







Investigation of the Rational Antibiotic Uses of University Students



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Abstract

Objective: This study assessed university students' knowledge levels regarding rational antibiotic use.

Methods: This study sample comprised 105 students studying at a university in Istanbul. The students were enrolled across five different faculties. The data were collected using an information form developed by the researchers. The parameters of the normal distribution were determined using the Shapiro-Wilk test. The Student's t-test was applied to evaluate the normally distributed quantitative data between the two groups. Mann–Whitney U test was used for data that was not normally distributed. The chi-square test, Continuity (Yates) Correction, and Fisher exact chi-square tests were used to compare the qualitative data.

Results: The largest proportion of participants were health science faculty students (38.6%). Most students had previously received information about antibiotic use (71.0%), had used antibiotics before (91.7%), read the package insert before using antibiotics (72.4%), made an effort to take antibiotics on time (79.3%), lacked understanding of the term microbiota (59.3%), and lacked knowledge about the relationship between antibiotics and microbiota (55.9%).

Conclusion: The findings indicate that most students adhered to the principles of rational antibiotic use. The students required information about the human microbiota and the relationship between microbiota and antibiotics. Comprehensive educational programs should be implemented to improve students' understanding of rational antibiotic use and its relationship with the microbiota.


Keywords


Rational use of antibiotics · microbiota · university students



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INTRODUCTION

In recent years, the overuse and misuse of antibiotics, often influenced by recommendations from relatives, neighbours, or friends, have emerged as a pressing issue with adverse individual and societal effects. Studies have shown that antibiotics rank among the most widely used medications, accounting for up to 20% of all prescriptions globally and in our country (1,2). The failure to address the misuse and incorrect use of antibiotics has led to the emergence and proliferation of antibiotic-resistant microorganisms, contributing to rising morbidity and mortality rates (3). Notably, in Turkey, university students have been observed to use medications, particularly antibiotics, without sufficient knowledge or appropriate guidance. This behaviour is attributed to various factors, including limited access to healthcare facilities, time constraints in visiting healthcare institutions, psychological challenges, and stress (4).

Antibiotics are bioactive agents that inhibit the growth of or eliminate microorganisms, and they can be produced either biologically or through chemical synthesis (5). However, recent studies on microorganisms have shown that these microorganisms are increasing their antimicrobial resistance due to the uncontrolled and incorrect use of antibiotics over time (6-8). The failure to manage antimicrobial resistance effectively has promoted the terms "superbugs" and "super-resistance." Despite the World Health Organization's efforts, endemic and pandemic diseases continue to pose a growing global threat. The threat is further exacerbated by insufficient financial resources and inadequate ethical frameworks necessary to effectively address serious infectious and communicable diseases. (9).

Nurses hold a critical responsibility in addressing antibiotic resistance. Nurses play a pivotal role in direct patient communication and guidance throughout treatment. Within this scope, they are well-positioned to deliver education on rational antibiotic use to patients who have undergone or are currently undergoing antibiotic therapy. It is clear nowadays that a significant initiative has been the advocacy for rational antibiotic use, aimed at raising public awareness and curbing the uncontrolled use of antibiotics (10-13). The primary objective of this advocacy is to alleviate economic burdens and prevent adverse patient outcomes (11). Moreover, rational antibiotic use is pivotal in managing antimicrobial resistance. Environmental factors, dietary habits, and lifestyle shape the human microbiota, which comprises bacteria, fungi, archaea, and viruses. (14). Recent research exploring the impact of microbiota on health and disease indicates that it plays

a crucial role in the development and treatment of severe illnesses, including cancer, metabolic disorders, cardiovascular diseases, and various other conditions (15). Studies have examined the impact of antibiotics on the microbiota throughout an individual's lifespan, revealing effects such as reduced microbial diversity, the facilitation of new bacterial colonisation driven by antibiotic resistance, increased vulnerability to infections, and suppression of the immune system (16,17). Strategies to prevent or minimise this damage include addressing the widespread and excessive use of antibiotics (18). In this regard, raising awareness and providing education about antibiotic use, focusing on activating the body's own defence mechanisms, is of utmost importance in developing medical strategies.

METHODS

Objective

This study was conducted to determine the knowledge level of university students about rational antibiotic use.

Research Questions

1. What is the frequency of antibiotic use among university students?
2. What is the level of knowledge among students regarding the effects of unnecessary and incorrect antibiotic use on the body's microbiota?

Population and Sample

The population of the study consisted of all students at a private university in İstanbul from November to December 2019. To determine the sample size, it was decided to include the entire population rather than selecting a specific sample. A total of 145 students voluntarily participated in the study after being informed about it. The inclusion criteria for participation were being a legal adult, having no visual or auditory impairments that would prevent completing the forms, and voluntarily agreeing to participate in the study.

Data Collection Form

Data were collected using a form developed by the researchers, consisting of three sections with 28 questions (4, 19, 20). The first section included six questions regarding the demographic characteristics of the students (age, gender, field of study, grade level, place of residence, and health insurance status). The second section, titled "Questions on Rational Antibiotic Use" contained 16 questions related to the student's history and current use of antibiotics, reasons for use, instances of non-prescription antibiotic use, whether they read the leaflet of the medication, adherence to



prescribed timings, reasons for non-adherence, attention to specific aspects when using antibiotics, and the timing of discontinuing antibiotic use. The third section comprised six questions assessing the student's level of knowledge regarding the "Effects of Antibiotics on the Microbiota."

Statistical Analysis

Statistical analyses were performed using SPSS version 25. The normality of the variables was assessed using the Shapiro-Wilk test. For quantitative variables with normal distribution, the Student's t-test was employed for comparisons between groups, while the Mann-Whitney U test was used for non-normally distributed variables. Qualitative variable comparisons were conducted using the Chi-Square test, Continuity Correction, and Fisher's Exact Chi-Square test. Statistical significance was set at $p < 0.05$.

Ethical Aspects of The Research

Ethical approval for this study was obtained from the Clinical Research Ethics Committee of a Training and Research Hospital in Istanbul and the university's ethics committee (2011-KAEK-50). Necessary institutional permissions were secured from the private university where the research was conducted. Before data collection, students who volunteered to participate were provided with comprehensive information regarding the study, and their questions were addressed by the informed consent principle. Both verbal and written consent was obtained from the participants using an informed consent form, ensuring that ethical standards were upheld throughout the research process.

RESULTS

The average age of the students participating in the study was 21.10 ± 1.56 years. Of the participants, 71.7% were female, and the majority, 38.6%, were enrolled in Health Sciences. Final-year students accounted for 18.6% of the sample, and 79.3% of the students reported having health insurance (Table 1).

An analysis of the students' antibiotic use revealed that 71% had prior knowledge about antibiotics, with the most common source of information being school (33.8%). A significant majority (91.7%) reported previous antibiotic use, with 53.8% having used antibiotics within the past month. Additionally, 99.3% had used other medications alongside antibiotics, among which 54.5% were analgesics.

Regarding antibiotic usage habits, 72.4% of the students reported reading the medication leaflet, 35.9% stopped using antibiotics once their symptoms improved, and 79.3% ensured they took the medication on time. Forgetfulness was cited as

Table 1. Demographic characteristics of students (N:145)

		Mean \pm SD (min-max)	
Age		21.10 \pm 1.56 (18-26)	
		n	%
Gender	Female	104	71.7
	Male	41	28.3
Faculty	Health Science	56	38.6
	Vocational School	30	20.7
	Science and Letters	20	13.8
	Communication	8	5.5
	Foreign Language	9	6.2
Class	Engineering	22	15.2
	1st Year	35	24.1
	2nd Year	42	29.0
	3rd Year	41	28.3
Health Insurance	4th Year	27	18.6
	There is	115	79.3
	There isn't	30	20.7

the most frequent reason (53.1%) for not adhering to timely antibiotic administration (Table 2).

It was found that 59.3% of the students did not know the meaning of the term "microbiota," 55.9% were unaware of the relationship between microbiota content and antibiotic use, and did not know whether antibiotic treatment causes permanent changes to microbiota. Additionally, 53.8% were not informed about the effects of repeated antibiotic use on microbiota. Only 5.5% of the students indicated that antibiotic treatment affected the microbiota, 73.1% were unaware that the microbiota required time to recover after antibiotic treatment, and 51.8% did not know whether the effects of antibiotic treatment on the microbiota varied among individuals (Table 3).

Among the students, 82% from the School of Health Sciences, 50% from the Faculty of Engineering and Natural Sciences, and 75% from the Faculty of Communication had previously received information about antibiotic use. In contrast, 66.7% of the students from the School of Foreign Languages reported not having received any information on the topic (Table 4).

DISCUSSION

This study was designed to assess university students' knowledge regarding rational antibiotic use. The findings of this study were in close agreement with those reported in the existing literature.

In the study conducted by Ercan and Biçer in 2019, it was observed that as individuals' educational levels

increased, there were positive developments in rational drug use behaviours. It can be concluded that the undergraduate students who participated in this study generally demonstrated a good level of knowledge regarding

rational antibiotic use. When examining the sources of information about antibiotic use among the students in this study, 33.8% reported receiving education from their school, while 28.9% obtained information from social media and other

Table 2. General information about students' antibiotic use (N:145)

		n	%
Have you received information about antibiotic use before?	Yes	103	71.0
	No	42	29.0
Source of information (n:103)	Family	9	6.2
	School	49	33.8
	Social media	16	11.0
	Friends	3	2.1
	Other	26	17.9
	Yes	133	91.7
	No	12	8.3
Have you used antibiotics before?	Yes	76	52.4
	No	69	47.6
Have you used antibiotics in the past month?	Upper Respiratory Tract Infection (URTI)	27	18.6
	Urinary Tract Infection (UTI)	6	4.1
	Acute Sinusitis	10	6.9
	Dental issues	13	9.0
	Other	20	13.8
Reason for use in the past month	Yes	144	99.3
	No	1	0.7
Did you take other medications with antibiotics?	Pain reliever	79	54.5
	Fever reducer	43	29.7
	Vitamin	8	5.5
	Other	6	4.1
Other medications taken with	Yes	105	72.4
	No	40	27.6
Do you read the leaflet?	Doctor's recommendation	62	42.8
	When the symptoms decrease	52	35.9
	When the package is finished	31	21.4
When do you stop taking antibiotics?	Yes	115	79.3
	No	30	20.7
Do you take antibiotics on time?	Forgetfulness	77	53.1
	Neglect	10	6.9
	Dislike of the medication	17	11.7
	Belief that you have recovered	19	13.1
	Take when you feel it is necessary	22	15.2
	Time intervals	85	58.6
	Hunger/fullness status	52	35.8
Reason for not taking on time	Expiration date	37	25.5
	Dosage	31	21.3
	Interaction with the food	13	8.9
	Interaction with alcohol	9	6.2

Table 3. Students' knowledge levels about microbiota and the antibiotic-microbiota relationship (N:145)

		n	%
I know what microbiota mean.	Yes	59	40.7
	No	86	59.3
One of the main factors that changes the microbiota is antibiotics.	True	63	43.4
	False	1	0.7
	Uninformed	81	55.9
The organisms affected in the microbiota due to antibiotic treatment vary from person to person.	True	72	49.7
	False	5	3.4
	Uninformed	68	46.9
Antibiotic treatment can cause permanent changes and diseases in the microbiota.	True	58	40.0
	False	6	4.1
	Uninformed	81	55.9
Repeated use of antibiotics can make the microbiota resistant to antibiotics.	True	78	53.8
	False	4	2.8
	Uninformed	63	43.4
It takes months for the microbiota to recover after antibiotic treatment.	True	32	22.1
	False	7	4.8
	Uninformed	106	73.1
Antibiotic treatment has no effect on the microbiota content.	True	8	5.5
	False	61	42.1
	Uninformed	76	52.4
The microbiota content immediately once improves the antibiotic treatment was finished.	True	9	6.2
	False	50	34.5
	Uninformed	86	59.3
The organisms affected in the microbiota due to antibiotic treatment are the same for everyone.	True	6	4.1
	False	64	44.1
	Uninformed	75	51.8

Table 4. Data on the comparison of antibiotic use information based on the students' field of study

Field of Study	Receiving information about antibiotic use			
	Knows		Does not Know	
	n	%	n	%
School of Health Science	46	82.1	10	17.9
Vocational School	20	66.7	10	33.3
Faculty of Science and Letters	10	50.0	10	50.0
Faculty of Communication	6	75.0	2	25.0
Foreign Language	3	33.3	6	66.7
Engineering	11	50.0	11	50.0
	X ² =15.914 p=0.007			

A statistically significant difference was found between the students' field of study and their receipt of information about antibiotic use (p=0,007).

sources. Although the sources from which students obtained information varied, 72.4% of the students indicated that they read the medication leaflet when using antibiotics. In a similar study by Akman in 2021, the three most used sources

for obtaining information by students in health programs were identified as 47.1% family and friends, 46.6% medication leaflets, and 45.4% the internet. Shahpawee et al. (2020) reported that 81% of students received information about



antibiotic use from healthcare professionals. In a similar study conducted by Kocyigit et al. in 2020 involving medical students, one-third of the students stopped using antibiotics when their symptoms improved, which is comparable to the 35.9% of students in this study who discontinued antibiotic use upon symptom reduction. Given the similarity in these proportions, it appears that university students in this age group, regardless of their field of study, exhibit similar habits regarding the discontinuation of antibiotic use.

When examining the general knowledge of the university students included in the study regarding rational antibiotic use, it can be stated that the students possess a level of knowledge and have developed attitudes consistent with the principles of rational antibiotic use. However, a significant portion of students lack knowledge about the principles of rational antibiotic use and exhibit antibiotic usage behaviours that could be considered hazardous. Büyüker (2020) conducted a study with nursing students and found that the majority did not adhere to the principles of rational antibiotic use, highlighting significant educational needs in this area. This aligns with the findings of the present study, in which slightly more than 50% of the students demonstrated partial adherence by focusing on only one fundamental aspect of rational antibiotic use. These results indicate that university students' adherence to the recommended practices remains suboptimal. Soysal and Şahin (2020) performed a similar study with university students and reported that although most students complied with physicians' recommendations regarding antibiotic use, they failed to adhere to five out of six necessary precautions. In contrast, the current study observed that 57.3% of students discontinued antibiotic use without consulting a physician. This discrepancy may be attributed to differences in the accessibility and standards of healthcare institutions available to the respective study populations despite other similarities between the groups. Supporting these findings, Uçman and Uysal (2021) conducted research with adult participants and reported significant parallels between adults' rational drug use behaviours and the rational antibiotic use behaviours observed in university students in this study. However, adults exhibited a higher level of awareness regarding rational antibiotic use, likely due to previous negative experiences with improper antibiotic practices. Age and experience play critical roles in shaping behaviours and awareness related to rational antibiotic use. The results of this study underscore the crucial need for targeted educational interventions to improve adherence to rational antibiotic use principles, particularly among university students. This population may not have had firsthand experience of the consequences of improper use.

Closing these educational gaps is essential for fostering more rational antibiotic use, reducing the risks associated with misuse, and ultimately improving public health outcomes.

Regarding the students' knowledge of the microbiota and the relationship between antibiotics and the microbiota, it was found that most students did not respond to over 50% of the nine questions posed. Specifically, 59.3% of participants did not even know what the term "microbiota" meant, making it unsurprising that they were also unaware of the relationship between antibiotics and the microbiota. However, an analysis of the responses indicates that a significant proportion of students may hold the belief that antibiotic use exerts some influence on the microbiota.

A comparison of the students' habits of obtaining information about antibiotic use with their field of study revealed significant differences ($p < 0.05$). Students in the field of Health Sciences had the highest rate of obtaining information about antibiotic use, at 82%. Khan et al. (2013) found that 92.8% of students in the health field consulted a doctor before using antibiotics. Furthermore, Cikes et al. (2020) reported that 71.6% of students receiving education in their native language and 87% of students receiving education in English in the health field indicated a continuous need for education on antibiotic use.

CONCLUSION

The findings of this study indicate that although a significant proportion of students paid attention to various aspects of rational antibiotic use, some lacked sufficient knowledge in this area. This raises concerns as these students are likely to assume influential roles in multiple sector post-graduation, potentially impacting community antibiotic practices. To address these issues, undergraduate curricula should include training on rational drug use, specifically focusing on antibiotics. Additionally, increasing academic staff awareness and incorporating topics such as the antibiotic-microbiota relationship and antibiotic resistance into educational programs could provide long-term benefits in combating antibiotic-resistant microorganisms. These initiatives are crucial to foster informed future professionals who can contribute to the control of antibiotic resistance.

Limitations

The sample for this study was confined to students enrolled at a university in Istanbul. Furthermore, given that the number of participants may be inadequate to represent the entire university population, it is anticipated that additional research will be necessary to generalise the findings.



Ethics Committee Approval: Ethical approval for this study was obtained from the Clinical Research Ethics Committee of a Training and Research Hospital in Istanbul and the university's ethics committee (2011-KAEK-50).

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