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ORIGINAL ARTICLE

# Self-Medication Practice with Antimalarials and Associated Factors Among Undergraduate Health Science Students in North Western - Tanzania: A Cross-Sectional Study

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## ABSTRACT

**Background:** Self-medication is a growing public health concern in developing and developed countries.
**Objective:** This study was designed to assess the prevalence of self-medication practice among undergraduate health science students and to determine its concomitant factors.
**Methods:** This study was conducted in May 2021 among undergraduate health science students studying at the Catholic University of Health and Allied Sciences (CUHAS) in Mwanza, Tanzania. An analytical cross-sectional design was used in this study. Semi-structured questionnaires were used to collect information on the sociodemographic characteristics of respondents and to assess their anti-malarial self-medication practice.
**Results:** A total of 340 participants were recruited. The prevalence of self-medication with antimalarials was 55.9%. Among 190 students who ever used antimalarials without a prescription; the majority 143 (75.3%) obtained antimalarials from community drug outlets, and 116 (61.0%) used artemether-lumefantrine. The majority reported the emergence of acute illness (ie, no time to attend health facilities) 82 (43.2%) to be the major reason for self-medication. Students aged 25 years and above were more likely to use antimalarials without a prescription compared to students aged between 18 and 21 years, (aOR=2.99 (95% CI 1.24-0.7.22). Compared to first-year students, third-year (aOR=0.18 (95% CI 0.07-0.41), fourth-year (aOR=0.32 (95% CI 0.13-0.79), and fifth-year students (aOR=0.16 (95% CI 0.04-0.64) were significantly less likely to take antimalarials without a prescription.
**Conclusion:** The study found a high prevalence of self-medication with antimalarials among undergraduate health science students, emphasizing the need for strategies to promote the rational use of antimalarials. It is recommended to improve access to healthcare facilities and educate students about the risks associated with self-medication to reduce its prevalence.

## BACKGROUND

Malaria is still one of the major public health threats across the world.[1] Notwithstanding substantial improvements in reducing malaria prevalence, *Plasmodium falciparum* malaria caused approximately an estimated 619 000 malaria deaths globally in 2021, the majority of which were in sub-Saharan Africa.[2] Four countries accounted for just over half of all malaria deaths globally in 2021: Nigeria (31%), the Democratic Republic of the Congo (13%), Niger (4%), and Tanzania (4%).[2] Common antimalarial drugs used in Tanzania include artemether-lumefantrine, sulphadoxine/pyrimethamine, piperaquine/(dihydro)artemisinin, and amodiaquine/artesunate.[3] Self-medication with anti-malaria drugs is a common practice in countries where the malaria burden is high.[4] This is due to a variety of reasons, including limited access to healthcare facilities, high healthcare costs, and inadequate knowledge about the appropriate use of antimalarial drugs.[5]

Self-medication is defined as the use of medications to treat self-identified disorders or symptoms, or the intermittent or continuous use of a prescribed medicine for chronic or recurrent diseases or symptoms without seeking medical guidance.[6] Self-medication is a serious public health concern, both in developing and developed countries.[7] Antimalarials are not permitted for self-medication and must only be obtained from drug outlets with a doctor's prescription.[8] Self-medication with antimalarials can lead to serious consequences such as delay in diagnosis of illness, drug resistance, increase of co-morbidities, and, in some cases, death.[9,10]

Studies have shown that the prevalence of self-medication with antimalarials differs across the globe, and is more prevalent in low- and middle-income countries.[11] The prevalence of self-medication with antimalarial drugs in sub-Saharan Africa varies widely among countries and populations. Previous studies done in the Congo, Ghana, and Cameroon reported a prevalence of self-medication between 41.0% and 57.8%.[12–14] In the general population, self-medication with antimalarials is a phenomenon common in Tanzania.[15] In a study conducted in Saudi Arabia, the prevalence of self-medication among university students was 98.2%.[16] However, data on self-medication practice with antimalarials among undergraduate health science students, particularly in low- and middle-income countries, are scarce.

Studies on the prevalence and factors associated with antimalarial self-medication among undergraduate health science students in Tanzania are necessary to help with the planning of interventions to improve the use of these medicines. To the best of our knowledge, no study has yet been undertaken in Tanzania that has reported antimalarial self-medication among university students. Thus, this study was conducted in order to determine the prevalence of self-medication with antimalarials among undergraduate students at the Catholic University of Health and Allied Sciences (CUHAS) in Mwanza, Tanzania, as well as to assess the sociodemographic factors associated with self-medication with these medications.

# METHODS

## Study Design and Setting

The study employed an analytical cross-sectional design. It was conducted in CUHAS in May 2021. The university is located at Bugando Hill, within the Bugando Medical Centre (BMC). premises in north western, Mwanza, Tanzania, the setting with stable high malaria transmission.[17] Its core business is training, research, and consultancy services. CUHAS train health professionals in the fields of medicine, pharmacy, medical laboratory sciences, nursing, radiology and public health through diploma, bachelor, masters and PhD programmes. Undergraduate students from the following courses were the study population: Doctor of Medicine (MD), Bachelor of Science in Nursing (BSN), Bachelor of Pharmacy (BP) and Bachelor of Medical Laboratory Sciences (BMLS).

## Sampling and Data Collection Procedure

The Taro Yamane formula (ie, $n=N/(1+N(e)^2)$) was used to obtain a minimum sample size of 332 because this study was conducted in a finite population with a known population size.[18] The Taro Yamane formula is a statistical sampling formula used to determine the sample size required of a finite population to achieve a certain level of accuracy and confidence in the survey results. The formula takes into account the population size, desired level of precision, and level of confidence. These parameters have the ability to influence the accuracy and reliability of the survey results.[19] The total number of undergraduates was 1968 and the acceptable sampling error was 0.05. All the 1,968 students were invited through their class representatives to participate in the study and, from these, 340 students volunteered and consented in writing by signing a consent form to participate through the completion of a survey questionnaire.

Semi-structured questionnaires consisting of both open-ended and closed-ended questions were used to collect information on the sociodemographic characteristics of respondents and to assess their anti-malarial self-medication practice. The self-administered questionnaire was set in English, printed, and pretested. The self-administered questionnaires were completed in the presence of the research assistants. Self-administered questionnaires were used to minimize interviewers' bias in the way questions were asked, and more importantly because all respondents were literate. Based on the reports from previous studies,[20–22] the following information was included in the questionnaire: social demographic characteristics (gender, age, marital status, course of study, and year of study), practice of self-medication (if one has ever used antimalarials for self-medication in his or her lifetime, source of supply of antimalarials, health outcome after self-medication, if one had stopped treatment without finishing the course), common types of antimalarials used, and reasons for practicing self-medication.

The questionnaires was assessed for content validity by experts in the School of Public Health at CUHAS.

## Data Analysis

Data were analyzed using STATA version 14. Categorical data were presented in frequencies (percentages) and with the aid of charts and tables. Quantitative variables were presented as median (Interquartile range). Differences between social demographic characteristics between students who had practiced self-medication and those who had not were examined using

Chi-square or Fisher exact tests where appropriate. The trend analysis was conducted to examine the difference between self-medication practice and the year of study. Multivariable logistic analysis was used to identify social demographic factors associated with self-medication among the students. All independent variables were included in the model. *P* values of less than .05 were considered statistically significant. The strength of the association was also measured by odds ratio (OR) and adjusted odds ratio (aOR) with corresponding 95% confidence interval (CI).

## Ethical Consideration

This study was approved by The Catholic University of Health and Allied Sciences and Bugando Medical Centre's Joint Ethics and Research Review Committee (IRB approval No: UEC/1821/2021). Participants' verbal and written consent to participate in the study were sought and obtained before the questionnaires were administered. During the data collection, personal identifiers such as name and phone numbers of the participants were not recorded to ensure confidentiality. Rather, numbers were assigned for coding purpose. The collected information was coded and kept confidential, only to be accessed by the principal investigator.

# RESULTS

## Socio Demographic Information of Respondents

A total of 340 students were enrolled in the study, of whom the

most (n=182, 53.5%) were female, and age category 22 to 24 years had more respondents (n=166, 48.8%) than the rest. The median (interquartile range) age of participants was 22 (21 to 24) years. The predominant course was MD (n=142, 41.8%), while second-year students were 89 (26.2%) (Table 1).

## Practice of Self-Medication with Antimalarials

One hundred ninety (55.9%) of the respondents admitted to having ever used antimalarials without a prescription. Among them, the majority (n=143, 75.3%) obtained antimalarials from community drug outlets and almost half of them (n=98, 51.6%) recovered. Furthermore, about one quarter (n=45, 23.7%) of those who admitted to having self-medicated did not finish the treatment course (Table 2).

Out of 190 undergraduate students that practiced self-medication with antimalarial, majority 116 (61.0%) used artemether-lumefantrine. Others used sulphadoxine/pyrimethamine 36 (19.0%), piperaquine/(dihydro) artemisinin 30 (15.8%) and amodiaquine/artesunate 8 (4.2%) for malaria treatment without the doctor's prescription (Figure 1).

The reason most reported (n=82, 43.2%) for self-medication was the emergence of acute illness (ie, no time to attend health facilities). Other reasons included too much time taken at health facilities (ie, long queues at facility) (n=46, 24.2%), accessibility of drug outlets (n=34, 17.9%), high treatment cost at health facility (n=22, 11.6%) and out of stock of medicines in health facilities (n=6, 3.2%). (Figure 2).

## Demographic Factors Associated with Self-Medication with Antimalarials

There was no statistically significant association with self-medication practice for gender ($X^2$=3.635; $P$>.05), and age group ($X^2$=1.268; $P$>.05) of undergraduate students. However, self-medication practice statistically significantly differed among the courses ($X^2$=9.420; $P$<.024) and year of study ($X^2$=18.450; $P$<.001). The prevalence of self-medication was higher among BSN (n=46, 66.7%) and first year students (n=57, 68.7%) compared to other courses. With $P$ value=.004, the declining trend in the rates of self-medication with increase in year of study was statistically significant (Table 3).

Having controlled for confounders, multivariable logistic regression analysis revealed that self-medication practice was significantly independently associated with age and the year of study. Students aged 25 years and above were more likely to use antimalarials without a prescription compared to those aged 18 to 21 years, (aOR=2.99; 95% CI, 1.24 to 0.7.22; $P$<.015). Compared to first year students, the third-year students (aOR=0.18; 95% CI, 0.07 to 0.41; $P$<.001), fourth year students (aOR=0.32; 95% CI, 0.13 to 0.79; $P$<.013), and fifth year students (aOR=0.16; 95% CI, 0.04 to 0.64; $P$<.034) were significantly less likely to take antimalarials without a prescription, (Table 4).

**TABLE 1: Sociodemographic Characteristics of Participants (N=340)**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Gender | | |
| Female | 182 | 53.5 |
| Male | 158 | 46.5 |
| Age (Years) | | |
| 18-21 | 103 | 30.3 |
| 22-24 | 166 | 48.8 |
| 25 and above | 71 | 20.9 |
| Median age years (Interquartile range) | 22 (21 - 24) | |
| Course of study | | |
| MD | 142 | 41.8 |
| BP | 85 | 25.0 |
| BSN | 69 | 20.3 |
| BMLS | 44 | 13.0 |
| Year of study | | |
| First | 83 | 24.4 |
| Second | 89 | 26.2 |
| Third | 80 | 23.5 |
| Fourth | 70 | 20.6 |
| Fifth | 18 | 5.3 |

Abbreviations: MD, Doctor of Medicine; BSN, Bachelor of Science in Nursing; BP, Bachelor of Pharmacy; BMLS, Bachelor of Medical Laboratory Sciences.

**TABLE 2: Practice of Self-Medication with Antimalarials**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Ever used antimalarials for self-medication (n=340) | | |
| Yes | 190 | 55.9 |
| No | 150 | 44.1 |
| Source of supply of antimalarials (n=190) | | |
| Drug outlets | 143 | 75.3 |
| Family members | 25 | 13.2 |
| Leftovers from previous treatment | 12 | 6.2 |
| Friends | 10 | 5.3 |
| Health outcome after self-medication (n=190) | | |
| Recovered | 98 | 51.6 |
| Improved | 71 | 37.4 |
| Did not improve | 21 | 11.0 |
| Stopped treatment without finishing the course (n=190) | | |
| Yes | 145 | 76.3 |
| No | 45 | 23.7 |

**TABLE 3: Association Between Sociodemographic Characteristics and Self-Medication Practice**

| Sociodemographic Characteristics | Self-Medication (n=190) | No Self-Medication (n=150) | P Value | Chi-Square Value |
|---|---|---|---|---|
| Gender | | | | |
| Female | 93 (51.1) | 89 (48.9) | .057 | 3.635 |
| Male | 97 (61.4) | 61 (38.6) | | |
| Age (Years) | | | | |
| 18-21 | 59 (57.3) | 44 (42.7) | .531 | 1.268 |
| 22-24 | 88 (53.0) | 78 (47.0) | | |
| 25 and above | 43 (60.6) | 28 (39.4) | | |
| Course of study | | | | |
| MD | 67 (47.8) | 75 (52.8) | .024 | 9.420 |
| BP | 48 (56.5) | 37 (43.5) | | |
| BSN | 46 (66.7) | 23 (33.3) | | |
| BMLS | 29 (65.9) | 15 (34.1) | | |
| Year of study[a] | | | | |
| First | 57 (68.7) | 26 (31.3) | .001 | 18.450 |
| Second | 55 (61.8) | 34 (38.2) | | |
| Third | 31 (38.7) | 49 (61.3) | | |
| Fourth | 40 (57.1) | 30 (42.9) | | |
| Fifth | 7 (38.9) | 11 (61.1) | | |

[a]In the trend analysis, P=.004
Abbreviations: MD, Doctor of Medicine; BSN, Bachelor of Science in Nursing; BP, Bachelor of Pharmacy; BMLS, Bachelor of Medical Laboratory Sciences.

**TABLE 4: Univariate and Multivariable Analysis of the Association Between Sociodemographic Variables and Self-Medication**

| Sociodemographic characteristics | OR (95% CI) | P-value | aOR (95% CI) | P-value |
|---|---|---|---|---|
| Gender | | | | |
| Female | 1 | | 1 | |
| Male | 1.52 (0.99-2.34) | .057 | 1.32 (0.82-2.11) | .243 |
| Age (Years) | | | | |
| 18-21 | 1 | | 1 | |
| 22-24 | 0.84 (0.51-1.38) | .494 | 1.80 (0.92-3.55) | .088 |
| 25 and above | 1.15 (0.61-2.12) | .666 | 2.99 (1.24-7.22) | .015 |
| Course of study | | | | |
| BMLS | 1 | | 1 | |
| BP | 0.67 (0.31-1.43) | .301 | 0.67 (0.30-1.51) | .330 |
| BSN | 1.03 (0.46-2.30) | .934 | 1.12 (0.47-2.64) | .802 |
| MD | 0.46 (0.23-0.96) | .032 | 0.49 (0.22-1.05) | .065 |
| Year of study | | | | |
| First | 1 | | 1 | |
| Second | 0.73 (0.39-1.39) | .345 | 0.58 (0.29-1.17) | .128 |
| Third | 0.28 (0.15-0.55) | <.001 | 0.18 (0.07-0.41) | <.001 |
| Fourth | 0.61 (0.31-1.18) | .141 | 0.32 (0.13-0.79) | .013 |
| Fifth | 0.29 (0.10-0.83) | .022 | 0.16 (0.04-0.64) | .034 |

Abbreviations: MD, Doctor of Medicine; BSN, Bachelor of Science in Nursing; BP, Bachelor of Pharmacy; BMLS, Bachelor of Medical Laboratory Sciences; OR, Crude Odds Ratio; aOR, Adjusted Odds Ratio.

**FIGURE 1: Commonly used antimalarials used for self-medication (n=190)**

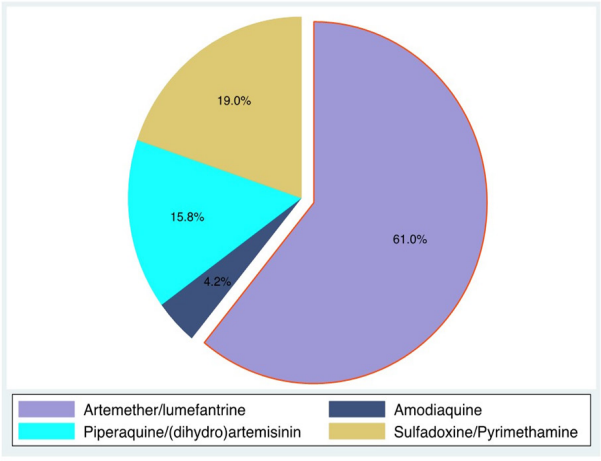
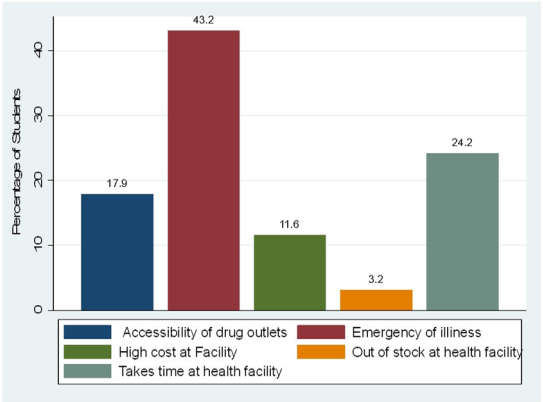



**FIGURE 2: Reasons for Practicing Self-Medication (n=190)**




## DISCUSSION

Self-medication is a widespread practice across the globe.[23] Self-medication is still popular, and it is more prevalent among adolescents and more common among university students.[24] This study examined the prevalence of antimalarial self-medication and related factors among undergraduate health science students.

In the present study, more than half (55.9%) of the sampled undergraduate health science students reported practicing self-medication which compares with the

findings reported in Ethiopia.[25] However, a lower prevalence was reported in two previous Nigerian studies[21,22]. On the other hand, in a cross-sectional study conducted in Gondar Town, North Western Ethiopia, the private Health Sciences students reported a higher prevalence compared to the current study.[7] Variations in socioeconomic status, sample size, study setting, sampling procedure, and law enforcement could possibly explain these differences among the studies. The setting of the current study was CUHAS, a health science university, and it essentially investigated if the students had ever practiced self-medication with antimalarials in their lifetime, contrary to other studies. Additionally, this study investigated self-medication specifically with antimalarials only. Moreover, the higher prevalence of self-medication among the students at CUHAS could be attributed to the medical knowledge that they had acquired from their courses, which somehow but not surprisingly predisposed them to the antimalarial self-medication practice. Reports have been published that knowledge of disease or treatment is one of the determinants of self-medication.[26]

The present study findings on common antimalarials used for self-medication are in agreement with results from a study conducted in community settings in Kenya and Tanzania.[15,27] However, sulfadoxine/pyrimethamine was the first-line medicine for the treatment of uncomplicated malaria until it was replaced by artemether/lumefantrine in 2006.[28,29] Nevertheless, sulfadoxine/pyrimethamine remains the medicine of choice for intermittent preventive treatment for malaria in pregnancy.[30] The current study revealed that some of self-medicating students did not comply with antimalarial treatment protocol. About a quarter did not finish the treatment courses. Inappropriate use of antimalarials may increase the risks of developing malaria parasite resistance.[11] Adherence to antimalarial therapy is a key public health practice in attaining effective implementation of malaria case management strategy and prevention of antimalarial resistance.[31] Furthermore, self-medication with antimalarials can lead to drug wastage, hence becoming a potential for drug shortage, failure to treat the actual cause of fever (non-malarial febrile illnesses) and causing unnecessary undesired side effects.

While the present study showed that self-medication was higher than what was reported in some other studies, between year of study and between age group comparisons displayed significant variation in self-medication. For instance, compared to first year students, the present study revealed that third year to fifth-year students were less likely to take antimalarials without prescription. This could be attributed to the knowledge that third- to fifth-year students had acquired in the course of their study that self-medication is not a good practice. Conversely, and surprisingly, older students (ie, those 25 years and above) were more likely to take antimalarials without a prescription compared to younger ones. Probably, as reported elsewhere,[32] cumulative illness events could be the cause of the reported older students' increased rate of self-medication. Consistent with previous studies, the major dispenser of antimalarials without prescription was community drug outlets.[22,26] In low and middle income countries, community drug outlets and pharmaceutical personnel are the most accessible health facilities and healthcare providers to the members of the community including university students.[33]

According to previous research, factors that significantly influence self-medication include gender, age, economic status, level of education, past successful use, and severity of illness.[34,35] Women are more likely to self-medicate than men; older individuals may have more experience with self-medication and may be more likely to do so; individuals with limited access to healthcare may be more likely to self-medicate due to financial constraints; individuals with lower levels of education may have less knowledge about the potential risks of self-medication; and past successful use of medication can also influence an individual's decision to self-medicate, as they may believe that the same medication will be effective for a new illness or condition. Last but not least, people may feel the need to self-medicate if they perceive their symptoms as urgent.[34–37] Previous studies have reported lifestyle, readily available drugs, drugs stored at home, increased medical consultation costs, time-consuming clinical processes, a lack of nearby healthcare facilities, and extensive advertising as some of the leading reasons for university students' self-medication-seeking behavior.[36,37] This study revealed that the most common factor that led to self-medication among university students was emergency of illness (no time to attend health facilities). Health facility charges contribute greatly to self-medication as one tries to cut down medical costs by avoiding the high consultation fees of physicians. [38] In this study the high treatment costs at health facilities contributed less in self-medication, possibly because, according to the university policy, every student should be covered by health insurance. These and other findings suggest that efforts should be made by the government to improve access to healthcare facilities that provide prompt and effective treatment for malaria to discourage the practice of self-medication. Future studies should be conducted to investigate, through a qualitative methodology, whether students in health science universities understand the consequences of self-medication and inappropriate use of antimalarials and if they do, why do they still practice it.

## CONCLUSION

The study found a high prevalence of self-medication with antimalarials among undergraduate health science students, emphasizing the need for strategies to promote the rational use of antimalarials. It is recommended to improve access to healthcare facilities and educate students about the risks associated with self-medication to reduce its prevalence. We recommend that policymakers ensure that all community drug outlets dispense antimalarials only to clients who have a prescription and that the drug use regulations are strictly abided by.

### Study Limitations and Strengths

The strength of the study was the good sample size, and it is the first study to assess self-medication practice with antimalarial among university students in Tanzania. There are some limitations to this study. First, this study was conducted in only one health-sciences University. Thus, its results cannot be generalized to a larger population of health science universities in the country. Additionally, a cross-sectional study design was used; hence, causal

relationships between variables cannot be established. Furthermore, there is a possibility of recall bias, over and under reporting, since the analyses were based on self-reports. Another limitation that could affect the reported prevalence is the use of a convenience sampling procedure. Nevertheless, the results shed some light on what is happening with regard to utilization of antimalarial drugs among undergraduate students, thereby forming the basis for a wider study on the subject to be conducted in order to rectify the problem.

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