

Practice and Prevalence of Antibiotic Self-Medication among Undergraduate Students at Kilimanjaro Christian Medical University College, Tanzania

Fat-hiya Abdi Hussein^a, Akili Mawazo^b, Jacqueline J. Mwakibinga^a, Rosemary Malya^{a,c}, Rukia Rajab Bakar^d, Adonira T. Saro^{a,c}, Debora Charles Kajeguka^{a*}

^aKilimanjaro Christian Medical University College, Moshi, Tanzania, ^bSchool of Medicine, Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania, ^cKilimanjaro Christian Medical Centre, Moshi, Tanzania, ^dThe state University of Zanzibar, Zanzibar

Correspondence to Debora Charles Kajeguka (debora.kajeguka@kcmuco.ac.tz)

ABSTRACT

Background: Antibiotic self-medication has been on the rise in different parts of the world. Antibiotic self-medication causes excessive antibiotic exposure to humans which is associated with many health risks including antibiotic resistance. The objective of this study was to assess practice and determine the prevalence of antibiotic self-medication among undergraduate students.

Methodology: This was a descriptive cross-sectional study conducted at Kilimanjaro Christian Medical University College. A self-administered questionnaire was used to assess the practice and knowledge of antibiotic self-medication among undergraduate students. A total of 300 undergraduate students were purposively sampled. The association between categorical predictors and antibiotic self-medication was presented as Odds Ratios (OR) with 95% Confidence Intervals (95% CIs) using logistic regression.

Result: The prevalence of antibiotic self-medication among undergraduate students is 191(63.7%) with amoxicillin 103(53.9%) being the most used antibiotic for treatment of respiratory disorders 109(57.1%) and gastrointestinal disorders 50(26.2%). Pharmacy is the major source of antibiotics used for self-medication 165(86.4%). Delayed/queue in seeking hospitals services was the main reason for practicing antibiotic self-medication 74(38.7%).

Conclusion: The study observed a high prevalence of antibiotic self-medication among undergraduate students. This calls for immediate implementation of public health programs aimed at increasing awareness of consequences that may result from antibiotic self-medication. At the policy-making level, there is an urgent need to legislate and enforce laws restricting access to antibiotics in Tanzania.

INTRODUCTION

Self-medication with antibiotics is frequently practiced in many parts of the world and has been one of the major factors contributing to the development of antibiotic resistance. World Health Organization (WHO) defines self-medication as self-care based on the selection and use of antibiotics by individuals to treat self-recognised symptoms or illnesses.¹ Antibiotic self-medication has negative consequences as incorrect diagnosis with inappropriate treatment can lead to disease progression, life-threatening conditions², and increased emergence of resistant bacteria that would be challenging to eliminate.³

Undergraduate students in universities or colleges, who are the future health care workers, play a pivotal role in educating the community or patients on the advantages and disadvantages of self-medication.⁴ Different studies have reported prevalence of

antibiotic self-medication among undergraduate students in different parts of the world.^{2,4-10} Antibiotic self-medication tendency is a common problem among healthcare college students during their junior years of study. This is due to their expanding awareness of diseases and therapeutics.¹¹ It has been reported that healthcare students usually practice self-medication based on their limited knowledge and as a result the prevalence of antibiotic self-medication has been reported to range from 45.8% to 77.1% in Ethiopia¹²⁻¹⁶ and 38.8% to 92.3% in Nigeria.¹⁷⁻¹⁹

Studies in Kuwait²⁰ and Pakistan⁴ have reported prevalence of up to 98% and 99% respectively. Moreover, factors such as easy access to medical guides, health writings, opinion from their colleagues and self-prescription are among the main drivers for self-medication among healthcare college students.²¹

In Tanzania, like in many other African countries, antibiotics are available in pharmacies (usually locate-

d in health facilities) and accredited drug dispensing outlets (ADDO). Antibiotics are more available to communities in the drug-specific retailers through the prescription and over-the-counter dispensing mechanisms.^{22,23}

Several studies have been conducted elsewhere to highlight the problem of antibiotic self-medication in the general community^{22,24,25}, students^{26,27} and children through their parents/caretakers.^{28,29} There is limited data on antibiotic self-medication practices among undergraduate students in Tanzania. Therefore, there was a need to conduct this study to determine the prevalence of the problem and emphasise more knowledge and practice on antibiotic self-medication as it threatens public health. Hence, findings from this study will provide baseline findings that would help in formulating strategies for control of antibiotic consumption in the medical and non-medical communities.

MATERIAL AND METHODS

Study Area, Design and Population

A descriptive, cross-sectional study was conducted at Kilimanjaro Christian Medical University College (KCMUCo) from April to May 2017. KCMUCo is a private medical institution which is a constituent college of Tumaini University-Makumira located in Kilimanjaro, Tanzania. The main campus is located in the urban area of Moshi district. The study included both male and female medical students from Year 1 to Year 3. The study excluded year 4 and year 5 students because they were in their clinical rotations/ practice and thus were not readily available.

Sampling Method and Data Collection Tool Questionnaire

The questionnaire was adopted from Araia *et al.*,³⁰. Non-probability (purposive) sampling technique was used to get the sample of 300 students. The students were approached during class hours and the questionnaires were self-administered. The questionnaire was set in English language and it composed of closed-ended questions. The questions were structured into subsections that guided data analysis and interpretation. The questionnaire was composed of 3 sections. Section 1 composed of socio-demographic information such as; sex, gender and year of study.

Section 2 composed of 12 questions. Participants were asked questions regarding their knowledge on self-medication. The following questions were asked; "Can self-medication be practiced in all illnesses? Do you think that self-medication is better than medical consultation? Can the same prescription be shared between two people having different complaints? Do you think that self-medication can result in harmful consequences, Do you think that self-medication can delay seeking medical advice? Do you think that antibiotic resistance is an outcome of self-medication without prescription and can self-medication lead to emerging of a new problem like new complaint?".

Section 3 composed of 14 questions regarding self-medication practice with antibiotics. Participants were asked which medical condition (s) assessment prompted them to self-medicate with antibiotics, what were the reasons for self-medication and the sources of the antibi-

otic they use(d).

Validity of the Questionnaire

To maximise validity, the questionnaire was pretested on relevant respondents before distribution. 10 students filled the questionnaire as a pilot study, and in-depth cognitive interviews were carried out to examine how the students understood and responded to the questions. In addition, 2 experts in the field of survey design approved the quality of the questionnaire. After the pretest, adjustments in phrasings were made so as to make the questionnaire simple to answer and yet give accurate and credible data.

Data Analysis Plan

Data was analysed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp, Armonk, NY, USA). Descriptive statistics were used to summarise the data. The association between categorical predictors (sex, mode of entry, year of study and course) and antibiotic self-medication was presented as odds ratios (OR) with 95% Confidence Intervals (95% CIs) using logistic regression. Only one predictor was significantly associated with self-medication in the bivariate analysis (set to $p < .1$). Therefore, multivariate analyses were not performed. A $p < .05$ was significant.

Ethical Considerations

Ethical approval to conduct this study was obtained from KCMUCo ethical committee, Certificate Number 2473. Before administration of the questionnaire, written consent was sought from the participants. All measures to protect privacy and confidentiality were considered. Neither names nor students' registration number were mentioned during data collection and final publication.

RESULT

Socio-Demographic Characteristics of the Study Participant

A total of 376 questionnaires were administered, 300 undergraduate students filled and returned the questionnaire, giving a response rate of 80%. Among these 187(62.3%) were males and 113(37.7%) were females. The mean age was (Mean \pm SD) 23.3 \pm 2.6 years. 180(36.0%), 107(35.7%) and 85(28.3%) were in their 1st, 2nd, and 3rd year respectively, while 98(32.7%), 85(28.3%), 67(22.3%) and 50(16.7%) were in BSc laboratory Medicine, BSc Physiotherapy and BSc nursing classes respectively, Table 1.

Knowledge of Antibiotic Use Based On Antibiotic Self-Medication

Over 90% of the respondents were aware that self-medication should not be practiced in any illnesses and that seeking for medical consultation is the best treatment practice. Majority of the respondents knew that the same prescription cannot be shared between two people with different complaints. As expected, majority reported that antibiotic use for self-medication can lead to antibiotic resistance. Few respondents 16(5.3%) reported that self-medication can be practiced in all illnesses, 20(6.7%) reported that self-medication is better than seeking for medical consultation, and 19(6.3%) reported "no" to a statement that self-medication can result in harmful consequence. Only 6(2.0%) reported "no" to a statement

that self-medication can cause a delay in seeking medical advice, Table 2. All respondents 300(100.0%) had heard about antibiotics.

Antibiotic Self-Medication Practice

A total of 191(63.7%) respondents practiced antibiotic self-medication, 109 (57.1%) used antibiotics to treat respiratory disorder, 50(26.2%) gastrointestinal disorders, 24(12.6%) pain in case of injury, 6(3.1%) skin disease and 2(1.0%) fever. When asked about the reason for antibiotic self-medication, 74(38.7%) mentioned delayed/ queue in seeking hospitals services, 54(28.3%) emergency illness, 28(14.7%) said it is convenient, 16(8.4%) used their experience, 12(6.3) reported health facility being too far, lastly, 7(3.7%) reported that there is no medicine in the health facility.

Regarding the source of information/antibiotics for self-medication, 165(86.4%) got an opinion from a pharmacist, 11(5.8%) got an opinion from a friend, 6(3.1) called a doctor by phone satisfaction with the previous prescription and 5(2.6) used leftover treatment from a previous illness, Table 3. Among those who practiced antibiotic self-medication (191), when they were asked about the outcome of self-medication, 143(74.9%) reported that their condition improved while 2(1.0%) reported that their condition got worse. 13(6.8%) reported adverse reactions such as vomiting, dizziness and headache.

TABLE 1: Demographic Characteristics of the Studied Population (N=300)

Variable	n	%
Sex	187	62.3
Male		
Female	113	37.7
Mode of entry		
Direct from school	279	93.0
In-service	11	7.0
Year of study		
Year 1	108	36.0
Year 2	107	35.7
Year 3	85	28.3
Course		
Medicine	85	28.3
BSc Laboratory	98	32.7
BSc Nursing	50	16.7
BSc physiotherapy	67	22.3

Common Antibiotic Used for Self-Medication

Antibiotics commonly used by undergraduate health care students are shown in Figure 1. The most commonly used were amoxicillin 103(53.9%), followed by metronidazole 41 (21.5%), erythromycin 24(12.6%), doxycycline 12(6.3%), chloramphenicol 6(3.1%), and lastly tetracycline 5 (2.6%).

Association of Self-Medication with Socio-Demographic Characteristics

In the univariate analysis of predictors for self-medication, only one variable qualified for further analysis. Respondents in their 2nd year of study were more likely to self-medicate themselves with antibiotics as compared to 3rd-year students (OR = 2.68; 95% CI: 1.42 – 5.04). Since only one variable qualified for further analysis, the multivariable analysis was not performed, Table 4.

DISCUSSION

Currently, there are increasing reports of antibiotic resistance in different parts of the world³¹, its prevalence is increasing and among the major drivers of resistance is antibiotic self-medication.³² Equally, Self-medication is reported to be an increasing problem among medical and non-medical students.³³

Though the inappropriate use of antibiotics as a result of self-medication is common worldwide, developing countries are most affected due to the higher prevalence of diseases and limited resources.³⁴ In this study, more than half of the respondents who practiced self-medication preferred amoxicillin 53.9%. Amoxicillin is from the penicillin group of antibiotics. The choice of antibiotics used by majority of the respondents demonstrates that these groups of antibiotics are more prone to misuse since they are readily available and at low cost. A big percentage of the respondents got their medicines from pharmacies 86.4%, more importantly, these antibiotics are the most used and prescribed by clinicians in the region.³⁵ A study conducted in Nigeria reported that antibiotic is the most frequently mis-used drug among undergraduate students¹⁷, specifically amoxicillin, which has been reported to be used for self-medication elsewhere.^{18,35} Due to inappropriate treatment, there is probable risk of antimicrobial resistance as well as adverse events for individuals. Resistance to amoxicillin has been reported in the setting.^{36,37} The inappropriate use of antibiotics in the area resulted in the observed resistance to antibiotics.

The prevalence of antibiotic self-medication in this study (63.7%) is lower than that observed in a study conducted in the Democratic Republic of Congo which reported a prevalence of 73.4%.³⁸ Moreover, studies conducted in Sudan (79.5%)², Pakistan 76%⁴, Palestine 98%³⁹ and Eritrea 79.2%³⁰ found that the prevalence of antibiotic self-medication among undergraduate students was considerably higher as compared to results from the present study. This could be attributed to their high knowledge about medications and, consequently, think that their knowledge is adequate to practice self-medication⁴⁰, and that they do not need medical consultation.⁴¹ In areas where self-medication is common among the general population, also undergraduate students have the same behaviours. In Tanzania, a prevalence of 58% was reported among the general population.²⁴ Therefore, the prevalence is generally similar. In Ethiopia, a study conducted among households showed the prevalence of self-medication to be at 50.2%.⁴² In other settings such as Saudi Arabia, Ras Al-Khaimah, India and Pakistan, the prevalence was reported to be 35.4%, 52.1%, 69.6% and 84.4% respectively.⁴³⁻⁴⁶

The practice of self-medication is common among both the general population and students. Undergraduate students attempt to practice their acquired knowledge of pharmacology and related subjects and this has resulted

FIGURE 1: Common Antibiotic Used for Self-Medication

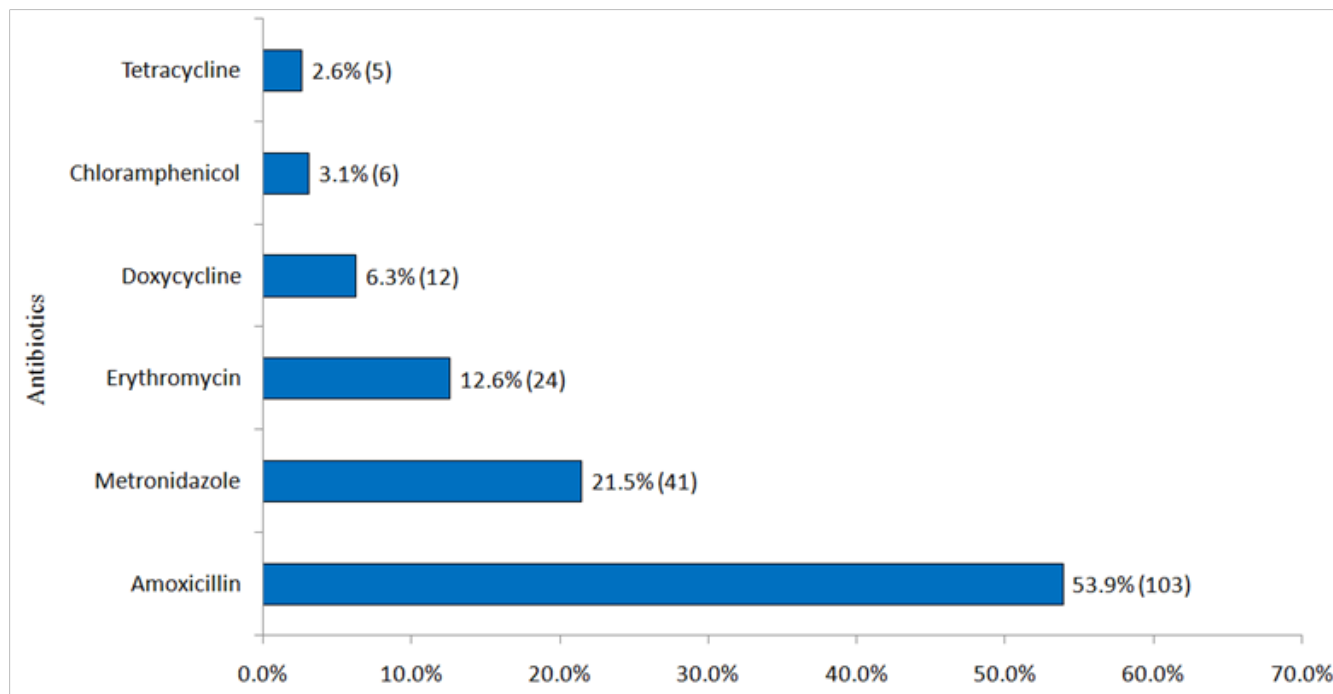


TABLE 2: Knowledge of Self-Medication (N=300)

Knowledge statement	Response	n (%)
Can self-medication be practiced in all illness	Yes	16(5.3)
	No	284(94.7)
Do you think that self-medication is better than medical consultation	Yes	20(6.7)
	No	280(93.3)
Can the same prescription be shared between two people having a different complaint	Yes	16(5.3)
	No	284(94.7)
Do you think that self-medication can result in harmful consequences such as antimicrobial resistance	Yes	281(93.7)
	No	19(6.3)
Do you think that self-medication can delay seeking medical advice	Yes	294(98.0)
	No	6(2.0)
Do you think that a resistance is an outcome of self-medication without prescription?	Yes	295(98.3)
	No	3(1.0)
	I don't know	2(0.7)
Can self-medication lead to emerging of a new problem like the new complaint	Yes	296(98.7)
	No	2(0.7)
	I don't know	2(0.7)

Bolded responses are correct unless indicated otherwise

TABLE 3: Practice Regarding Self-Medication of Antibiotics among Undergraduate Students (n=191)

Variable	Response	n (%)
Common ailments leading to self-medication	Respiratory disorder	109(57.1)
	Gastrointestinal disorder	50(26.2)
	Injury	24(12.6)
	Skin disease	6(3.1)
	Fever	2(1.0)
Reasons for self-medication	Delayed/queue in seeking hospitals services	74(38.7)
	Emergency illness	54(28.3)
	Convenience	28(14.7)
	Experience	16(8.4)
	Health facility being too far	12(6.3)
	No medicine in the health facility	7(3.7)
Source of information/antibiotic	Opinion from a pharmacist	165(86.4)
	Opinion from a friend	11(5.8)
	Calling a Doctor/Satisfaction with the previous prescription	6(3.1)
	Leftover from a previous illness	5(2.6)
	*Media	4(2.1)

* Such as TV, Internet, newspapers, radio, promotions

TABLE 4: Association of Self-Medication with Antibiotics and Socio-Demographic Characteristics

Variable	Yes n(%)	No n(%)	COR (95% CI)	p-value	
Sex	Male	117 (62.6)	70 (37.4)	1.00 (0.28-3.50)	>.05
	Female	74 (65.5)	39 (34.5)	Reference	
Mode of entry	Direct	176 (63.1)	103 (36.9)	0.68 (0.25-1.81)	>.05
	In-service	15 (71.4)	6 (28.6)		
Year of study	Year 1	58 (53.7)	50 (46.3)	0.85 (0.48-1.51)	>.05
	Year 2	84 (78.5)	23 (21.5)	2.68 (1.42-5.04)	.002
	Year 3	49 (57.6)	36 (42.4)	1	
Course	Medicine	52 (61.2)	33 (38.8)	0.67(0.33-1.32)	>.05
	BSc Laboratory	61 (62.2)	37 (37.8)	0.70 (0.36-1.36)	>.05
	BSc Nursing	31 (62.0)	19 (38.0)	0.69 (0.32-1.50)	>.05
	BSc Physiotherapy	47 (70.1)	20 (29.9)	1	

COR: Crude odds ratio

in a higher prevalence of self-medication among undergraduate students of up to 98% in Kuwait²⁰ and 99% in Pakistan.⁴

Clinical Features and Self-Medication

The main reasons for self-medication reported by respondents in this study were delayed/queue in seeking

hospitals services, emergency illness and experience. Reasons for delayed/queue in seeking hospitals services could be due to the small number of health workers employed at the hospitals, late coming among the hospital employees, and corruption among health workers where these workers are bribed by well-off patients and place their appointment cards before others.⁴⁷ Similar findings were observed in studies conducted in Ethiopia^{5,48} and Pakistan.⁴

In this study, the most common health problems which lead to self-medication among undergraduate students were respiratory and gastrointestinal disorders at 57.1% and 37.1% respectively. This observation is in agreement with previous studies.^{40,49-51} This study observed that respiratory disorders such as flu and cold were the most common ailment that provoked self-medication among the respondents. Consequences of illnesses such as; cold, flu and fever could be due to viral infections, and thus these conditions are usually wrongly treated using antibiotics.⁵² This indicates inappropriate antibiotic use as treatment of viral infections. Such inappropriate antibiotic use leads to development of resistant microbes, increased treatment cost and adverse reactions. The rational use of antibiotics is thus of utmost importance to limit the increase in bacterial resistance.

Association of Self-Medication with Socio-Demographic Characteristics

Self-medication with antibiotics was observed with no significant association with socio-demographic characteristics variables such as sex as well as the mode of entry. Results show that students in year 2 were more likely to practice self-medication as compared to students in year 3 of study. There is no direct explanation as to why the second-year undergraduate students were more likely to self-medicate, this may have happened by chance. Otherwise, we expected that third-year students could have practiced self-medication more as compared to others because they are more exposed to the field as compared to the second- and first-year students. In other studies, conducted in Tanzania, an association of Self-medication with antibiotics with socio-demographic characteristics was reported.^{24,25} However, these findings were in the general population.

Limitation of the study

The main limitation of this study is that the data collected was self-reported. This may introduce some bias in the behaviour of the respondents studied. Prevalence of self-medication was studied for one month only, results could have been different in other periods as well as in different seasons. The study population was only undergraduate students of year 1 to year 3, other students were not included because the time of data collection coincided with the time of their clinical rotation in peripheral hospitals. The inclusion of other undergraduate students could have presented differences in analysed data. However, this has no effect on the validity of the results observed concerning the parameters assessed in this study. Some variables were not stretched enough to provide multiple responses, this could also have provided a different perspective on antibiotic self-medication among undergraduate students.

CONCLUSION

The study observed a high prevalence of antibiotic self-medication among undergraduate students. This calls for immediate implementation of public health programs aimed at increasing awareness of consequences that may result from antibiotic self-medication. There is need for review of educational programs especially in the teaching of clinical pharmacology to include modules on self-medication and rational use of medicines. At the policy-making level, there is an urgent need to legislate and enforce laws restricting access to antibiotics in Tanzania. More importantly, a national commitment for solving the problem of antibiotic misuse in Tanzania is urgently required.

Acknowledgement

The authors would like to thank all respondents who voluntarily took part in this study.

REFERENCES

1. WHO. The role of the pharmacist in self-care and self-medication. World Health Organisation. Published 1998. Accessed October 20, 2018. <http://apps.who.int/medicinedocs/en/d/Jwhozip32e/>
2. Awad AI, Eltayeb IB. Self-medication practices with antibiotics and antimalarials among Sudanese undergraduate university students. *Annals of Pharmacotherapy*. 2007;41(7-8):1249-1255. doi:10.1345/aph.1K068
3. Osemene KP, Lamikanra A. A study of the prevalence of self-medication practice among university students in southwestern Nigeria. *Tropical Journal of Pharmaceutical Research*. 2012;11(4):683-689. doi:10.4314/tjpr.v11i4.21
4. Kanwal ZG, Fatima N, Azhar S, Chohan O, Jabeen M, Yameen MA. Implications of self-medication among medical students-a dilemma. *J Pak Med Assoc*. 2018;68(9):1363-1367. doi:10.1088/0957-4484/18/14/145502
5. Gutema GB, Gadisa DA, Abebe Z, et al. Self-Medication Practices among Health Sciences Students: The Case of Mekelle University. *Journal of Applied Pharmaceutical Science*. 2011;01(10):183-189.
6. Zhu X, Pan H, Yang Z, Cui B, Zhang D, Ba-Thein W. Self-medication practices with antibiotics among Chinese university students. *Public Health*. 2016;130:78-83. doi:10.1016/j.puhe.2015.04.005
7. Patil SB, Vardhamane SH, Patil B V., Santoshkumar J, Binjawadgi AS, Kanaki AR. Self-medication practice and perceptions among undergraduate medical students: A cross-sectional study. *Journal of Clinical and Diagnostic Research*. Published online 2014. doi:10.7860/JCDR/2014/10579.5313
8. Badiger S, Kundapur R, Jain A, et al. Self-medication patterns among medical students in South India. *Australas Med J*. 2012;5(4):217-220. doi:10.4066/AMJ.2012.1007
9. Damodar G. Assessment of Self-medication Practices among Medical, Pharmacy and Nursing Students at a Tertiary Care Teaching Hospital. *Indian Journal of Hospital Pharmacy*. 2012;49:79-83.
10. Donkor ES, Tetteh-quarcoo PB, Nartey P, Agyeman IO. Self-Medication Practices with Antibiotics among Tertiary

- Level Students in Accra , Ghana : A Cross-Sectional Study. *IntJ Environ Res Public Health*. 2012;9:3519-3529. doi:10.3390/ijerph9103519
11. Gyawali S, Shankar PR, Poudel PP, Saha A. Knowledge, Attitude and Practice of Self-Medication Among Basic Science Undergraduate Medical Students in a Medical School in Western Nepal. *J Clin Diagn Res*. 2015;9(12):FC17-22. doi:10.7860/JCDR/2015/16553.6988
 12. Bekele SA, Argaw MD, Yalew AWW. Magnitude and Factors Associated with Self-Medication Practices among University Students: The Case of Arsi University, College of Health Science, Asella, Ethiopia: Cross-Sectional Survey Based Study. *Open Access Library Journal*. 2016;03(06):1-15. doi:10.4236/oalib.1102738
 13. Abebe D, Tenaw G, Dessalegn H, Franelee AZ. Knowledge, attitude and practice of self-medication among health science students at Debre Markos University, Northwest Ethiopia. *Journal of Public Health and Epidemiology*. 2017;9(5):106-113. doi:10.5897/JPHE2017.0926
 14. Beyene A, Getachew E, Dobocho A, Poulos E, Abdurahman K, Alebachew M. Knowledge , Attitude and Practice of Self Medication among Pharmacy Students of Rift Valley University , Abichu Campus , Addis Ababa , Ethiopia. *Journal of Health & Medical Informatics*. 2017;8(3):1-6. doi:10.4172/2157-7420.1000269
 15. Angamo MT, Nasir Tajure W. Knowledge, Attitude and Practice of Self medication in Southwest Ethiopia. *Interanation Journal of Pharmaceutical sciences & Research*. 2012;3(04):1005-1010.
 16. Hailemichael W, Sisay M, Mengistu G. Assessment of Knowledge , Attitude , and Practice of Self-medication among Harar health sciences College Students , Harar , Eastern Ethiopia. *Journal of Drug Delivery and Therapeutics*. 2016;6(5):31-36.
 17. Ayanwale M, Okafor I, Odukoya O. Self-medication among rural residents in Lagos, Nigeria. *Journal of Medicine in the Tropics*. 2017;19(1):43-48. doi:10.4103/jomt.jomt_51_16
 18. Fadare JO, Tamuno I. Antibiotic self-medication among university medical undergraduates in Northern Nigeria. *J Public Health Epidemiol*. 2011;3(5):217-220.
 19. Idoko CA, Omotowo BI, Ekwueme OE, et al. Prevalence and Pattern of Self-medication among Medical Students in a Nigerian University. 2018;23(1):189-193.
 20. Al-Hussaini M, Mustafa S, Ali S. Self-medication among undergraduate medical students in Kuwait with reference to the role of the pharmacist. *Journal of Research in Pharmacy Practice*. Published online 2014. doi:10.4103/2279-042X.132706
 21. Lukovic JA, Miletic V, Pekmezovic T, et al. Self-medication practices and risk factors for self-medication among medical students in Belgrade, Serbia. *PLoS ONE*. 2014;9(12). doi:10.1371/journal.pone.0114644
 22. Mbwambo G, Emidi B, Mgabo M, Sigalla G, Kajeguka D. Community knowledge and attitudes on antibiotic use in Moshi Urban, Northern Tanzania: Findings from a cross sectional study. *African Journal of Microbiology research*. 2017;11(25):1018-1026. doi:10.5897/AJMR2017.8583
 23. Battersby A, Goodman C, Abondo C, Mandike R. Improving the Supply , Distribution and Use of Antimalarial Drugs by the Private Sector in Tanzania. *Malaria Consortium*. 2003;(25 February-22 March).
 24. Horumpende PG, Said SH, Mazuguni FS, et al. Prevalence, determinants and knowledge of antibacterial self-medication: A cross sectional study in North-eastern Tanzania. *PLoS ONE*. 2018;13(10). doi:10.1371/journal.pone.0206623
 25. Kajeguka DC, Moses EA. Self-medication practices and predictors for self-medication with antibiotics and antimalarials among community in Mbeya city, Tanzania. *Tanzania Journal of Health Research*. 2017;19(4). doi:10.4314/thrb.v19i4.6
 26. Chuwa BB, Njau LA, Msigwa KI, Shao ER. Prevalence and factors associated with self medication with antibiotics among university students in moshikilimanjaro Tanzania. *African Health Sciences*. 2021;21(2):633-639. doi:10.4314/ahs.v21i2.19
 27. Berdnikova V, Lykina T, Bochkayeva Z. Antibiotic self-medication and knowledge about antimicrobial resistance among medical and non-medical students of the University of Dodoma, Tanzania. In: *Antimicrobial Resistance / International Journal of Infectious Diseases* . Vol 101. ; 2021:8-119. doi:10.1016/j.ijid.2020.09.154
 28. Benedicto JP, Isdory Mkumbaye S, Rajab Bakar R, et al. Antibiotic use in Moshi Urban: A cross-sectional Study of Knowledge and Practices among Caretakers of Children in Kilimanjaro Tanzania. *Rwanda Journal of Medicine and Health Sciences*. 2021;4(3):347-356. doi:10.4314/rjmhs.v4i3.4
 29. Simon B, Kazaura M. Prevalence and factors associated with parents self-medicating under-fives with antibiotics in bagamoyo district council, tanzania: A cross-sectional study. *Patient Preference and Adherence*. 2020;14:1445-1453. doi:10.2147/PPA.S263517
 30. Araia ZZ, Gebregziabher NK, Mesfun AB. Self medication practice and associated factors among students of Asmara College of Health Sciences, Eritrea: A cross sectional study. *Journal of Pharmaceutical Policy and Practice*. 2019;12(1):1-9. doi:10.1186/s40545-019-0165-2
 31. Zaman S Bin, Hussain MA, Nye R, Mehta V, Taib KM, Hossain N. A Review on Antibiotic Resistance : Alarm Bells are Ringing Origin of antibiotic resistance. *Cureus*. 2017;9(6). doi:10.7759/cureus.1403
 32. Rather IA, Kim BC, Bajpai VK, Park YH. Self-medication and antibiotic resistance: Crisis, current challenges, and prevention. *Saudi Journal of Biological Sciences*. 2017;24(4):808-812. doi:10.1016/j.sjbs.2017.01.004
 33. Kasulkar AA and, Gupta M. Self medication practices among medical students of a private institute. *Indian Journal of Pharmaceutical Sciences*. 2015;77(2):178-182. doi:10.4103/0250-474X.156569
 34. Morgan DJ, Okeke IN, Laxminarayan R, Perencevich EN, Weisenberg and S. Non-prescription antimicrobial use wo-

- orldwide: a systematic review. *Lancet Infect Dis.* 2011;11(9):692-701. doi:10.1038/jid.2014.371
35. Núñez M, Tresierra-Ayala M, Gil-Olivares F. Antibiotic self-medication in university students from Trujillo, Peru. *Medicina Universitaria.* 2016;18(73):205-209. doi:10.1016/j.rmu.2016.10.003
36. Kumburu HH, Sonda T, Mmbaga BT, et al. Patterns of infections, aetiological agents and antimicrobial resistance at a tertiary care hospital in northern Tanzania. *Tropical Medicine and International Health.* 2017;22(4):454-464. doi:10.1111/tmi.12836
37. Kajeguka DC, Nambunga PP, Kabissi F, et al. Antimicrobial resistance patterns of phenotype Extended Spectrum Beta-Lactamase producing bacterial isolates in a referral hospital in northern Tanzania. *Tanzania Journal of Health Research.* 2015;17(3):1-8. doi:10.4314/thrb.v17i3.%c
38. Thriemer K, Katuala Y, Batoko B, et al. Antibiotic prescribing in DR Congo: a knowledge, attitude and practice survey among medical doctors and students. *PLoS One.* 2013;8(2):e55495. doi:10.1371/journal.pone.0055495
39. Sawalha AF. A descriptive study of self-medication practices among Palestinian medical and nonmedical university students. *Research in Social and Administrative Pharmacy.* 2008;4(2):164-172. doi:10.1016/j.sapharm.2007.04.004
40. Alshogran O, Alzoubi K, Khabour O, Farah S. Patterns of self-medication among medical and nonmedical University students in Jordan. *Risk Management and Healthcare Policy.* 2018;2018:11:169-176. doi:10.2147/RMHP.S170181
41. Alkhatatbeh MJ, Alean Q, Alqudah MAY. High prevalence of self-medication practices among medical and pharmacy students: a study from Jordan. *Int Journal of Clinical Pharmacology and Therapeutics.* 2016;54(05):390-398. doi:10.5414/CP202451
42. Jember E, Feleke A, Debie A, Asrade G. Self-medication practices and associated factors among households at Gondar town, Northwest Ethiopia: a cross-sectional study. *BMC Research Notes.* 2019;12(153). doi:10.1186/s13104-019-4195-2
43. Sridhar S, Shariff A, Dallah L, Anas D, Ayman M, M Rao P. Assessment of nature, reasons, and consequences of self-medication practice among general population of Ras Al-Khaimah, UAE. *International Journal of Applied and Basic Medical Research.* 2018;8(1):3-8. doi:10.4103/ijabmr.ijabmr_46_17
44. Alghanim S a. Self-medication practice among patients in a public health care system. *Eastern Mediterranean health journal.* 2011;17(5):409-416.
45. Afridi MI, Rasool G, Tabassum R, Shaheen M, Siddiquallah, Shujaiddin M. Prevalence and pattern of self-medication in Karachi: A community survey. *Pakistan Journal of Medical Sciences.* 2015;31(5):1241-1245. doi:10.12669/pjms.315.8216
46. Kumar V, Mangal A, Yadav G, Raut D, Singh S. Prevalence and pattern of self-medication practices in an urban area of Delhi, India. *Medical Journal of Dr DY Patil University.* 2015;8(1):16. doi:10.4103/0975-2870.148828
47. Ameh N, Oyefabi M, Sabo B. Application of queuing theory to patient satisfaction at a tertiary hospital in Nigeria. *Nigerian Medical Journal.* 2013;54(1):64. doi:10.4103/0300-1652.108902
48. Abay SM, Amelo W. Assessment of Self-Medication Practices Among Medical, Pharmacy, Health Science Students in Gondar University, Ethiopia. *Journal of Young Pharmacists.* 2010;2(3):306-310. doi:10.4103/0975-1483.66798
49. Ghaieth MF, Elhag SRM, Hussien ME, Konozy EHE. Antibiotics self-medication among medical and nonmedical students at two prominent Universities in Benghazi City, Libya. *Journal of Pharmacy and Bioallied Sciences.* 2015;7(2):109-115. doi:10.4103/0975-7406.154432
50. Rathish D, Wijerathne B, Bandara S, et al. Pharmacology education and antibiotic self-medication among medical students: A cross-sectional study. *BMC Research Notes.* 2017;10(337). doi:10.1186/s13104-017-2688-4
51. Dönmez S, Güngör K, Göv P. Knowledge, attitude and practice of self-medication with antibiotics among nursing students. *International Journal of Pharmacoepidemiology.* 2018;14(1):136-143. doi:10.3923/ijp.2018.136.143
52. Mavura A, Sigalla GN, Muro F, et al. Physician prescription practice of antibiotics for upper respiratory tract infection at Kilimanjaro Christian Medical Centre Moshi, Tanzania. *African Journal of Pharmacy and Pharmacology.* 2018;12(27):408-416. doi:10.5897/AJPP2018.4956

Peer Reviewed

Competing Interests: None declared.

Funding: This study was not funded

Received: 26 October 2021; **Accepted:** 15 August 2021

Cite this article as Hussein AF, Mawazo A, Mwakibinga JJ, Malya R, Bakar RR, Saro TA, Kajeguka CD. Practice and Prevalence of Antibiotic Self-Medication among Undergraduate Students at Kilimanjaro Christian Medical University College, Tanzania. *E Afr Sci.* 2022; 4(1):21-28. <https://doi.org/10.24248/easci.v4i1.52>

© Chilongola et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are properly cited. To view a copy of the license, visit <http://creativecommons.org/licenses/by/4.0/>. When linking to this article, please use the following permanent link: <https://doi.org/10.24248/easci.v4i1.52>
