Short Survey

Knowledge, Attitude, and Practice of Antibiotic Use among Medical Students in the College of Medicine, National University, Oman

Mazin Al-rudaini[1*], Sanam Anwar[2], Hala Al Sawaii[3], Ranim Al Balushi[3], Taqwa Al Bahrani[3], Thuraiya Al Kindi[3], Yaqeen Al Jabri[3], Zainab ALHabsi[3]

ABSTRACT

OBJECTIVE: To assess the knowledge, attitude, and practice toward antibiotic use among medical students at the College of Medicine, Oman.

METHODOLOGY: A cross-sectional study was conducted at the College of Medicine, where both pre-medical and medical students participated in data collection from November 2023 to January 2024. A structured pretested questionnaire was used to collect data from all students. SPSS version 20 was used for data analysis. Independent variables were presented as frequencies and percentages, while the total knowledge score was presented as the mean and standard deviation. The mean total knowledge score was analyzed to independent variables using a t-test.

RESULTS: A total of 472 students participated in this study, with most (74.2%) having no prior training on antibiotic use. Students with prior training on antibiotic use had better knowledge (81.5±18.4) than those without it (62.1±25). Most students (87.7%) recognised that improper antibiotic use could lead to antibiotic resistance in the future, and the mean total knowledge score was 67.14 ± 24.9. A high percentage of students reported stopping the antibiotics once symptoms subsided (56.6%).

CONCLUSION: Medical students' knowledge of proper antibiotic use was generally good. Knowledge of students with previous training courses and those from clinical years was higher. There was a very significant association between poor knowledge and bad antibiotic practices, like using antibiotics for self-medication and stopping antibiotics when symptoms subside.

KEYWORDS: Antibiotics, attitude, knowledge, medical students, Oman, practice, resistance

INTRODUCTION

Antibiotics are essential medications used to treat bacterial infections. However, inappropriate use of antibiotics can lead to the development of antibiotic resistance, which is recognized as a global public health crisis[1]. The increasing rise of antibiotic resistance is affecting the efficacy of antibiotics, which have revolutionized medicine and saved millions of lives. The World Health Day theme 2020 emphasized the urgency of acting against drug resistance as the theme title was "Combat drug resistance: no action today means no cure tomorrow". Moreover, in 2022, the World Antimicrobial Awareness Week theme was "Preventing Antimicrobial Resistance Together" [2]. The antimicrobial resistance would have been the third leading cause of death, with approximately 4.95 million deaths associated with it[3].

Several studies have identified gaps in medical students' knowledge regarding the appropriate use of antibiotics. An Iranian study conducted among medical students revealed that their knowledge of antibiotic use was moderate to poor, and their understanding of antibiotic resistance and its consequences was limited[4]. Another study in Nigeria found that medical students had good knowledge of antibiotics. Still, their attitudes and practices were less favourable, and they did not always follow the course of antibiotic treatment[5]. In addition, a study in India revealed that the level of understanding of antibiotics' side effects varied from 78% to 86.5% among medical students, and their knowledge about methicillin-resistant *Staphylococcus aureus* infections was found to be unsatisfactory[6].

This research aims to assess the knowledge, attitudes, and practices of antibiotic use among medical students (if they become sick) at the College of Medicine. The results of this study will inform the development of targeted interventions to improve antibiotic prescribing practices among medical students, ultimately leading to better patient outcomes and a reduction in antibiotic resistance.

METHODOLOGY

A cross-sectional study was conducted at the College of Medicine to assess the knowledge, attitude, and practice toward antibiotics among medical students. Data collection and subsequent analysis were conducted from November 2023 to January 2024,

[1]*Department of Medicine, College of Medicine and Health Sciences, National University, Suhar, Oman*
[2]*Department of Public Health and Epidemiology, College of Medicine and Health Sciences, National University, Suhar, Oman*
[3]*Pre-Clerkship Medical Student, College of Medicine and Health Sciences, National University, Suhar, Oman*
Correspondence: *mazinsaleh@nu.edu.om*
doi: 10.22442/jlumhs.2025.01170
Received: 05-07-2024 *Revised: 24-12-2024*
Accepted: 07-01-2025 *Published Online: 28-02-2025*

following approval from the Ethics and Biosafety Committee (Ref. No. NU/COMHS/EBC0040/2023). The inclusion criterion encompasses all medical students at the College of Medicine, including those in the 1st to 3rd medical years (preclinical years) and the 4th to 6th medical years (clinical years); therefore, no sample size calculation was performed. Informed consent was taken from the students, and their participation was considered voluntary. The anonymity and confidentiality of data were upheld throughout the process.

A structured pretested questionnaire modified from prior research by Hu Y et al.[7] was used to collect data from all medical students in the study. The questionnaire was pilot-tested with a small group of students before data collection to verify the validity of its content, grammar, and language use. The data were analysed using SPSS version 20. The exclusion criteria include incomplete responses by the students and those who participated in the pilot study. The independent categorical variables — gender, medical year, previous training course, source of information, knowledge, attitude, and practice — were presented as frequencies and percentages. The mean total knowledge score was associated with independent variables using the t-test as the significance test. These associations were presented as mean and standard deviation. Statistical significance was considered when p-value <0.05.

RESULTS

Sociodemographic characteristics

A total of 472 students participated in this study. The mean age of the participants was 21.4 ± 2.05 years. Most participants were female (91.1%) and from the 1st medical year (MD1) of the study (25.2%), followed by the 3rd medical year (MD3) (17.6%). Thus, most were from preclinical years (53.6%) and 46.4% from clinical years. Most students (74.2%) reported that they had not received any previous training on the use of antibiotics. The primary source of information on antibiotic use was through formal curriculum (67.2%) followed by self-study (56.6%) (**Table I**).

Knowledge of antibiotic use

Most of the students (87.7%) knew that improper antibiotic use may lead to antibiotic resistance in future. The least knowledge domain was the use of antibiotics for a common cold with green sputum (36%), the need for antibiotics to be administered only by intravenous infusion (51.1%), and not using antibiotics for a common cold (54.7%). The mean total knowledge score of all the nine items assessed was 67.14±24.9 (**Table II**).

Attitude on antibiotic use

The most common condition for which antibiotic use was preferred was answered by 394 students (83.5%). Out of them, most responses were for burning micturition (56.9%), followed by fever (53.6%) and sore throat (51.3%).

Practice on antibiotic use

The illnesses students suffered in the past 3 months were answered by 414 students (87.7%). Most of the responses were for runny nose (69.1%) and sore throat (62.3%), and the least were diarrhoea (17.6%). Self-medication with antibiotics for these common illnesses was reported by 83 students (54.6%). A significant proportion of students (57.2%) reported using antibiotics to prevent diseases such as the common cold. Many of them also reported stopping the use of antibiotics if symptoms subsided (56.6%).

Variables associated with knowledge

Students with previous training courses on antibiotic use (workshops, seminars, conferences, etc.) had better knowledge (81.5±18.4) than those without it (62.1±25.0), and the difference was statistically significant (p<0.001). Knowledge of students in clinical years (83.1±16.0) was higher than that of students in preclinical years (53.3±23.0) and p<0.001. The knowledge of students who self-medicated with antibiotics, used antibiotics to prevent common colds, and stopped antibiotics when symptoms subsided was lower than that of those who did not practice this incorrect use of antibiotics. All these differences were highly statistically significant (**Table III**).

Table I:
Demographic characteristics of participants

Characteristic			Frequency (n=472)	Percentage (%)
Age		Mean (SD)		21.4 (2.05)
Gender		Female	430	91.1
		Male	42	8.9
Medical year of study		MD1	119	25.2
		MD2	51	10.8
		MD3	83	17.6
		MD4	85	18
		MD5	35	7.4
		MD6	99	21
Previous training course		Yes	122	25.8
		No	350	74.2
Source of information	*Self-learning*	Yes	267	56.6
		No	205	43.4
	Bedside	Yes	124	26.3
		No	348	73.7
	Formal curriculum	Yes	317	67.2
		No	155	32.8
	Courses	Yes	41	8.7
		No	431	91.3
	Others	Yes	121	25.6
		No	351	74.4

Table II: Knowledge of antibiotic use (Correct response)

Knowledge domain	Frequency (n)	Percentage (%)
Antibiotics are effective for viral infection	320	67.8
Antibiotics have same effect as anti-inflammatory drugs	287	60.8
Antibiotics need to be given by intravenous infusion	241	51.1
Antibiotics should be stopped when symptoms subside	376	79.7
If we do not use antibiotics properly, there will be more risk of antibiotic resistance in future	414	87.7
Due to frequent use of antibiotics, it will be difficult to treat bacterial infection in future	375	79.4
Antibiotics are effective for treating common cold	258	54.7
Antibiotics are given for common cold with green sputum	170	36.0
Antibiotic overuse is a problem in Oman	411	87.1
Total knowledge score: Mean (SD) = 67.14 (24.9)		

Table III: Variables associated with Knowledge score

Variables		Frequency (n=472)	Total knowledge score		*P value
			Mean	SD	
Gender	Female	430	67.0	25.0	0.873
	Male	42	67.7	24.7	
Previous training course	No	350	62.1	25.0	<0.001
	Yes	122	81.5	18.4	
Medical year of study	Preclinical years	253	53.3	23.0	<0.001
	Clinical years	219	83.1	16.0	
Self-medication with antibiotics for common illness	No	389	69.8	24.4	<0.001
	Yes	83	54.6	24.0	
Stopping antibiotics if symptoms subside	No	306	72.8	23.6	<0.001
	Yes	166	56.6	24.0	
Use antibiotics to prevent diseases like common cold	No	337	71.1	24.6	<0.001
	Yes	135	57.2	23.1	

**P-value less than < 0.05 is considered to be statistically significant*

DISCUSSION

Knowledge of antibiotic use

A firm grasp of antibiotic use, particularly among medical students, is crucial for its significant impact in combating antibiotic resistance, ensuring patient safety, and enhancing healthcare efficiency.

In this study, 87.7% of the students acknowledged that improper antibiotic use can lead to antibiotic resistance, compared to a study conducted in Saudi Arabia that reported a 60% knowledge rate[8]. A higher percentage of knowledge about antibiotic use can be attributed to the significant efforts made by the Ministry of Health to increase awareness and understanding of antibiotic resistance among all groups of society, particularly in the event of misuse[9].

Additionally, 79.7 % of the students in this study believed that antibiotics could be stopped if symptoms subside. This idea is illustrated in the data from a survey conducted among the Omani population to assess and address this issue. It has been found that more than half of the participants still believe that antibiotics should be stopped once the symptoms subside[10]. A higher percentage of malpractice is essential for promoting antibiotic resistance[11].

Most students (87.1%) are aware of antibiotic misuse, which is relatively higher than in the Chinese study but less than in the Columbian study[7,12]. Some students might have personal experiences with antibiotic resistance through their health issues or witnessing cases in hospitals or family members suffering from antibiotic-resistant infections. Moreover, the College's curriculum emphasizes the consequences of misuse to bring students' attention to antibiotic-resistance issues and make them aware of such problems[13].

Practice on antibiotics use

This study reveals a trend of antibiotic self-medication among medical students, with 54.6% reporting such behaviour for common illnesses within the past two to three months. This prevalence surpasses the Chinese study (27% over one month),[7] yet falls short of the

rate reported in a Sudanese investigation (60.8% over twelve months)[14]. A stark contrast is observed in an Australian study, where a striking 91.7% of medical students admitted to self-medicating with antibiotics[15]. The composition of our study sample, with 53.6% of participants hailing from preclinical years, may contribute to the elevated rate of antibiotic self-medication observed compared to the Chinese study. Furthermore, our study's relatively small sample size (83 out of 472 students reporting self-medication) may inflate the apparent prevalence.

The present study found that a significant proportion of medical students (57.2%) reported using antibiotics to prevent the common cold. This result does not align with a study conducted among Chinese medical students, which found that only 15% of medical students had used antibiotics as prophylaxis in the past year[7]. This practice might be driven by misconceptions about the preventive benefits of antibiotics or a lack of understanding about their appropriate use. This highlights the need for educational interventions to address misconceptions regarding the proper use of antibiotics.

Our study reveals that 56.6% of medical students discontinue antibiotic use upon resolution of symptoms. This finding contrasts with a Chinese study, which reported a significantly higher rate of 91.1% cessation upon symptom disappearance[7]. Conversely, it surpasses the rate documented in a Sudanese study, where only 7% of students reportedly stopped to complete the entire treatment course[14]. The difference in rates of discontinuing antibiotic use upon symptom disappearance between our study and the Chinese study could be attributed to the sample size, as the Chinese study had a larger sample size (1,819 students) compared to our study (472 students).

Associated variables with knowledge

This research reveals that senior students possess substantially higher mean knowledge scores than their junior counterparts, with a statistically significant $p<0.001$. This aligns with the results of another study involving Sudanese medical students[14]. This finding can be explained by the fact that pharmacology and clinical medicine are not taught during the first preclinical years, which are essential parts of the curriculum that help consolidate knowledge on antibiotics.

Our study showed that students who had received previous training courses on antibiotic use had a higher mean knowledge score than those with no training, with a highly significant p-value of <0.001. Similarly, a study in Colombia shows that students who have completed training courses have higher mean knowledge scores than those who have not[12]. This indicates the effectiveness of such training courses in improving knowledge regarding the use of antibiotics.

Attitude on antibiotic use

In our study, most students preferred to use antibiotics for medical illnesses, such as burning micturition (56.9%), fever (53.6%), and sore throat (51.3%). Higher percentages of attitudes toward antibiotic use were also reported in studies involving Sudanese medical students (60.8%) and Nigerian medical students (82.2%)[14].

The study's limitations included the involvement of medical students from the College of Medicine only and the exclusion of other colleges, such as nursing and pharmacy colleges, to increase the sample size and facilitate a more comprehensive comparison. Another limitation is that, since our study was questionnaire-based, antibiotic use was essentially self-reported as recall information, which may have overstated or understated the actual antibiotic use.

CONCLUSION

The student demonstrated a good understanding of correct antibiotic use. The previous training courses on antibiotic use and the clinical years' practices had a significant impact on the student's knowledge of antibiotic use. The association between poor knowledge and bad antibiotic practices can be overcome by introducing proper antibiotics in the teaching curriculum early.

Ethical Permission: National University, College of Medicine & Health Sciences, Sohar, Sultanate of Oman, Ethics and Biosafety Committee (EBC), letter No. NU/COMHS/EBC0040/2023.

Conflict of Interest: No conflicts of interest, as stated by authors.

Financial Disclosure/Grant Approval: No funding agency was involved in this research.

Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Al-Rudaini M: Concept, design, leading contribution in writing, manuscript proofreading
Anwar S: Data analysis, writing the results, manuscript proofreading
Al-Sawaii H: Literature review, data collection, writing the discussion and proofreading
Al-Balushi R: Literature review, data collection, writing the discussion and proofreading
Al-Bahrani T: Literature review, data collection, writing the discussion and proofreading
Al-Kindi T: Literature review, data collection, writing the discussion and proofreading
Al-Jabri Y: Literature review, data collection, writing the discussion and proofreading
ALHabsi Z: Literature review, data collection, writing the discussion and proofreading

REFERENCES

1. Organization WH. Global antimicrobial resistance and use surveillance system (GLASS) .Genève, Switzerland: World Health Organization; 2022.
2. Organization WH. World Antimicrobial Awareness Week. World Health Organization. [cited 2024 Jun 3]. Available from: https://www.who.int/campaigns/world-antimicrobial-awareness-week/ 2022.
3. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. Lancet. 2022; 399: 629–55. doi: 10.1016/S0140-6736(21)02724-0.
4. Jorak A, Keihanian F, Saeidinia A, Anwar M, Sarfraz M. A cross-sectional study on knowledge, attitude and practice of medical students toward antibiotic resistance and its prescription, Iran. Adv Environ Biol. 2014; 8: 675–81.
5. Jairoun A, Hassan N, Ali A, Jairoun O, Shahwan M. Knowledge, attitude and practice of antibiotic use among university students: a cross-sectional study in UAE. BMC Public Health. 2019; 19(1): 518. doi: 10.1186/s12889-019-6878-y.
6. Gupta MK, Vohra C, Raghav P. Assessment of knowledge, attitudes, and practices about antibiotic resistance among medical students in India. J Family Med Prim Care. 2019; 8(9): 2864–9. doi: 10.4103/jfmpc.jfmpc_504_19.
7. Hu Y, Wang X, Tucker JD, Little P, Moore M, Fukuda K et al. Knowledge, attitude, and practice with respect to antibiotic use among Chinese medical students: A multicentre cross-sectional study. Int J Environ Res Public Health. 2018; 15 (6): 1165. doi: 10.3390/ijerph15061165.
8. Soomro S, Alshammari HO, Alabbas YA. Awareness and knowledge about antibiotic use and resistance among students of Northern Border University Saudi Arabia. J Trop Dis. 2017; 05: 5. doi: 10.4172/2329-891X.1000247.
9. Ambusaidi A, Taylor N, Quinn F, Rizk N, Taylor S. Omani senior secondary school student's knowledge of and attitudes to antibiotic resistance. PLoS One. 2022; 17(2): e0264500. doi: 10.1371/journal.pone.0264500.
10. Jose J, Jimmy B, Alsabahi AGMS, Al Sabei GA. A study assessing public knowledge, belief and behavior of antibiotic use in an Omani population. Oman Med J. 2013; 28(5): 324-30. doi: 10.5001/omj.2013.95.
11. Gilbert GL. Knowing when to stop antibiotic therapy. Med J Aust. 2015; 202(11): 571. doi: 10.5694/mja15.00249.
12. Higuita-Gutiérrez LF, Roncancio Villamil GE, Jiménez Quiceno JN. Knowledge, attitude, and practice regarding antibiotic use and resistance among medical students in Colombia: a cross-sectional descriptive study. BMC Public Health. 2020; 20(1): 1861. doi: 10.1186/s12889-020-09971-0.
13. Microbiology & immunology. College of Medicine. 2021 [cited 2024 Jun 3]. Available from: https://nu.edu.om/medicine/microbiology-immunology/.
14. Elmahi OKO, Musa RAE, Shareef AAH, Omer MEA, Elmahi MAM, Altamih RAA et al. Perception and practice of self-medication with antibiotics among medical students in Sudanese universities: A cross-sectional study. PLoS One. 2022; 17(1): e0263067. doi: 10.1371/journal.pone.0263067.
15. Williams A, Crawford K. Self-medication practices among undergraduate nursing and midwifery students in Australia: a cross-sectional study. Contemp Nurse. 2016; 52(4): 410-20. doi: 10.1080/10376178.2016.1197782.