Malaria history was not significantly associated with non-adherence (Odd Ratio=0.089, $p > 0.05$), non-adherence due to personal barriers (Odd Ratio = 0.09, $p > 0.05$), social barriers (Odd Ratio = 0.103, $p < 0.05$), knowledge-related barriers (Odd Ratio = 0.088, $p > 0.05$) and religious barriers (Odd Ratio = 0.09, $p > 0.05$).

Table 1: Socio-demographic data of respondents

Variables	Variable Characteristics	Frequency (Percentage)
Age (in years)	15-19	300 (85.7 %)
	20-24	41 (11.7 %)
	25 and above	9 (2.6%)

Continued...

Gender	Male Female	100 (28.6 %) 250 (71.4 %)
Ethnicity	Igbo Yoruba Hausa Others	105 (30 %) 55 (15.7 %) 15 (4.3 %) 175 (50.0 %)
Religion	Christian Muslim Traditional African Religion	200 (57.1 %) 15 (4.3 %) 135 (38.6 %)
Marital Status	Married Single	5 (14%) 345 (98.6 %)
Academic Level	100	350 (100%)
History of Malaria	Yes No	340 (97.0 %) 10 (3.0 %)

Table2: Challenges faced by undergraduates in University of Delta, Agbor, Delta State with malaria treatment plan

Statements	Yes (%)	No (%)
Taste of medication (malaria drug)	250 (71.4)	100 (28.6)
Duration of treatment	130 (37.1)	220 (62.9)
Fear of side effects	300 (85.7)	50 (14.3)
The nature of patient illness	100 (28.6)	250 (71.4)
Price of malaria medication	295 (84.3)	55 (15.7)

Table3: Level of non-compliance with anti-malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State.

Statements	Yes (%)	No (%)
I stop taking malaria drug soon as the symptoms subside	280 (80.0)	70 (20.0)
I only take half of the prescribed drug(s)	312 (89.1)	38 (10.9)
I take more than one dose when feeling very sick	291 (83.1)	59 (16.9)
I take herbal concoction and oral malaria drug(s) concurrently	253 (72.3)	97 (27.7)

I take Vitamin C even when I am on malaria drug	261 (74.6)	89 (25.4)
I complete the prescribed dosage of the medication even when I stop feeling feverish.	50 (14.3)	300 (85.7)
I take the prescribed dosage of the medicine at the right time.	100 (28.6)	250 (71.4)

Table 4: Personal barriers causing non-compliance with anti-malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State

Statements	Yes (%)	No (%)
I discontinue because of unpleasant taste of malaria medication	277 (79.1)	73 (20.9)
I discontinue because of adverse reaction of the medication	260 (74.3)	90 (25.7)
Anti-malaria drug(s) makes me feel sick and sluggish	180 (51.4)	170 (48.6)
I stop taking malaria medication (Artemisinin based combination therapy) because the quantity is too much for me	200 (57.1)	150 (42.9)
I discontinue with the medication because it takes too long to complete the dose	240 (68.6)	110 (31.4)

Table 5: Social barriers causing non-compliance with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State

Statements	Yes (%)	No (%)
I stopped taking prescribed malaria drug because of non-affordability of full course of treatment.	290 (82.9)	60 (17.1)
I discontinued because my friends see me as a sickly fellow.	214 (61.1)	136 (38.9)
I discontinued because I always forget to take the drug	300 (85.7)	50 (14.3)
Taking anti-malaria medications restrict my movement and socialization hence, I stopped taking them.	306 (87.4)	44 (12.6)
I stopped because where I come from, we do not fall sick of malaria	274 (78.3)	76 (21.7)

Table 6: Religious barriers causing non-compliance with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State

Statements	Yes (%)	No (%)
I discontinued because taking drugs is against my religious belief	300 (85.7)	50 (14.30)
I believe in the ultimate healing power of God, thus I stopped taking drug.	250 (71.4)	100 (28.6)
I slept in the church and malaria vanished, that is why I discontinued	200 (57.1)	150 (42.9)
Taking anti-malaria drug makes me look like an “unbeliever”	250 (71.4)	100 (28.6)
“Holy water” is more potent than anti-malaria drug	197 (56.3)	153 (43.7)
I believe malaria is a punishment from the Gods and only the Gods can cure it.	194 (55.4)	156 (44.6)

Table 7: Knowledge-related factors affecting non-adherence with malaria treatment plan among undergraduates in University of Delta, Agbor, Delta State

Statements	Yes (%)	No (%)
Non-adherence to malaria treatment regimen cannot cause recurrent malaria infection	240 (68.6)	110 (31.4)
Effectiveness of herbal drugs, makes me abandon my malaria drugs	201 (57.4)	149 (42.6)
Malaria is caused by drinking dirty water, poor nutrition, so there is no need to take malaria medication	190 (54.3)	160 (45.7)
Malaria drug causes more harm than good to the body	210 (60.0)	140 (40.0)
Malaria medications are ineffective	230 (65.7)	120 (34.3)
Poorly treated malaria infection can cause many other health complication	105 (30.0)	245 (70.0)
Herbal preparations are cheaper, better and readily available than malaria drug	280 (80.0)	70 (20.0)
I do not know the benefit of taking malaria drugs; hence I do not take them	250 (71.4)	100 (28.6)
I discontinued taking malaria because of inadequate information from the healthcare providers as regard malaria drug usage	190 (54.3)	160 (45.7)

Table 8: Relationship of malaria history with non-adherence with malaria treatment plan and its associated factors

Factors	Exp(B)/Odd Ratio	<i>p</i>
Non-adherence	0.089	0.09
Non-adherence due to personal barriers	0.09	1.101
Non-adherence due to social barriers	0.103	0.089
Non-adherence due to knowledge related barriers	0.088	0.095
Non-adherence due to religious barriers	0.09	0.868

Discussion

Non-adherence to treatment plan is a cardinal barrier hindering effective disease prevention and control leading to mutation of parasites and disease resistance [21,22]. The study investigated barriers responsible for non-adherence to malaria treatment plan among fresh university undergraduate students of University of Delta, Agbor, Nigeria.

Demographic survey showed that majority of the study participants were between ages 15 to 19 years. This is a fair representation of the entry age of undergraduate students in typical Nigerian Universities as reported by Ofoha and Uchenna (2023) [23] and Ibrahim *et al.* (2025) [24]. As expected, majority of the undergraduates were single [25]. The preponderance of Igbo ethnicity, a Christian major population, was attributable to the ethno-historical peculiarity of Agbor being an Igbo dominated City [26]. Similar to a study conducted by Abu *et al.* (2025) [27], majority of the participants were females.

Majority of participants reported having history of malaria. This implied that most of the undergraduates had recovered from previous malaria infections. However, whether the previous treatment was effective enough to prevent relapse and malaria resistance was not within the scope of this study.

Studies have shown that poorly treated malaria is a principal cause of recurrence [18]. Cessation of medications as soon as symptoms disappeared as well as incorrect malaria drugs may cause incomplete destruction of malaria parasite leading to a new wave of sickness [16].

With respect to malaria treatment plan, 61% had challenge adhering to the malaria treatment plan. Challenges identified by the participants were bitter taste of drug, fear of side effects and the cost of the treatment. Bitter nature of drugs like quinine and Artemisinin Combination Therapy (ACT) often accounts for drug refusal and hesitancy [18]. Adverse side effects including nausea, dizziness, headache, and sleep problems and elevated consultation and medication fees are known to be associated with malaria treatment especially in middle and low income countries [16]. Conversely, many students did not recognize duration of treatment as a challenge.

In this study, non-adherence to malaria treatment was defined as stoppage of treatments as soon as symptoms disappeared and incomplete treatment cycle, adhering to half of the prescribed drugs, taking more than one dose, concomitant use of

unstandardized herbal solution, the concomitant use of vitamin C with malaria drugs and inability to take prescribed drugs at right time. The level of non-adherence to malaria treatment among the students was estimated as 63%. A slightly related study involving adults and paediatric inpatients and healthcare workers reported that adherence to malaria treatment guidelines in Uganda was 33.07% [28].

Personal barriers accounted for 66% of the non-adherence to malaria treatment plan in the study. The identified personal barriers included bitter taste of the drug, adverse drug reaction, high pill burden and long treatment cycle, and they are known to be related with aversion and mental barriers [18].

Furthermore, the finding of the study showed that 66% of the undergraduates were non-adherent due to religious barrier. Perceptions that taking malaria medications contradicts their faith, beliefs in ultimate power of God for malaria healing, believing that taking malaria medication indicates unbelief, belief in 'holy water' and perception that malaria is punishment from God portrayed religion-related impediments to malaria treatment. Plethora of studies in developing countries identified beliefs associating witchcraft as the best treatment for malaria as a barrier to malaria treatment among children.

Knowledge related barriers accounts for non-adherence to malaria treatment with many of the students agreeing that non-adherence to malaria treatment regimen cannot cause recurrent malaria infection. In addition, preference for unstandardized herbal drugs due to their relatively higher efficiency, poor knowledge about the actual cause of malaria, perception that prescribed malaria medications are inefficient, poor knowledge about the likelihood of poorly treated malaria causing complication indicated poor knowledge about

malaria treatment plan. Malaria ignorance has been identified as one of the barriers responsible for non-adherence to malaria treatment plan in patients [16]. Besides the knowledge-related barrier, 79% of the undergraduates were non-adherence with malaria treatment plan due to social barriers.

Non-affordability of malaria treatment cost is a known barrier for malaria treatment [14,15]. In this study, besides cost, social barriers including dissociation from friends, pill skipping due to forgetfulness, reduced access to people and belief of inherent family supernatural immunity against malaria were social barriers which caused non-adherence to malaria treatment plan among the undergraduates. Social isolation occasioned by long recovery period [17], pill skipping associated with alleviation of initial symptoms of the disease [29,30] and belief of inherent family supernatural immunity against malaria are associated with malaria resistance [16,17]. Among all the barriers, social barriers showed the highest but insignificant negative associations with malaria history.

Conclusion

The findings of this study indicated that social factors were relatively responsible for high non-adherence to malaria treatment plan among the undergraduates. Authorities at various levels should intensify efforts on awareness dissemination regarding malaria, its treatment and complications to increase student's knowledge about the disease and its treatment. The University Management should liaise with the State Ministry of Health to organize seminar on malaria, its treatment and complications to increase student's knowledge about malaria and its treatment to enable them make informed decision to adhere to malaria treatment plan when undergoing malaria treatment therapy and reduce

the incidence of resistance which occur with non-adherence with treatment plan.

Acknowledgement

The authors express sincere appreciation to the management of University of Delta, Agbor and Delta State Ministry of Health for their supports.

References

1. Showler AJ, Kazmi K, Obetta C, Igboanugo S, Boggild AK. Protozoan diseases: malaria, clinical features, management and prevention. In: Quah SR, editor. *International Encyclopedia of Public Health*. 3rd ed. Academic Press; 2025. p. 812-29.
2. Shin HI, Ku B, Park E, Ju JW, Lee HI. Status of world malaria in 2021 (2022 World Malaria Report). *Jugan Geongang Gwa Jilbyeong*. 2023;16(22):684-706.
3. World Health Organization. Malaria [Internet]. Geneva: World Health Organization; 2026 [cited 2026 Sep 18]. Available from: <https://www.who.int/news-room/fact-sheets/detail/malaria>
4. Anjorin ET, Olulaja ON, Osoba ME, Oyadiran OT, Ogunsanya AO, Akinade ON, et al. Overtreatment of malaria in the Nigerian healthcare setting: prescription practice, rationale and consequences. *Pan Afr Med J*. 2023; 45:111.
5. Djihinto OY, Medjigbodo AA, Gangbadja ARA, et al. Malaria-transmitting vectors microbiota: overview and interactions with *Anopheles* mosquito biology. *Front Microbiol*. 2022; 13:891573.
6. Conn JE, Ribolla PE. Ecology of *Anopheles darlingi*, the primary malaria vector in the Americas and current nongenetic methods of vector control. In: Adelman ZN, editor. *Genetic Control of Malaria and Dengue*. Academic Press; 2016. p. 81-102.
7. McConnaughey M. Life cycle of parasites. Reference Module in Biomedical Sciences. Elsevier; 2014. ISBN: 9780128012383.
8. Hemingway J, Shretta R, Wells TN, Bell D, Djimé AA, Achee N, et al. Tools and strategies for malaria control and elimination: what do we need to achieve a grand convergence in malaria? *PLoS Biol*. 2016;14(3): e1002380.
9. Kanikwu PN, Adeniyi MJ, Seriki SA, Adesuwa EP. Knowledge, attitude and practice of adequate diet among people living with HIV in Auchi, Edo State. *Int J Biomed Clin Res*. 2025;3(5):1-7.
10. Kanikwu NP, Adeniyi MJ, Seriki AS, Fatima D. Self-reported malaria prevalence, knowledge and utilization of control strategies in indigenous community of Iyamho: investigating a nexus. *Anat Physiol Biochem Int J*. 2025;8(2):555733
11. Bachan EG, Abu J, Adokiya MN, West CT. Effectiveness of malaria control interventions in resource-limited countries: a systematic review. *J Interv Epidemiol Public Health*. 2025;8(3):74.
12. Isiguzo C, Anyanti J, Ujuju C, Nwokolo E, De La Cruz A, Schatzkin E, et al. Presumptive treatment of malaria from formal and informal drug vendors in Nigeria. *PLoS One*. 2014; 9(10): e110361.
13. Negasa K, Huluka TK, Yebassa MA, Waqkene T. Utilization of long-lasting insecticide-treated net and its associated factors among pregnant women in Dawo district, Southwest Shoa Zone, Oromia, Ethiopia, 2023. *Front Public Health*. 2024; 11:1261254.
14. Oladipo HJ, Tajudeen YA, Oladunjoye IO, Yusuf SI, Yusuf RO, Oluwaseyi EM, et al. Increasing challenges of malaria control in sub-Saharan Africa: priorities for public health research and policymakers. *Ann Med Surg (Lond)*. 2022; 81:104366.
15. Djedanem M, Salé NM, Aminou EYYM, Testa J, Jambou R. Status and prospects of seasonal malaria chemoprevention among children in Sahelian countries: a systematic review and meta-analysis. *PLoS Glob Public Health*. 2025;5(9): e0005124.
16. Kokwaro G. Ongoing challenges in the management of malaria. *Malar J*. 2009; 8(Suppl 1): S2.
17. Unite against malaria: challenges and achievements in malaria control around the globe. *Nat Commun*. 2026; 17:3782.
18. Bamikole OJ, Olajide TH, Adedeji BA, Ademola SA, Fayehun AF, Bukoye NO, et al. Drug use practices and self-treatment for suspected malaria in Ibadan, Nigeria. *Am J Trop Med Hyg*. 2023;108(6):1122-6.

19. Limone P, Toto GA. Factors that predispose undergraduates to mental issues: a cumulative literature review for future research perspectives. *Front Public Health*. 2022; 10:831349.
20. Yamane T. Statistics: an introductory analysis. 2nd ed. New York: Harper and Row; 1967.
21. Ozolua PO, Adeniyi MJ, Onize KH, Evbuomwan L. Prevalence of multi drug resistant bacteria in urine of pregnant women in Auchi, South-Southern Nigeria. *West Afr J Life Sci*. 2025; 2(2):9-22.
22. Ozolua PO, Adeniyi MJ, Oribhabor CO. Antibacterial activity of aqueous and ethanolic extracts of *Murraya koenigii* (curry leaf) against vancomycin, Septrin and streptomycin resistant bacteria isolates from open dumpsites in Iyamho, Nigeria. *Salus et Scientia*. 2026;2(2):1-7.
23. Ofoha D, Uchenna C. Challenges of underage admission in Nigerian universities: an empirical study. *Niger J Educ Psychol*. 2023;12(4):89-104.
24. Ibrahim R, Adeola R, Subair ST, Oparinde OR. University entrants age and intellectual readiness of undergraduates in Nigerian universities. *Al-Hikmah J Educ*. 2025; 12(1):162-74.
25. Imaledo JA, Peter-Kio OB, Asuquo EO. Pattern of risky sexual behavior and associated factors among undergraduate students of the University of Port Harcourt, Rivers State, Nigeria. *Pan Afr Med J*. 2012; 12:97.
26. Eborka NF, Igwe UC. Agbor-Benin socio-cultural relations in pre-colonial and colonial times. *UZU J*. 2025;10(1):45-65.
27. Abu Bonsra E, Amankwah Osei P, Adjei Kyeremeh E, Adama S, Sekyi AG, King EF. Factors associated with malaria in pregnancy among women attending ANC clinics in selected districts of the Ashanti Region, Ghana. *Malar J*. 2025;24(1):8.
28. Akello Z, Oloro J, Mukanyangezi MF, Asingizwe D. Adherence to severe malaria treatment guidelines in Northern Uganda: a mixed-methods study. *Malar J*. 2025;24(1):417.
29. Mulay HD, Murthy TD, Nerune SM, Amrutha MR. New methylene blue stain for malaria detection on thin smears. *J Krishna Inst Med Sci Univ*. 2017;6(1):76-81.
30. Adeniyi MJ, Agoreyo FO, Ige SF, Fabunmi OA, Ozolua OP, Biliaminu SA. Physiological implications of prolonged selenium administrations in normal and desynchronized adult female rats. *J Krishna Inst Med Sci Univ*. 2021;10(4):21-36.

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How to cite this article:

Kanikwu PN, Adeniyi MJ, Seriki SA, Igidi IP. Non-adherence to malaria treatment plan among university undergraduate population in Nigeria: evaluations of the overarching barriers. *J Krishna Inst Med Sci Univ*. 2026; 15(2): 146-157

■ Submitted: 09-Jan-2026 Accepted: 09-March-2026 Published: 01-April-2026 ■