

Knowledge, Attitudes, and Practices Regarding Antibiotic Use and Antimicrobial Resistance among Students and Staff of Kabul University: A Cross-Sectional Study

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Abstract

Introduction: The overuse and misuse of antibiotics have led to rising antimicrobial resistance (AMR), a major global health concern. A primary driver of AMR is excessive and inappropriate antibiotic use, often stemming from insufficient public knowledge. This study aimed to assess the knowledge, attitudes, and practices (KAP) related to antibiotic use and AMR among students and staff at Kabul University. **Methods:** A validated questionnaire was administered to a sample of students, faculty, and administrative staff at Kabul University. Descriptive statistics were performed, and simple regression analysis identified factors associated with inappropriate antibiotic use. **Result:** A total of 689 participants were surveyed. More than half (84.8%) reported using antibiotics in the past year. Participants demonstrated moderate knowledge; 65.7% were aware of antibiotic resistance, yet 79.1% reported using antibiotics for colds and sore throats. Furthermore, 83.5% discontinued antibiotics after symptom resolution, 61.5% used antibiotics without a prescription, and 63.1% retained leftover antibiotics for future use. **Conclusion:** The findings indicate a moderate level of knowledge but widespread inappropriate practices regarding antibiotic use among Kabul University students and staff. These results underscore the urgent need for targeted educational interventions to promote responsible antibiotic use and combat antimicrobial resistance (AMR).

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Introduction

Antibiotics are medications used to treat and prevent bacterial infections by either eradicating the pathogenic bacteria within the host or inhibiting their proliferation and dissemination, so enabling the host's immune system to manage and eliminate them (Aljayyousi et al., 2019). The discovery and creation of antibiotics is considered one of the most significant achievements of twentieth-century medicine. After prolonged use, antibiotics diminish in efficacy due to the emergence of antimicrobial resistance (AMR) (Mazińska et al., 2017). From 2000 to 2015, global antibiotic consumption increased by 65%, especially in low- and middle-income countries (LMICs) (Bortone et al., 2021). The misuse of antibiotics is a significant issue in developing countries. Reports suggest that the use of antibiotics has risen in Uzbekistan, Oman, Eritrea, Pakistan, Nepal, Jordan, Sudan, Lebanon, Zimbabwe, Nigeria, and Yemen (Ahmad et al., 2022). Antibiotic resistance poses significant clinical and economic challenges to global public health (Aldhafar & Talat, 2016). Research indicates that antibiotic resistance is responsible for a minimum of 700,000 deaths globally each year (Gu & Ohmagari, 2021). A global estimate predicts that, without further intervention, antibiotic resistance will result in 10 million deaths yearly by 2050, incurring a cost of 100 trillion USD to the global economy (Miyano et al., 2022). Approximately fifty percent of these occurrences transpire in Asia (Chapot et al., 2021). Antimicrobial resistance is anticipated to result in 4.73 million fatalities in Asia by 2050 (Shahpawee et al., 2020). One of the main factors leading to the growth and spread of resistance is the improper and inappropriate utilization of antibiotics (Awad & About, 2015). Multiple forms of improper antibiotic utilization have been reported, including failure to complete the prescribed course, using leftover antibiotics from previous treatments, omitting doses, self-medicating or acquiring antibiotics without a prescription, and misapplying antibiotics for viral infections (Wong et al., 2021). Research indicates that inappropriate antibiotic use is associated with gender, culture, knowledge status, region, age, marital status, number of children, health insurance, dissatisfaction with healthcare

services, and the storage of antibiotics at home (Gebeyehu et al., 2015). It was similarly reported in other countries among healthcare personnel due to irrational antibiotic prescriptions (Haddadin et al., 2019). To reduce the risk of antibiotic resistance, it is essential for the general population to enhance its understanding of antibiotics, appropriate antibiotic usage, and knowledge of antimicrobial resistance (Miyano et al., 2022). Limited studies have investigated antibiotic usage in Afghanistan local populations, and the Afghanistan people has garnered minimal attention. A previous survey indicated that 34.9% of the sample visiting Kabul's central polyclinic utilized antibiotics for self-medication in the previous year, the most commonly utilized antibiotic for self-medication was amoxicillin (Negarandeh et al., 2021). Given this context and the lack of focused studies on academic communities, this study aimed to evaluate the knowledge, attitudes, and practices (KAP) of Kabul University students and staff regarding antibiotic use and antimicrobial resistance.

Materials and methods

This cross-sectional study was conducted at Kabul University, utilizing a pre-approved structured questionnaire, on students, administrative personnel, and academic staff. Participation was entirely voluntary, and respondent identities were strictly confidential. Ethical principles relevant to the study were rigorously adhered to. Before administering the questionnaire, the research objectives and context were explained, and informed consent was obtained from all participants.

This study utilized a structured questionnaire adapted from the instrument validated by Scaioli et al. (2015) to assess knowledge, attitudes, and practices regarding antibiotic use. The questionnaire comprised five distinct sections. The first section captured socio-demographic data through four items concerning age, gender, participant type (student, academic, administrative staff), and whether participants had relatives working in the health field. The second section evaluated antibiotic usage patterns with one item measuring frequency

of use in the past year. The third section assessed antibiotic knowledge through ten statements using a 4-point Likert scale (1=Strongly Disagree to 4=Strongly Agree). The fourth section examined antibiotic resistance knowledge through three dichotomous questions and three Likert-scale statements. The final section investigated attitudes and practices via eight dichotomous (yes/no) items concerning self-medication behaviors and adherence patterns. The results are presented in tabular and graphical form in the subsequent section. To ensure accuracy, a back-translation into English was performed and compared with the original version (Tronina et al., 2020). Following approval by the Research Board of the Faculty of Pharmacy, Kabul University, a pilot study involving 50 students and staff was conducted to assess reliability. The Cronbach's alpha coefficient for the questionnaire was determined to be 0.770, indicating good reliability (Goktas et al., 2022).

The study population comprised students from all faculties of Kabul University, as well as administrative and academic staff. The sample size was determined using the following the Krejcie and Morgan formula (Chaokromthong et al., 2021).

$$n = \frac{X^2 Np(1 - p)}{e^2(N - 1) + X^2p(1 - p)}$$

where, e is acceptable error of sample size (0.05), n is the sample size, N is the population size, p is the population proportions (Assumed to be 0.5) and X is the Chi-square (1.96).

Statistical analysis

Data analysis was performed using statistical software (e.g., IBM SPSS Statistics). Descriptive statistics—including frequencies, percentages, means, and standard deviations—were used to summarize the socio-demographic profile of participants and their responses to the knowledge, attitude, and practice items. Simple logistic regression analysis was used to identify the factors related with the irrational use of antibiotics.

Results

The study participants' socio-demographic profile

A total of 689 questionnaires were successfully completed by participants from various faculties at Kabul University, achieving a 100% response rate.

Table 1: Socio-demographic characteristics of the study participants at Kabul University (n = 689).

	Frequency	Percentage
Gender		
Male	426	61.8
Female	263	38.2
Age		
16-25	398	57.8
26-35	159	23.1
36-45	65	9.4
46-55	44	6.4
56-65	22	3.2
>66	1	1
Type of admission		
Students	377	54.7
Academic staff	176	25.5
Administrative staff	136	19.7
Had relatives working in health field		
Yes	240	34.8
No	449	65.2

The sample comprised students ($n = 377$, 54.7%), academic staff ($n = 176$, 25.5%), and administrative staff ($n = 136$, 19.7%). To provide critical context for interpreting knowledge levels, participants were categorized based on their faculty affiliation. The participant pool included individuals from the Faculty of Pharmacy and the Faculty of Veterinary Science (medical-related faculties) and a range of non-medical faculties. Male respondents ($n = 426$, 61.8%) slightly outnumbered female respondents ($n = 263$, 38.2%). The average age of participants was 28 years, with an age range spanning from 18 to 72

years (Table 1).

Usage of Antibiotics

Over half of the participants ($n = 584$, 84.8%) reported using antibiotics in the past year. Among them, a significant proportion ($n = 230$, 33.4%) used antibiotics only once or twice. In contrast, 156 participants (22.6%) used them three to five times, while 197 participants (28.6%) reported using antibiotics more than five times (Figure 1).

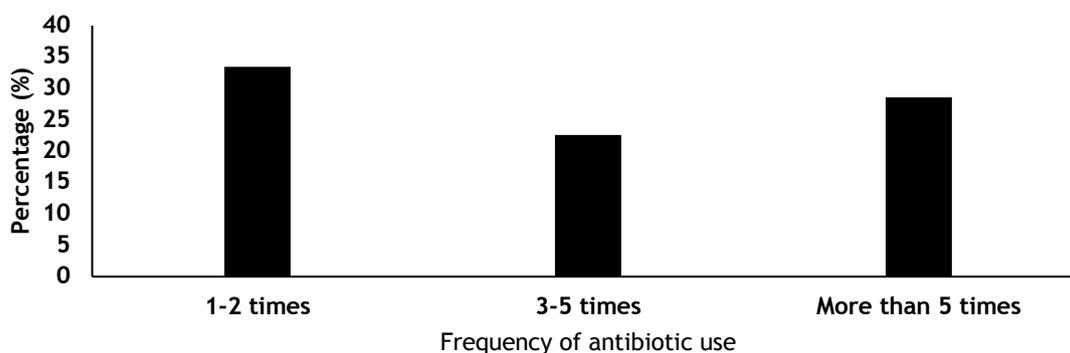


Fig 1: Frequency of antibiotic use among Kabul University participants in the past year.

Knowledge Regarding Antibiotics

Participants demonstrated varying levels of knowledge about antibiotics. Most respondents (63.3%) strongly agreed and 21.5% agreed that penicillin and amoxicillin are antibiotics, while a smaller portion disagreed (7.4%) or strongly disagreed (7.8%). In contrast, misconceptions were evident regarding other medications: 24.2% strongly agreed and 23.8% agreed that aspirin is an antibiotic, whereas 12.9% disagreed and 39.0% strongly disagreed. Similarly, 26.7% strongly agreed and 18.4% agreed that paracetamol is an antibiotic, while a larger portion disagreed (9.9%) or strongly disagreed (45.0%). Regarding the purpose of antibiotics, 40.1% strongly agreed and 30.8% agreed that antibiotics are effective against bacterial infections like tuberculosis, though some participants expressed disagreement (13.2%) or strong disagreement (16.0%). Misunderstandings

about viral infections were notable: 41.1% strongly agreed and 31.2% agreed that antibiotics are useful for viral infections such as the flu, despite this being incorrect, while 8.6% disagreed and 19.2% strongly disagreed. On the belief that antibiotics are indicated to reduce any kind of pain and inflammation, 28.3% strongly agreed and 41.4% agreed, while others disagreed (13.2%) or strongly disagreed (17.1%). Knowledge about the potential harms of antibiotics was moderately good: 36.1% strongly agreed and 36.9% agreed that antibiotics can kill good bacteria in the body, while 14.7% disagreed and 12.3% strongly disagreed. Additionally, 28.2% strongly agreed and 46.4% agreed that antibiotics can cause secondary infections after killing beneficial bacteria. Finally, awareness of allergic reactions caused by antibiotics was high, with 50.5% strongly agreeing and 36.7% agreeing, compared to only 7.3% and 5.5% who disagreed or strongly disagreed, respectively (Table 2).

Table 2: Knowledge Toward Antibiotic Consumption Among Participants

Questions on Knowledge about Antibiotic	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)
Penicillin or Amoxicillin are antibiotics	436 (63.3)	148 (21.5)	51 (7.4)	54 (7.8)
Aspirin is an antibiotic	167 (24.2)	164 (23.8)	89 (12.9)	269 (39.0)
Paracetamol is an antibiotic	184 (26.7)	127 (18.4)	68 (9.9)	310 (45.0)
Antibiotics are useful for bacterial infections (e.g., tuberculosis)	276 (40.1)	212 (30.8)	91 (13.2)	110 (16.0)
Antibiotics are useful for viral infections (e.g., flu)	283 (41.1)	215 (31.2)	59 (8.6)	132 (19.2)
Antibiotics are indicated to reduce any kind of pain and inflammation	195 (28.3)	285 (41.4)	91 (13.2)	118 (17.1)
Antibiotics can kill “good bacteria” present in our organism.	249 (36.1)	254 (36.9)	101 (14.7)	85 (12.3)
Antibiotics can cause secondary infections after killing good bacteria present in our organism.	194 (28.2)	320 (46.4)	102 (14.8)	73 (10.6)
Antibiotics can cause allergic reactions	348 (50.5)	253 (36.7)	50 (7.3)	38 (5.5)

Knowledge about Antibiotic Resistance

Among the 689 participants, 453 (65.7%) reported having heard about antibiotic resistance, while 236 (34.3%) had not. However, only 164 (23.8%) indicated that the issue of antibiotic resistance had been discussed during their degree courses, whereas 525 (76.2%) had not encountered the topic in their formal education. Notably, 365 participants (53.0%) had heard about antibiotic resistance from sources outside their degree courses. When asked about their understanding of antibiotic resistance, 286 respondents (41.5%) strongly agreed and 261 (37.9%) agreed that it is a phenomenon where bacteria lose sensitivity to antibiotics, while 91 (13.2%) disagreed and 51 (7.4%) strongly disagreed. Regarding the belief that misuse of antibiotics can lead to antibiotic resistance, a strong majority (58.5%) strongly agreed, 27.6% agreed, 8.7% disagreed, and 5.2% strongly disagreed. Finally, when asked whether it is acceptable to stop taking antibiotics once symptoms improve, 224 participants (32.5%) strongly agreed and 225 (32.7%) agreed with this incorrect practice, while 107

(15.5%) disagreed and 133 (19.3%) strongly disagreed (Table 3).

Attitudes and behaviours regarding antibiotics use

Study results revealed notable patterns in antibiotic consumption behaviours among participants. A significant proportion (79.1%) reported taking antibiotics for colds or sore throats, while 52.8% used them to treat fever. Additionally, 83.5% admitted to stop taking antibiotic once they started feeling better, which raises concerns about incomplete treatment courses. Regarding antibiotic prescription practices, 63.1% of respondents stated that they take antibiotics only when prescribed by a doctor. However, the same percentage (63.1%) reported keeping leftover antibiotics at home for potential future use. Furthermore, 61.2% admitted to self-medicating with leftover antibiotics for colds, sore throats, or flu without consulting a doctor. Over half of the participants (61.5%) acknowledged purchasing antibiotics without a medical prescription, and 59.1% had started antibiotic therapy based on a simple phone consultation with a doctor, without undergoing a proper medical

Table 3: Respondents level of Knowledge about antibiotics resistance (n = 689).

Knowledge about antibiotic resistance	Yes n (%)	No n (%)		
Have you ever heard about antibiotic resistance?	453 (65.7%)	236 (34.3%)		
In particular, have you discussed the problem of antibiotic resistance during degree courses?	164 (23.8%)	525 (76.2%)		
Have you ever heard of it outside degree course?	365 (53.0%)	324 (47.0%)		
	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)
Antibiotic resistance is a phenomenon for which a bacterium loses its sensitivity to an antibiotic.	286 (41.5)	261 (37.9)	91 (13.2)	51 (7.4)
Misuse of antibiotics can lead to a loss of sensitivity of an antibiotic to a specific pathogen.	403 (59.5)	190 (27.6)	60 (8.7)	36 (5.2)
If symptoms improve before it is completed the full course of antibiotic, you can stop taking it.	224 (32.5)	225 (32.7)	107 (15.5)	133 (19.3)

Table 4: Attitudes and behaviours regarding antibiotics use (n= 689).

Questionnaire on attitudes and behaviours regarding antibiotic use	Yes n (%)	No n (%)
Do you usually take antibiotics for cold or sore throat?	545 (79.1)	144 (20.9)
Do you usually take antibiotics for fever?	364 (52.8)	325 (47.2)
Do you usually stop taking antibiotics when you start feeling better?	575 (83.5)	114 (16.5)
Do you take antibiotic only when prescribed by the doctor?	435 (63.1)	254 (36.9)
Do you keep leftovers antibiotics at home because they might be useful in the future?	435 (63.1)	254 (36.9)
Do you use leftovers antibiotics when you have a cold, sore throat or flu without consulting your doctor?	422 (61.2)	267 (38.8)
Do you buy antibiotics without a medical receipt?	424 (61.5)	265 (38.5)
Have you ever started an antibiotic therapy after a simple doctor call, without a proper medical examination?	407 (59.1)	282 (40.9)

examination. These findings highlight widespread self-medication and inappropriate antibiotic use, emphasizing the need for stronger public health interventions to promote responsible antibiotic consumption and reduce the risk of antimicrobial resistance (Table 4).

Factors Associated with Usage of Antibiotics

Simple logistic regression analyses were conducted to identify factors associated with various antibiotic consumption behaviors (Table 5).

Association Between Having Relatives in the Healthcare Field and Antibiotic Consumption Behaviors

The analysis did not find a significant association between having relatives in the healthcare field and various antibiotic consumption behaviors. Participants who reported taking antibiotics for colds or sore throats had slightly higher odds (OR = 1.260, 95% CI: 0.819–1.939, $p = 0.294$), but this association was not statistically significant.

Similarly, stopping antibiotic use when feeling better did not show a meaningful relationship (OR = 1.018, 95% CI: 1.596–0.939). Taking antibiotics only when prescribed by a doctor was also not significantly associated with having relatives in the healthcare field (OR = 0.903, 95% CI: 1.305–0.624, $p = 0.586$). Additionally, keeping leftover antibiotics for future use (OR = 0.870, 95% CI: 1.262–0.624, $p = 0.586$) and using leftover antibiotics without consulting a doctor (OR = 0.888, 95% CI: 1.324–0.596, $p = 0.560$) did not show significant relationships. Similarly, purchasing antibiotics without a prescription was not significantly linked to having relatives in the healthcare field (OR = 1.394, 95% CI: 2.085–0.932, $p = 0.106$). Overall, these findings indicate that having relatives in the healthcare sector does not appear to influence antibiotic consumption behaviors among participants.

Association Between Gender and Antibiotic Practices

The analysis showed that gender was significantly associated with stopping antibiotics when feeling better. Male participants were less likely to stop taking antibiotics early compared to females (OR = 0.538, 95% CI: 0.356–0.814, $p = 0.003$). However, gender was not significantly associated with keeping leftover antibiotics for future use (OR = 0.811, 95% CI: 1.120–0.587, $p = 0.203$). Male participants were also significantly less likely to buy antibiotics without a prescription compared to females (OR = 0.716, 95% CI: 0.988–0.519, $p = 0.042$). However, gender was not significantly associated with the use of leftover antibiotics without consulting a doctor (OR = 0.901, 95% CI: 1.246–0.652, $p = 0.529$).

Association Between Previous Antibiotic Use and Behaviors

Participants who had used antibiotics in the previous year were significantly less likely to stop taking antibiotics early (OR = 0.581, 95% CI: 0.983–0.343, $p = 0.043$). However, no significant association was found between prior antibiotic use and the habit of keeping leftover antibiotics (OR = 0.761, 95%

CI: 1.166–0.496, $p = 0.210$). Participants with previous antibiotic use were also significantly less likely both to buy antibiotics without a prescription (OR = 0.548, 95% CI: 0.839–0.359, $p = 0.006$) and to use leftover antibiotics without consulting a doctor (OR = 0.422, 95% CI: 0.646–0.276, $p < 0.001$).

Association Between Knowledge of Antibiotic Resistance and Behaviors

Knowledge of antibiotic resistance was not significantly associated with either stopping antibiotics when feeling better (OR = 1.374, 95% CI: 2.163–0.873, $p = 0.170$) or keeping leftover antibiotics (OR = 1.039, 95% CI: 1.448–0.745, $p = 0.823$). Similarly, having heard about antibiotic resistance did not significantly influence buying antibiotics without a prescription or using leftovers, with p -values of 0.560 and 0.625, respectively (Table 5).

Association Between Having Relatives in Healthcare and Specific Practices

Having relatives working in the healthcare field did not show a significant association with stopping antibiotics when feeling better (OR = 1.099, 95% CI: 1.681–0.719, $p = 0.663$) or keeping leftover antibiotics (OR = 0.911, 95% CI: 1.268–0.654, $p = 0.581$). It was also not significantly associated with buying antibiotics without a medical receipt (OR = 1.220, 95% CI: 1.692–0.879, $p = 0.234$) or using leftover antibiotics without consultation (OR = 0.949, 95% CI: 1.322–0.682, $p = 0.759$).

Discussion

In this study we examined the knowledge, attitudes, and practices (KAP) related to antibiotic use and AMR among students and staff at Kabul University. Results showed that 84.4% of respondents had used antibiotics in the past year. Comparatively, a study in Poland found that nearly half of the participants (46%) had taken antibiotics in the previous year (Sobierajski et al., 2021) while in Germany, one-third (33%) had done so (Salm et al., 2018). A survey of Sri Lankan university students revealed that the majority (76%) had used antibiotics the previous

Table 5: Simple logistic regression analysis of factors associated with antibiotic consumption among study participants (n = 689).

Variables	Had relatives working in the health field	
	OR (95% C.I.)	p-Value
Gender		
Male	1.830 (1.306-2.566)	0.000
Female	-	-
Usually takes antibiotics for a cold or sore throat		
Yes	1.260 (0.819-1.939)	0.294
No	-	-
Stopping antibiotics when feeling better		
Yes	1.018 (1.596-0.939)	
No	-	-
Takes antibiotic only when prescribed by a doctor		
Yes	0.903 (1.305-0.624)	0.586
No	-	-
Keeping leftover antibiotics for future use		
Yes	0.870 (1.262-0.624)	0.586
No	-	-
Uses leftovers antibiotics for a cold, sore throat or flu without consulting a doctor		
Yes	0.888 (1.324-0.596)	0.560
No	-	-
Buys antibiotics without a medical prescription		
Yes	1.394 (2.085-0.932)	0.106
No	-	-

Variables	Stopping antibiotics When feeling better		Keeping leftover antibiotics for future use	
	OR (95% C.I.)	p-Value	OR (95% C.I.)	p-Value
Gender				
Male	0.538 (0.356-0.814)	0.003	0.811 (1.120-0.587)	0.203
Female	-	-	-	-
Relatives working in the health-related field				
Yes	1.099 (1.681-0.719)	0.663	0.911 (1.268-0.654)	0.581
No	-	-	-	-
Use antibiotics in the Previous Year				
Yes	0.581 (0.983-0.343)	0.043	0.761 (1.166-0.496)	0.210
No	-	-	-	-
Has heard about antibiotic resistance				
Yes	1.374 (2.163-0.873)	0.170	1.039 (1.448-0.745)	0.823
No	-	-	-	-

Table 5: Simple logistic regression analysis of factors associated with antibiotic consumption among study participants (n = 689) (cont.)

Variables	Do you buy antibiotics without a medical receipt?		Do you use leftovers antibiotics when you have a cold, sore throat or flu without consulting your doctor?	
	OR (95% C.I.)	p-Value	OR (95% C.I.)	p-Value
Gender				
Male	0.716 (0.988-0.519)	0.042	0.901 (1.246-0.652)	0.529
Female	- -	-	- -	-
Relatives working in the health-related field				
Yes	1.220(1.692-0.879)	0.234	0.949 (1.322-0.682)	0.759
No	- -	-	- -	-
Use antibiotics in the Previous Year				
Yes	0.548 (0.839-0.359)	0.006	0.422 (0.646-0.276)	0.000
No	- -	-	- -	-
Has heard about antibiotic resistance				
Yes	1.104 (1.541—0.791)	0.560	1.087 (1.516-0.779)	0.625
No	- -	-	- -	-

year (Sakeena et al., 2018). In this study 40.1% of respondents believed that antibiotics are effective in treating bacterial infections. In contrast, only 28.1% of Indian families were aware that antibiotics are used for bacterial infections (Agarwal et al., 2015). In a survey of health students from three East African universities, 98.1% correctly identified antibiotics as effective against bacterial infections (Lubwama et al., 2021). Similarly, the majority of Pakistani university students (80%) knew that antibiotics specifically target bacteria (Bukhsh et al., 2019). A study in the UAE found that 91.4% of university students understood that antibiotics kill and treat bacteria (Jairoun et al., 2019). According to this research, 41.1% of respondents mistakenly believed that antibiotics could treat viral infections like influenza. In an American urban study, more than half (57%) thought antibiotics were effective against viral infections (Sobeck et al., 2022). A study of Chinese parents found that 79% believed antibiotics could cure viral illnesses (Yu et al., 2014). In a survey of medical students in Nepal, 25.9% agreed with this incorrect notion (Sarwar et al., 2018). Antibiotics, however, are ineffective against viral infections (Teodoro & Chambel, 2013). This study also showed that 65.7% of respondents were familiar with the concept of antibiotic resistance. Among Pakistani students, a majority (80.1%) were aware of the term (Hayat et al., 2021) while 30.6% of Egyptian non-medical university students had heard of antibiotic resistance (Mostafa et al., 2021). A Romanian study found that 85.14% of participants knew about antibiotic resistance (Voidăzan et al., 2019). The World Health Organization (WHO) reported that 70% of respondents in 12 countries recognized the term, with higher education levels correlating with greater awareness (WHO, 2015). The findings also indicated that 83.5% of participants typically stop taking antibiotics once they feel better. In an Indian medical student survey, 88.7% disagreed with the notion of stopping antibiotics once symptoms improve (Gupta et al., 2019). A study of rural physicians and patients in Bangladesh found that around half of the patients discontinued their prescribed antibiotics once symptoms subsided (Sutradhar et al., 2014). In Serbia, 43% of participants believed it was acceptable to stop antibiotics once symptoms improved (Horvat et al., 2017). However, WHO guidelines advise completing the full course of antibiotics to prevent the development of drug-resistant bacteria (Haque et al., 2019). The study also revealed that 61.5% of respondents purchase antibiotics without a doctor's prescription. A population study in Indonesia found

that over 40% of participants obtained antibiotics without a prescription (Karuniawati et al., 2021). In Pakistan, 45% of non-medical university students admitted to using antibiotics without consulting a doctor in the previous six months (Gillani et al., 2017). In Sri Lanka, around 30% of pharmacists admitted to dispensing antibiotics without a prescription (Zawahir et al., 2021). Prescribing or purchasing antibiotics without proper medical assessment can contribute to the rise of antibiotic resistance (Islam et al., 2021). Furthermore, in our study, 63.1% of respondents reported saving leftover antibiotics for future use while 28.5% of dental patients in Chennai, India, stored leftover antibiotics for future use (Shamsudeen et al., 2018). The study also revealed that 79.1% of respondents commonly used antibiotics to treat colds or sore throats and 52.8% used them for fever. In a Nepalese study, antibiotics were frequently used for fever (94.1%) and sore throats (90.7%) (Deo et al., 2018). A Canadian study found that 30% of people used antibiotics for a cold and 55% for a sore throat (Jaja, 2018). Similarly, 83.33% of participants in an Indian survey of medical students and the general public reported using antibiotics for cough, fever, sore throat, and colds (Mir et al., 2019). While antibiotics are crucial for treating bacterial infections, the last few decades have seen a rise in microbial resistance due to excessive and uncontrolled antibiotic use, leading to significant health, environmental, and economic consequences, including prolonged hospitalizations and higher mortality rates (Almutairi et al., 2021). Increasing awareness about antibiotics and the risks of overuse is essential to limit usage frequency and encourage proper use (Higuaita et al., 2020). Our study has limitations: the study was conducted within a single academic institution, which limits the generalizability of the findings to the broader population of Afghanistan or other university settings. Furthermore, the use of a structured questionnaire, while reliable, may not capture the full complexity of participants' knowledge and attitudes, as it does not allow for in-depth exploration of reasoning behind their choices. Finally, the high proportion of participants from medical-related faculties (Pharmacy, Veterinary Science) might have influenced the overall results, potentially leading to an overestimation of the general knowledge level within the university community. Future research would benefit from a multi-institutional longitudinal design and the incorporation of qualitative methods to provide a more comprehensive understanding of antibiotic use behaviors.

Conclusion

This study reveals a critical disconnect between knowledge and practice regarding antibiotic use among students and staff. While respondents demonstrated average knowledge of antibiotics and antibiotic resistance, a high prevalence of inappropriate practices was observed, including self-medication, storing antibiotics for future use, using them for viral infections, and—most notably—discontinuing treatment prematurely (83.5%). The primary implication of these findings is the urgent need for targeted interventions within the university community, as these behaviors directly contribute to the growing threat of antimicrobial resistance (AMR). To address this, measures such as integrated educational campaigns and antimicrobial stewardship programs should be implemented to correct specific misconceptions. Future research should build on these findings by employing qualitative methods to explore the underlying reasons for self-medication and by conducting interventional studies to assess the effectiveness of these targeted educational programs in changing behavior. Generating this specific evidence is crucial for informing evidence-based policies and guiding authoritative actions to combat AMR.

Authors contributions

Conceptualization, A.T.G.; methodology, A.T.G.; formal analysis, M.Z. and A.T.G.; investigation, M.Z, L.B. and L.S.; resources, M.Z. and A.T.G.; writing—original draft preparation, M.Z.; writing—review and editing, A.T.G and J.A.O.; supervision, Q.A.N. and A.T.G.; project administration, M.Z. and A.T.G. All authors have read and agreed to the published version of the manuscript.”

Ethical approval statement

The study protocol was approved by the Ethics Committee of Faculty of Pharmacy, Kabul University (34-11/June/2022).

Conflict of interest

The authors declare no conflict of interests.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s)

used ChatGPT-4o solely for language polishing, grammar checking, and typo correction. The author(s) thoroughly reviewed and edited the content as needed and take full responsibility for the content of the published article.

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