

Exploring Antibiotic Use and Stewardship Awareness Among Turkish University Students

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Abstract

Antimicrobial resistance (AMR) is a global health threat driven by the misuse of antibiotics. Understanding students' knowledge is vital for strengthening antimicrobial stewardship (AMS); however, gaps remain across disciplines. This study aimed to explore undergraduate students' knowledge, attitudes, and practices regarding antibiotics, antimicrobial resistance (AMR), and antimicrobial stewardship (AMS). A qualitative study design was employed, involving face-to-face, semi-structured interviews with students from various faculties, conducted between May and July 2022. A total of 50 students from four different faculties were included in the study, and the data were analyzed using NVivo for thematic analysis. An inductive thematic analysis approach was utilized to identify key themes, subthemes, and categories. A total of 50 participants were interviewed: medicine (n = 15), nursing (n = 13), pharmacy (n = 12), and dentistry (n = 10), with a mean interview duration of 17 minutes. The majority were male (n = 30; 60%), and most participants were between 18 and 22 years of age (n = 28; 56%). While most participants demonstrated a basic understanding of the term "antibiotic," many lacked detailed knowledge regarding its appropriate use, including correct selection and duration of therapy. Notably, students from the nursing faculty exhibited lower levels of awareness regarding antibiotic resistance and safe antibiotic use, whereas students from the medical faculty demonstrated comparatively greater understanding. In conclusion, the findings highlight a moderate level of knowledge and awareness across all faculties regarding antibiotic use and resistance. These results emphasize the need for targeted educational interventions to improve undergraduate students' understanding of antimicrobial stewardship principles, particularly among nursing students, and to enhance their engagement with AMS practices.

Keywords: Antimicrobial stewardship; antibiotic resistance; antibiotic use; Türkiye

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Introduction

The appropriate use of medications, especially antibiotics, is essential for treating infectious diseases. Effective antibiotic use demands a comprehensive understanding of pharmacology and awareness of the potential risks of misuse, such as the development of antimicrobial resistance (AMR). AMR has emerged as a significant global health threat, complicating treatment strategies and undermining the effectiveness of antibiotics in clinical settings [1]. Antibiotics, while essential in clinical practice, are frequently overused or misused, resulting in increased resistance among pathogenic bacteria. As future healthcare professionals, healthcare students play a key role in addressing AMR through responsible antibiotic stewardship, which necessitates early and continuous education on appropriate usage and resistance mechanisms [2], [3].

Türkiye has one of the highest rates of antibiotic consumption in Europe, with widespread inappropriate use of antibiotics, particularly in primary healthcare settings [4]. In response to this alarming trend, the Turkish government implemented a national strategy (2014–2017) aimed at reducing antibiotic misuse, including legislation to restrict access to antibiotics without a prescription [5]. Despite these efforts, the inappropriate use of antibiotics remains a persistent challenge, exacerbating the problem of AMR in the country.

Globally, research has highlighted substantial variability in medical students' knowledge, attitudes, and practices regarding antibiotic use and AMR. For instance, in China, a significant proportion of healthcare students engage in self-medication with antibiotics, indicating a lack of awareness and responsible behaviour [6]. Similarly, studies in the USA and France reveal mixed levels of understanding about antimicrobial stewardship among healthcare students, with some students uncertain about ethical prescribing practices, including drug choice and dosage [7], [8]. These findings suggest that knowledge gaps and inconsistent behaviours regarding antibiotic stewardship are common among healthcare students globally.

While international studies have provided valuable insights, there remains a notable research gap in understanding the knowledge, attitudes, and practices of healthcare students in Türkiye regarding antibiotics, AMR, and antibiotic stewardship programs (ASP). Despite the increasing emphasis on AMR within the Turkish healthcare system, there is limited research examining the perceptions and behaviours of students across various faculties related to antibiotic use. Given the global variations in student awareness and behaviour regarding antibiotics, it is crucial to explore this issue within the context of Türkiye, where antibiotic consumption remains high. This is particularly concerning because healthcare students represent the future healthcare workforce. Inadequate knowledge and inappropriate antibiotic prescribing practices at this stage may contribute to improper clinical decision-making, thereby facilitating the development and spread of antimicrobial resistance. Therefore, there is an urgent need to enhance the competencies of healthcare students in antimicrobial stewardship in order to curb the growing global threat of AMR. Given the global variations in student awareness and behaviour regarding antibiotics, it is crucial to explore this issue within the context of Türkiye, where antibiotic consumption remains high. This is particularly relevant because undergraduate students in health-related disciplines represent future healthcare professionals who will not only prescribe antibiotics but also serve as key health educators, influencing public knowledge and practices regarding antibiotic use. This study aims to address this gap by investigating the knowledge, attitudes, and practices related to antibiotic use, AMR, and antimicrobial stewardship programs (ASP) among undergraduate students from different faculties in Türkiye. Through in-depth qualitative interviews, this study seeks to provide a comprehensive understanding of students' awareness and behaviours, which may inform targeted educational strategies and interventions to combat AMR more effectively in the country.

Materials and Methods

Materials

The primary study material was a semi-structured interview guide developed based on a review of the literature on antibiotic use, antimicrobial resistance (AMR), and antimicrobial stewardship (AMS). The interview guide consisted of open-ended questions designed to explore participants' knowledge, attitudes, and practices regarding antibiotic use, awareness of AMR, and perceptions of AMS. The guide was reviewed by experts in pharmacy and public health to ensure content relevance and clarity.

Face-to-face interviews were audio-recorded with participants' consent using a digital voice recorder. Demographic information, including age, gender, faculty, and year of study, was also collected prior to the interviews. Interview recordings were transcribed verbatim and imported into NVivo software (QSR International, Melbourne, Australia) for data organization, coding, and thematic analysis.

Methods

Study design

This qualitative study was conducted at a public university in Türkiye, located in the northern region of Adana, and included students from the Faculties of Medicine, Pharmacy, Dentistry, and Nursing. The study was conducted to explore participants' views on antibiotic use, antibiotic resistance (ABR), antimicrobial stewardship programs (ASP), and potential interventions for improvement. Semi-structured interviews were considered the most appropriate approach because they provide flexibility in exploring participants' knowledge and perceptions while maintaining consistency across interviews [9].

Development of study instrument and sampling

The interview guide was developed following an extensive literature review and was aligned with the qualitative exploratory design of the study [10], [11], [12]. It consisted of open-ended questions and subsections addressing participants' knowledge, attitudes, and perceptions regarding antibiotics, antimicrobial resistance (ABR), and antimicrobial stewardship programs (ASP) within health sciences education in Türkiye. The interview guide was prepared in both Turkish and English by an academician with extensive experience. Equivalence between the two versions was ensured through a back-translation process [13]. Pilot testing was conducted with six participants to assess the clarity and comprehensibility of the questions; however, the pilot data were not included in the final analysis. Figure 1 presents an overview of the major domains explored in the study.

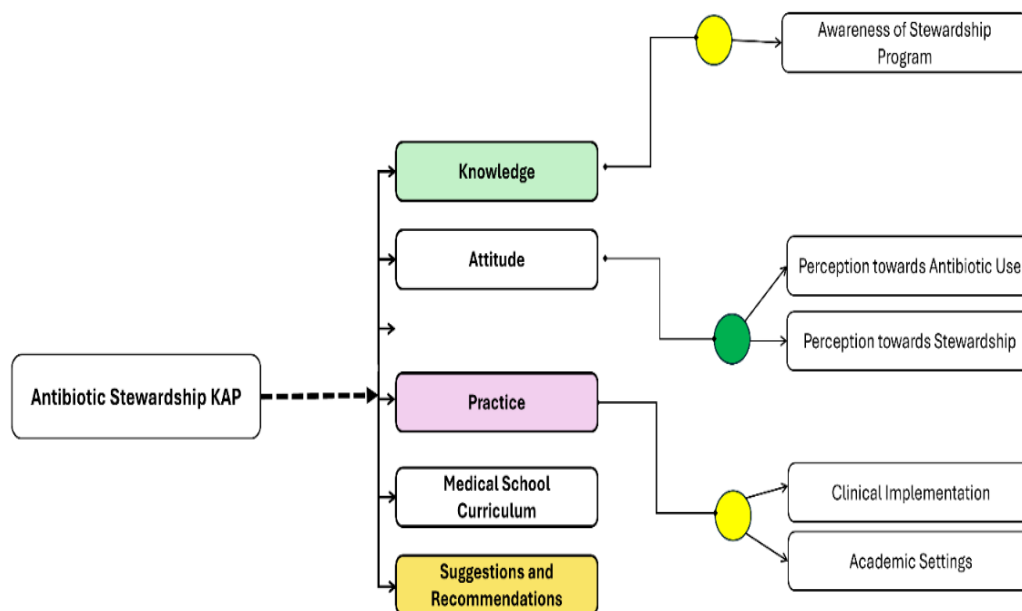


Figure 1. Summary of interview guide

Participants were selected using purposive sampling to ensure representation from different faculties and levels of study [14]. Purposive sampling, a fundamental technique in qualitative research, was employed to ensure the inclusion of participants with diverse perspectives from different faculties and years of study [14]. This approach enabled the selection of participants with sufficient academic exposure to contribute meaningfully to the study objectives [12], [14]. Eligible participants were undergraduate students enrolled in the Faculties of Medicine, Pharmacy, Dentistry, or Nursing who had completed at least one year of study and had prior exposure to coursework related to antibiotics or infectious diseases. In addition, participants were required to be willing to participate voluntarily and provide informed consent. These criteria ensured that participants possessed sufficient academic exposure and relevant knowledge to contribute meaningfully to the study objectives. The principal investigator (F.U.K.) visited the designated data collection sites within the university to recruit participants. Initially, 65 students were assessed for eligibility, of whom 10 were excluded based on the inclusion criteria. Subsequently, 55 eligible students were invited to participate in the study. During the recruitment process, five students withdrew or did not complete the interview process. Consequently, a total of 50 participants provided informed consent and completed the interviews, and their data were included in the final analysis. Data collection continued until thematic saturation was achieved. Figure 2 illustrates the participant screening, recruitment, and final inclusion process.

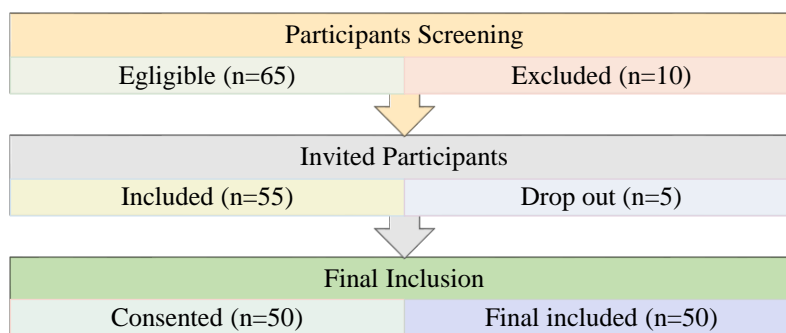


Figure 2. Flow diagram of participant screening, recruitment, and final inclusion in the study.

Data collection

Data were collected through face-to-face semi-structured interviews conducted in designated quiet areas within each faculty to provide a comfortable environment for participants. The interviews were conducted in either Turkish or English, according to the participants' preference, and lasted between 17 and 30 minutes. Written informed consent was obtained from all participants prior to the interviews to ensure that they understood the voluntary nature of their participation and their right to withdraw from the study at any time without penalty.

The interviews were conducted by a researcher with a pharmacy background who had received training in qualitative research methods. The researcher was not involved in the participants' academic teaching or evaluation. Participants were informed that all information would be treated confidentially and that their participation would not affect their academic standing in any way. To enhance the accuracy and credibility of the data, participants were given the opportunity to review their interview transcripts.

Data analysis

Data analysis was conducted separately from data collection and followed the six-step thematic analysis framework proposed by Braun and Clarke [15]. The process involved familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. All interview recordings were transcribed verbatim. The Turkish transcripts were subsequently translated into English, and translation accuracy was ensured through a forward-backward translation process [16], [17]. Initial codes were generated using an open-coding approach to identify meaningful units of data. These codes were then grouped into categories, sub-themes, and overarching themes. To enhance the credibility and trustworthiness of the findings, multiple researchers independently reviewed the coding framework and emerging themes. Regular research team meetings were conducted to discuss discrepancies and achieve consensus on the final thematic structure [17]. NVivo 19 qualitative data analysis software was used for data organization, coding, theme development, and data visualization, including the generation of word clouds.

Results and Discussion

A total of 50 undergraduate students from four faculties were recruited after meeting the eligibility criteria and providing informed consent. Participant recruitment continued until data saturation was achieved. The majority of participants were male ($n = 30$, 60%), with the largest proportion recruited from the Faculty of Medicine ($n = 15$, 30%). Participants were categorized according to their year of study, with first- and second-year students classified as junior students ($n = 18$, 36%) and third- and fourth-year students classified as senior students ($n = 20$, 40%). Participant characteristics are summarized in Table 1.

Use of Antibiotics among Undergraduate Students

Across all disciplines and years of study, antibiotic use was common. Although most students recognized the role of antibiotics in the treatment of infections, several inappropriate practices were identified, including discontinuing antibiotics after symptom resolution, storing leftover antibiotics, and sharing antibiotics with others. These findings suggest a gap between students' knowledge and their actual practices. Medical undergraduate students (MUGs) and pharmacy undergraduate students (PUGs) demonstrated better knowledge of antibiotic use and related terminology than nursing undergraduate students (NUGs) and dental undergraduate students (DUGs). These findings indicate that inappropriate antibiotic use remains prevalent in Türkiye despite regulations restricting over-the-counter access to antibiotics, consistent with previous studies [18], [19], [20], [21].

Knowledge and Factors Associated with Antibiotic Resistance

Most participants demonstrated a basic understanding of antibiotic resistance (ABR); however, many lacked a clear understanding of the underlying mechanisms. MUGs and PUGs exhibited comparatively better knowledge, whereas NUGs demonstrated limited understanding and DUGs showed a moderate level of understanding. Self-medication and the premature discontinuation of antibiotic therapy were identified as the primary factors contributing to ABR, consistent with findings reported in other low- and middle-income countries (LMICs) [22]. The findings highlight the urgent need to strengthen students' foundational knowledge of ABR before their transition into clinical practice. Similar trends have been reported in studies conducted in other countries, emphasizing the importance of enhancing education on appropriate antibiotic use and antimicrobial resistance among healthcare students [23], [24].

Table 1. Participants' demographic characteristics

Variables	n (%)
Gender	
Male	30 (60)
Female	20 (40)
Age (years)	
18-22	28 (56)
23-27	22 (44)
≥ 28	0 (0)
Duration of interview (min)	
10-15	12 (24)
16-25	17 (34)
> 26	21 (42)
Program of study	
PUGs	12 (24)
MUGs	15 (30)
NUGs	13 (26)
DUGs	10 (20)
Year of study	
First-year undergraduate	10 (20)
Second-year undergraduate	08 (16)
Third-year undergraduate	12 (24)
Fourth-year undergraduate	10 (20)
Final year undergraduate	10 (20)

Abbreviations: MUGs, medical undergraduate students (MBBS); PUGs, pharmacy undergraduate students (PharmD); NUGs, nursing undergraduate students (BSN); DUGs, dental undergraduate students (BDS)

Awareness of Antibiotic Stewardship Programs

The term antimicrobial stewardship program (ASP) was unfamiliar to most participants, particularly nursing undergraduate students (NUGs) and dental undergraduate students (DUGs). Although some students had heard of the term, they commonly associated it with infection control departments rather than recognizing its broader role in optimizing antimicrobial use. Overall, participants demonstrated limited awareness of the fundamental components of ASPs. Pharmacy undergraduate students (PUGs) exhibited comparatively better awareness and acknowledged the role of ASPs in promoting safe antibiotic use and reducing antimicrobial resistance.

Participants also demonstrated varying levels of knowledge regarding antibiotic resistance (ABR). While most students were familiar with the concept of ABR, many lacked a clear understanding of its underlying mechanisms. MUGs and PUGs generally exhibited greater awareness of ABR and its contributing factors, whereas DUGs and NUGs showed comparatively lower levels of understanding. Poor adherence to prescribed antibiotic regimens, inadequate patient education, and inappropriate antibiotic use were commonly identified as factors contributing to the development and spread of ABR.

Furthermore, participants recognized that healthcare professionals and university students could play an important role in reducing ABR through patient education and responsible antibiotic use. Many participants also emphasized the need for additional training, internships, and educational activities related to ABR and ASP. These findings suggest that current educational exposure may be insufficient to adequately prepare students for their future roles in antimicrobial stewardship. These findings are consistent with previous studies reporting limited awareness of antimicrobial stewardship among healthcare students [25], [26]. Strengthening ASP-related competencies is essential, particularly in low- and middle-income countries (LMICs), where antibiotic misuse remains prevalent. The major themes and representative quotations are summarized in Tables 2 and 3.

Table 2. Participants' use of antibiotics (theme I)

Sub-themes	Categories	Representative quotations			
		MUGs (n=15)	PUGs (n=12)	DUGs (n=10)	NUGs (n=13)
Have you recently taken any antibiotics? And where did you get these from?	Do you have any idea of the basic mechanism of antibiotics and their classifications?	I can identify the antibiotics but sometimes become confused about different mechanisms of action. (MUGs-03)	Antibiotics can kill bacteria, but not viruses or other microbes. I am familiar with the mechanism of action of cephalosporins (PUGs-01)	Antibiotics are less prescribed after the tooth extractions and implants I do not readily remember the mechanism of action (DUGs-07)	We have studied the different classes of antibiotics but not in detail as I focus on the administration and its side effects. (NUGs-10)
	Do you know about the adverse drug reactions due to antibiotics?	During the clinical round, I observed some of the patients having allergic reactions due to penicillin and that's why an allergy test is important before the use of penicillin. (MUGs-05)	Yes, ADRs due to antibiotics are common and tetracycline cannot be used in pediatrics as it has some side effects and is permanent. (PUGs-06)	Every medication has a side effect and true is the same for antibiotics. (DUGs-03)	Any unwanted effect caused by a medication is considered an adverse effect (NUGs-04)
	Self-medication of antibiotics	Self-medications sometimes lead to medication errors and antibiotics must not be used without a prior prescription. (MUGs-01)	Antibiotics may be harmful if taken without consulting a physician (PUGs-11)	I think if a patient is in dire need of an antibacterial drug, he must receive it but health rules do not allow such uses. (DUGs-03)	I have practically observed some of the side effects of medications not particularly related to antibiotics. (NUGs-02)
What makes you think that once you start therapy, you should stop taking antibiotics after a few doses?	After feeling well	I think the therapy must complete its duration as directed by the physician. (MUGs-06)	Ultimately at the middle of the therapy or after some doses can not describe the positive outcomes. (PUGs-12)	If a patient is feeling well then, no need for further treatment with medications. (DUGs-08)	This is not good to switch the therapy in the middle of treatment as our teachers at the hospital emphasized on whole therapy strategy. (NUGs-05)
	Due to adverse effects	Possibility of the severe ADRs. (MUGs-04)	If ADRs occur the patient must report it to the hospital or pharmacy. (PUGs-06)	I didn't notice such cases in my clinical duties. (DUGs-06)	Adverse effects can be handled as doctors change drugs. (NUGs-09)
If antibiotics were used to treat the same ailment, would that be ethical to distribute, store, and provide them to friends and family?	Storage of unnecessary antibiotics at home	Antibiotics at home are not a good practice but due to need is a common practice. (MUGs-09)	Unnecessary storage of antibiotics will lead to self-medication and medication errors. (PUGs-02)	It is not a good practice but sometimes it's a compulsion to store at home. (DUGs-06)	Some emergency medications should be available at home to assist patients when needed (NUGs-08)
	Recommendations regarding antibiotic brands	I always recommended some of the brands of antibiotics instead of locals. (MUGs-11)	I do not agree because I learned that a brand has the same effect as a product. (PUGs-12)	I have no idea as by clinical practice during study hours we only look at what our doctor prescribes. (DUGs-01)	As I engaged with the prescription, we only use the drugs available for the administration irrespective of the company names. (NUGs-03)
What particular illnesses or diseases might antibiotics be used to treat?	Infectious diseases like;	Infectious diseases can be treated with antibiotics like TB and typhoid fever. (MUGs-12)	Respiratory tract infections are common here and antibiotics can be used. (PUGs-01)	I observed cases of dental sepsis during practice (DUGs-04)	As this is my first year of study I study some of the subjects related to bacteria. (NUGs-01)
	Other than microbial origin of diseases	We can use but not in all cases. (MUGs-01)	Only in infectious diseases as in others it cannot be useful. (PUGs-02)	Antibiotics are only effective against bacteria (DUGs-03)	Yes, only inactions origin needs antibiotics. (NUGs-10)

Table 3. Antibiotic resistance and students' responses (theme II)

Sub-themes	Categories	Representative quotations			
		MUGs (n=15)	PUGs (n=12)	DUG (n=10)	NUGs (n=13)
Could you please, tell us about AMR/ABR/ as one of the major public health issues around the world	What do you know about the AMR/ABR?	I previously participated in infection control training, and it was a valuable hands-on learning experience. (MUGs-01)	When bacteria become resistant to a particular antibiotic for some reason. (PUGs-09)	I have heard the terms ABR and AMR, but I do not understand their underlying mechanisms. (DUGs-05)	I studied this term in my pharmacology book but wasn't in detail. (NUGs-06)
	What are the main factors in ABR spreading?	There are many contributing factors, and one of them is that patients do not follow their physicians' instructions. (MUGs-05)	Patient education and awareness regarding ABR are essential, as many patients do not fully understand pharmacists' instructions regarding antibiotic use. (PUGs-05)	I think we must provide some information related to the use and administration of antibiotics as patients often ask about the use of medicines before obtain from a pharmacy. (DUGs-06)	I am not sure what exactly contributes to ABR, but I think the body's response may also play a role. (NUGs-05)
	Turkey is ready to combat the fight against ABR?	I think the Turkish health regulatory authority made some regulations about a decade ago and now ABR is in control. (MUGs-10)	ABR is one of the issues in the treatment outcomes and Turkey has some regulations regarding ABR. (PUGs-11)	I don't think so and have no idea of date information related to ABR in our country. (DUGs-07)	I need to study ABR in greater depth before I can understand Türkiye's current situation regarding ABR (NUGs-06)
University students can play a better role in the reduction of ABR?	Medical school students can play a better role in the reduction of ABR.	Students can contribute to reducing ABR by applying and sharing their knowledge after graduation. (MUGs-06)	As future pharmacists, we can contribute by educating patients in both community and hospital pharmacies about the safe use of antibiotics. (PUGs-08)	Our dental school and hospital may contribute to this noble cause by arranging some events on the safe use of medications. (DUGs-02)	Universities can only provide basic knowledge; however, the implementation of drug regulations is equally important. (NUGs-03)
	Healthcare settings and workers can play a better part in ABR.	Of course, healthcare providers like physicians and others can play an important role. (MUGs-04)	Today's medical students are tomorrow's healthcare providers, and proper education on ABR will enable them to play a significant role in combating resistance. (PUGs-07)	As per our duties, we can educate the patients and only a few minutes can lead to the safe use of antibiotics. (DUGs-06)	Whenever I visit the hospital I feel to help and educate a patient in a better way. (NUGs-09)
Specific training regarding ABR and antimicrobial stewardship (ASP) is the need of time in Turkey?	Students need special internships.	One year house job is a unique internship and I am waiting for it to learn more about my profession. (MUGs-08)	I agree with you there must be a compulsory internship in the study hours for pharmacy students to learn basic skills at hospital. (PUGs-05)	Yes, the best way is to learn and the training hours must be exceeded to practice at the dental unit. (DUGs-07)	We have weekly hours duty inwards to learn about nursing skills. (NUGs-02)
	Healthcare workers need more training	Hands-on training like last year I experienced infection control training and that was an amazing experience. (MUGs-01)	I agree, but students in their final year also need some training before going to any job setting. (PUGs-07)	I have no idea at this stage but training must be there especially the dental section needs more hands-on training for the perfect practices. (DUGs-01)	At the school of nursing, we get routine training, and that is enough to learn as a nursing student. (NUGs-03)
ABR is rising in Turkey as well as in other parts of the world?	Due to a lack of awareness and education	ABR is not only a problem in developing countries. (MUGs-11)	ABR is rising all over the world as I read one of the articles indicating bugs and resistance. (PUGs-05)	I think ABR can occur to anyone. (DUGs-04)	During my ward rotation, I observed a patient with multidrug-resistant (MDR) infection. (NUGs-01)

Recommendations for Curriculum Improvement

Participants from all faculties emphasized the need for curriculum revision to incorporate updated information on antibiotic resistance (ABR) and antimicrobial stewardship programs (ASP). Medical undergraduate students (MUGs) and pharmacy undergraduate students (PUGs) highlighted the importance of aligning educational content with international standards, whereas dental undergraduate students (DUGs) stressed the need for updated information reflecting recent advances in dental practice. Nursing undergraduate students (NUGs) emphasized the importance of continuous curriculum revision to ensure that educational content remains relevant and up to date. These findings are consistent with previous studies that have highlighted curriculum revision as an important strategy for improving knowledge and promoting the appropriate use of antibiotics, thereby reducing antimicrobial resistance [3].

The overall findings indicated that PUGs demonstrated comparatively better knowledge regarding antibiotic use, ABR, and ASP, followed by MUGs, whereas DUGs and NUGs exhibited lower levels of knowledge and awareness. These findings reveal important knowledge gaps, particularly among non-pharmacy and non-medical students, and underscore the need for targeted educational interventions. Participants also reported that insufficient time is currently allocated to teaching ABR and ASP within the curriculum, which may contribute to inadequate preparedness for future clinical practice. Similar findings have been reported in previous studies, emphasizing the importance of comprehensive education and practical training for healthcare students to optimize therapeutic outcomes and combat antimicrobial resistance [20], [21], [27].

This study highlights the need for early and comprehensive education on antibiotic use, antibiotic resistance (ABR), and antimicrobial stewardship programs (ASP) across all healthcare disciplines. As future healthcare professionals, students are expected to play a critical role in promoting appropriate antibiotic use and implementing antimicrobial stewardship practices. Therefore, strengthening educational interventions during undergraduate training may contribute to improved antibiotic stewardship and better patient outcomes in future clinical practice. Several limitations of this study should be acknowledged. First, the study was conducted at a single institution with a relatively small sample size, which may limit the generalizability of the findings. Second, although participants were recruited from different years of study, comparisons across academic years were not stratified. Furthermore, differences between academic disciplines were not formally compared; rather, the study focused on identifying common patterns and shared experiences among participants.

Conclusion

In conclusion, this study identified substantial gaps in undergraduate students' knowledge, attitudes, and practices regarding antibiotics, antibiotic resistance (ABR), and antimicrobial stewardship programs (ASP) across different healthcare disciplines. Although pharmacy and medical students demonstrated relatively better knowledge, important deficiencies remained, particularly among nursing and dental students. Inappropriate antibiotic-related practices, including self-medication and premature discontinuation of therapy, were commonly reported despite existing regulatory restrictions. Furthermore, awareness of ASP was generally limited, and participants highlighted insufficient coverage of ABR- and ASP-related topics within current curricula. These findings underscore the need to revise existing curricula by integrating antimicrobial stewardship principles and implementing targeted educational interventions to equip future healthcare professionals with the competencies required to combat antimicrobial resistance effectively.

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Declarations

- Author contribution : Conceptualization and study design: FUK, YF, and YK. Data collection: FUK, ANCG, and YK. Formal analysis: ZK, HR, and FK. Interpretation of results: ZK, HR, and NT. Writing—original draft preparation: FUK and TA. Writing—review and editing: YK and YF. Critical revision of the manuscript: YK and YF. All authors reviewed and approved the final version of the manuscript for submission.
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- Conflict of interest : None.
- Ethics Declaration : Ethical approval for this study was obtained from the Ethics Committee of the Health Science Center, Cukurova University (Approval No. 303481) (Supplementary File S2). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee and the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.
- Additional information : No additional information is available for this paper.

Informed Consent Statement

Written informed consent was obtained from all participants prior to their enrolment in the study. Participants were informed about the study objectives, procedures, voluntary nature of participation, confidentiality of the information provided, and their right to withdraw from the study at any time without any consequences.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to ethical restrictions and the need to protect participants' confidentiality.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the authors used artificial intelligence (AI)-assisted technology solely to improve the readability and language of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article. The authors confirm that no AI tools were used for data collection, data analysis, interpretation of results, or the generation of scientific conclusions.

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