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Pharmacy students' knowledge and attitudes towards antibiotic use: A cross-sectional study

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ABSTRACT: Antibiotics are the most common and most used drug group in the world. Misuse and overuse of antibiotics has led to the emergence of antibiotic resistance, infections that are difficult to treat and have a high mortality rate may occur, the length of hospital stay, and health expenses may increase, as well as drug side effects and interactions increases. In this context, rational use of antibiotics and informing public has a great importance for the world. In this study, we aimed to reveal insights about the knowledge and attitudes of future healthcare professionals, pharmacy students, towards antibiotic use. The mean age of the participants in this study was 21.65±2.37 and 78.7% of participants were female. The participants' total mean score from Antibiotic Use Scale was 36.05 ± 11.17 while the score of attitudes subdimension was 19.27 ± 7.54; subjective norm was 9.97 ± 3.14 and intention was 6.81 ± 3.47. In this study we evaluated the pharmacy students' knowledge and attitudes towards antibiotic use and identified factors that negatively affect rational antibiotic use. The findings of this study contribute to our understanding of the complex dynamics surrounding antibiotic use. This was a cross-sectional study conducted among pharmacy students. The data was collected with the help of Volunteer Data Form and Antibiotic Use Scale via google forms.

KEYWORDS: Antibiotics; rational antibiotic use; pharmacy students; rational drug use.

1. INTRODUCTION

Antibiotic resistance refers to a decrease in effectiveness of an antimicrobial drug in curing a disease or condition. A microorganism is called as multidrug-resistant when it is resistant to multiple antimicrobials [1]. Antibiotic resistance in pathogenic organisms has become a global problem, with significant consequences for the cure and prevention of infectious diseases [2]. WHO has identified Antimicrobial Resistance as one of ten major threats to global health [3]. The phenomenon is mostly caused by the increased use and abuse of antibiotics in human health, agriculture, and veterinary care. Antibiotic resistance is alarmingly rising for bacteria that either cause hospital-acquired infections or infections that spread through the population [2].

Turkey ranked first among Organization for Economic Co-operation and Development (OECD) nations in terms of specified daily antibiotic dose consumption in 2015 with a percentage of 41.1 (OECD average 20.5) [4]. However, as a result of the studies initiated within the scope of popularizing the rational use of antibiotics and to raise awareness about antibiotic consumption under the leadership of the Ministry of Health, antibiotic consumption in Turkey, which was 42.28 units per thousand people in 2011, decreased to 24.39 units in 2020 and Turkey is no longer at the top of the list [5].

The process of propitiously prescribing and delivering medicines to the appropriate patient for the diagnosis, prevention, and treatment of ailments is named as rational drug use [6]. Patients must receive medications that seem to be appropriate for their clinical needs, in doses that suitable for their own clinical needs, for a sufficient amount of time, and at the lowest possible cost for them and their community [7]. Since physicians are responsible for making diagnoses and writing prescriptions, they are one of the most responsible people on the rational drug use. On the other hand, giving information about the drugs and double checking the prescription are pharmacists' liability. Thus, pharmacists play a significant part in rational use of drugs [8]. It is possible to say that drugs are not always used rationally and that irrational drug use is a common public health problem in our country and in the World [9]. The World Health Organization (WHO) estimates that more than half of all medicines are prescribed and distributed improperly, and that more than half of the patients do not take their medications correctly [10].

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Informing patients and their families, and providing patient counseling are some of the responsibilities of healthcare professionals [11-13]. Training for healthcare professionals is one of the intervention strategies which should be used to improve rational drug use [14]. Health members' educational levels should be raised, and training programs linked to the topic should be updated. The eleventh development plan of the Republic of Turkey includes raising, monitoring, and evaluating rational drug use awareness [15].
University students, particularly pharmacy students, are the future providers of antibiotics. Therefore, understanding their knowledge and attitudes in relation to antibiotic usage can greatly impact antibiotic-related issues [16, 17]. Since the knowledge and attitudes of pharmacy students regarding the use of antibiotics will affect the health of their patients and therefore the public, we believe that it will be beneficial to detect and complete during undergraduate education if there is any missing point regarding rational drug use. In this study, we aimed to evaluate the knowledge and attitudes of the students of the faculty of pharmacy, regarding the use of antibiotics.

2. RESULTS

A total of 183 individuals were recruited into the study with the mean age 21.65±2.37. 78.7% of the participants were female and 54.6% of the participants had a relative working in the field of health (Table 1).

Table 1. Sociodemographic characteristics of participants

Variables		Mean	SD[a]
	Age (year)	21.65	2.37
		Number (n[b])	**Percentage (%)**
Gender	**Female**	155	78.7
	Male	39	21.3
Class	**Prep school**	1	0.5
	1	31	16.9
	2	28	15.3
	3	55	30.1
	4	30	16.4
	5	38	20.8
Have a relative working in the field of health	**Yes**	100	54.6
	No	83	45.4
Using antibiotic in the last year	**Yes**	109	59.6
	No	74	40.4
Receiving training (except school) regarding antibiotic usage	**Yes**	98	53.6
	No	85	46.4

[a] SD: Standart deviation
[b]n: Number of participants

Approximately all of the participants declared that in case of they have cold or flu, they will not accept their friend's antibiotic offer. 90.1% of the participants declared that they don't believe that taking antibiotic is always helpful. 83.6% of the participants stated that they don't recommend those who have flu and common cold, to use antibiotics. Participants' answers to Antibiotic Use Scale is presented on Table 2 and the scores they got from sub-dimensions are shown on Table 3.

Table 2. Distribution of participants' answers to Antibiotic Use Scale

Question number	(1) Strongly disagree n[a] (%)	(2) Disagree n (%)	(3) Undecided n (%)	(4) Agree n (%)	(5) Strongly agree n (%)	p[b] value

1. Whenever I am sick, I cannot recover without antibiotics.	115 (62.8)	40 (21.9)	19 (10.4)	7 (3.8)	2 (1.1)	.000
2. I recommend those who have flu and common cold, to use antibiotics.	108 (59)	45 (24.6)	25 (13.7)	4 (2.2)	1 (0.5)	.000
3. I believe that it will be beneficial to use antibiotics every time I get sick.	145 (79.2)	18 (9.8)	13 (7.1)	7 (3.8)	0 (0)	.000
4. I feel more comfortable when I take antibiotics.	85 (46.4)	37 (20.2)	31 (16.9)	25 (13.7)	5 (2.7)	.000
5. If my friend gives antibiotics in case of any cold and flu, I will accept her/him offer.	154 (84.2)	14 (7.7)	9 (4.9)	2 (1.1)	4 (2.2)	.000
6. I save the remaining antibiotics for future reuse.	88 (48.1)	13 (7.1)	40 (21.9)	26 (14.2)	16 (8.7)	.000
7. Getting sick makes me very unhappy, I want to use antibiotics to get better as soon as possible.	109 (59.6)	37 (20.2)	23 (12.6)	11 (6)	3 (1.6)	.000
8. Like some people in the community, I believe that taking antibiotics is always helpful.	132 (72.1)	33 (18)	14 (7.7)	4 (2.2)	0 (0)	.000
9. The thought that I will recover faster when I use antibiotics relieves me.	77 (42.1)	38 (20.8)	31 (16.9)	32 (17.5)	5 (2.7)	.000
10. I see no harm in using the antibiotic given by the pharmacist.	27 (14.8)	28 (15.3)	42 (23)	49 (26.8)	37 (20.2)	.049
11. After using, I keep the antibiotics left at home for reuse.	72 (39.3)	21 (11.5)	36 (19.7)	32 (17.5)	22 (12)	.000
12. Like the people around me (my family/friends, etc.), I believe that it is not possible to get	134 (73.2)	30 (16.4)	14 (7.7)	3 (1.6)	2 (1.1)	.000

well without taking antibiotics in cases such as colds and flu.						
13. I always think that the use of antibiotics in cases such as common cold will speed up the recovery.	113 (61.7)	28 (15.3)	24 (13.1)	15 (8.2)	3 (1.6)	.000
14. I don't see any harm in using antibiotics on recommendation without consulting a doctor.	150 (82)	18 (9.8)	11 (6)	1 (0.5)	3 (1.6)	.000
15. I believe that I will recover sooner when I use antibiotics.	67 (36.6)	39 (21.3)	36 (19.7)	29 (15.8)	12 (6.6)	.000
16. My parents think that it is right for me to use antibiotics to recover from colds and flu.	71 (38.8)	47 (25.7)	32 (17.5)	25 (13.7)	8 (4.4)	.000
17. When I have similar complaints, I do not hesitate to use the antibiotic I used before without a prescription.	94 (51.4)	34 (18.6)	20 (10.9)	29 (15.8)	6 (3.3)	.000
18. I do not see any harm in using antibiotics if my acquaintances, such as family/friends, whom I trust in health, recommend it.	101 (55.2)	33 (18)	15 (8.2)	24 (13.1)	10 (5.5)	.000
19. I believe I will suffer less when I take antibiotics.	88 (48.1)	46 (25.1)	32 (17.5)	12 (6.6)	5 (2.7)	.000

[a]n: Number of participants
[b]Analyzed with the one-factor chi-square test

Table 1. Antibiotic use scale score distribution

Sub dimensions	Score ± SD
1) Attitude	19.27 ± 7.54
2) Subjective Norm	9.97 ± 3.14
3) Intention	6.81 ± 3.47
Total Score	36.05 ± 11.17

SD: Standart deviation

There was no statistically significant difference between the total score of participants regarding their class or having a relative working in the field of health. On the other hand female participants scored significantly better than male participants on the antibiotic use scale ($p<0.005$) (Table 4).

Table 4: Score distribution of antibiotic use scale based on variables

Variables		Total Score ± SD[a]	p[b]
Gender	Female	34.85±10.27	
	Male	40.46±13.25	0.005
Class	Prep school	37.00	
	1	36.97±12.78	
	2	32.68±10.68	
	3	38.53±11.88	0.271
	4	34.13±7.49	
	5	35.68±11.28	
Have a relative working in the field of health	Having a relative working in the field of health	34.55±10.98	0.099
	Not having a relative working in the field of health	37.29±11.23	
Receiving training (except school) regarding antibiotic usage	Receiving training	35.33±10.51	0.349
	Not receiving training	36.88±11.90	

[a]SD: Standart deviation
[b]t test in independent samples, one-way analysis of variance was performed to compare by class.

3. DISCUSSION

Earlier studies have emphasized the significance of education and training of healthcare professionals and students [18, 19]. The education and training about rational antibiotic use during undergraduate education have a positive impact on the attitude and behavior regarding the use of antibiotics [20]. In this study, 53.6% (n=98) of the participants stated that they received training on antibiotic use outside of school. According to a study conducted with 640 medicine students, participants were asked the same question that whether they had received training on rational drug use. It was determined that 80.78% of the students did not receive education [21]. Even though the rate of participants receiving training is much higher in our study, no significant difference was found between the total scores of the participants who received training on the use of antibiotics and those who did not. When we compared the total score of participants according to their grade, no significant difference was found too. On the other hand the total score of participants according to their grade and education status were relatively good. This might be because of the basic education they received at the faculty.

In many studies conducted with university students in various countries, it was seen that self-starting antibiotics is a very common problem all over the World [22-27]. In this study, 19.1% of the participants stated that when they have similar complaints, they do not hesitate to use the antibiotic they used before. Even though this rate is high, the rate of self-starting antibiotics is much higher in other studies. It was found that the rate of self-initiation of antibiotics among the medical students in China was 27% [25]. In another study, it was found that 45% of Italian medical students self-started antibiotics [28]. In a study conducted in Pakistan, it was determined that 60% of pharmacy students started antibiotics on their own [29].

In this study, more than half of the participants, (59.6%) claimed to have taken antibiotics in the last year. In parallel with this study, a study conducted in North India, 57.6% of the medicine students were found to have used antibiotics in the last year [30]. In contrast, according to a study with medicine students in Saudi Arabia, it was found that nearly all students (97.2%) used antibiotics in the last year [31]. In our study, 32% of the participants (n=59) used antibiotics two or more times in the last year. In the study of Núñez et al., it was seen that 70% of university students who used antibiotics in the last year used antibiotics two or more times [22]. In our study, 2.1% of the participants indicated that they don't see any harm in using antibiotics on recommendation without consulting a doctor. In a study conducted by Şantaş et al, it was discovered that 42.4% of the participants were taking medication on suggest [32]. In another study, 32.1% of the participants took into consideration of the drugs suggested by non-physicians [33]. According to mentioned data, when compared to other studies it was determined that there is more emphasis placed on following a physician's advice among the participants in our study.

18.1% of the participants declared that their parents think that it is right for them to use antibiotics to recover from colds and flu. However only 2.7% of the participants believe that it is not possible to get well without taking antibiotics in cases such as colds and flu and recommend antibiotic usage to those who have flu and common cold. 90.1% of the study participants don't believe that taking antibiotics is always helpful and 91.8% of the participants don't agree using antibiotics on recommendation without consulting a doctor. These findings are important in terms of revealing the effect of pharmacy faculty students' knowledge on their attitudes and their differences from other people in the society.

This study has some limitations. Firstly, due to time constraints, we were able to carry out this study with the pharmacy faculty students of a single university and we were not able to reach all students of the pharmacy faculty. Secondly, due to this study only includes students of a single university, we couldn't compare our results with the students from another university. Thirdly, there was a Covid-19 pandemic at the time this study was conducted, the pandemic may also have an impact on individuals' attitudes on antibiotic use.

4. CONCLUSION

In conclusion, this study has explored pharmacy students' knowledge and attitudes towards antibiotic use and provided a deeper understanding of the underlying reasons behind individuals' attitudes towards antibiotics and uncovered personal beliefs, experiences, and perspectives that shape antibiotic use behaviors. Pharmacy students have demonstrated a good awareness of the use of antibiotics, but they can reach a much better level with the completion of their deficiencies. Education campaigns targeting both the general public and healthcare professionals, coupled with interventions that address socio-cultural influences, can promote rational antibiotic use and mitigate the development of antibiotic resistance. Moving forward, further research is needed to explore and develop the long-term effectiveness of interventions aimed at changing individuals' attitudes and behaviors towards antibiotic use.

5. MATERIALS AND METHODS

5.1. Study design

This cross-sectional study was carried out between 01/10/2022 and 01/01/2023 with the students of the pharmacy faculty of a university. Before conducting the study, participants were informed about the goal and the procedure of the research, and they were guaranteed of anonymity. After the participants who met the criteria for inclusion and agreed to participate in the study, have read and approved the informed consent form. The questionnaires were administered via google forms. Only one survey was administered to each participant. The sample size of the study was calculated to include at least 80 students, with a 95% confidence interval and ±10% precision.

Inclusion criteria:

- University students over the age of 18 who agreed to participate in the study..

Exclusion criteria:

- University students under the age of 18.
- Individuals who declined to participate in the study.

5.2. Data collection

A questionnaire consisting of two parts were used as a data collection tool. After the participants who met the inclusion criteria and agreed to participate in the study, read the informed consent form and gave their consent via online, the questionnaires were administered via google forms. Each participant was surveyed only once. In the first part of the questionnaire, the participant profile was recorded, and socio-demographic information was collected with the help of "Volunteer Data Form". In this part, age, gender, class information of the participants were obtained. It was also recorded whether or not they have relatives working in the field of health and, if so, the degree of proximity. Participants were also asked whether they had received training on antibiotic use and how many times they had used antibiotics in the last year.

5.2.1. Antibiotic Use Scale

In the second part, the "Antibiotic Use Scale" was applied in order to measure the attitudes, subjective norms and intentions of the participants towards rational antibiotic use. This scale consists of 19 questions with 3 sub-dimensions (attitude, subjective norm, intention). Questions numbered 1, 2, 3, 4, 7, 8, 9, 12, 13, 15 and 19 are belong to attitude dimension. Questions numbered 5, 10, 14, 16 and 18 are belong to subjective norm dimension, which are related to social pressure, encouragement, or support for antibiotic use. Questions numbered 6, 11 and 17 are belong to intention subdimension, which are related to agreed intention to use antibiotics.

Antibiotic Use Scale is a Likert-type instrument. All of the statements are evaluated by coding from 1 to 5. In the scale, "strongly disagree" is evaluated as 1 point, "disagree" 2 points, "undecided" 3 points, "agree" 4 points, and "strongly agree" 5 points. Respondents to the scale can get a maximum of 95 points from the scale, while the lowest score can be 19. There is an inverse relationship between getting a high score on the scale and consciousness. High scores on the sub-dimensions mean that their attitudes, subjective norms, and intentions are at their highest. Expressions do not require true/false or reverse coding.

Antibiotic Use Scale was developed by Assistant Professor Ali Derya Atik and Assistant Professor Yakup Doğan and its validity and reliability have been proven by the researchers [34]. Permission was taken from the researchers to use the scale.

5.3. Data Analysis

Analyses were conducted using the IBM SPSS Statistics V22.0 (IBM, Armonk, New York, USA). All data were considered statistically significant at p-value<0.05 and 95% confidence interval. In the analysis of the data, first of all, descriptive statistics and frequency distributions of the variables were examined. Mean and standard deviation from descriptive statistics were used for the scores of the participants from the Antibiotic Use Scale. Categorical data were analyzed using frequency and percentage distributions. t-test was used in independent samples to compare the scores of the participants from the antibiotic use scale according to the variables of gender, having a close relative with a healthcare professional, and receiving antibiotic training, and one-way analysis of variance was performed to compare according to class.

5.4. Ethical consideration

This study was evaluated at the Acıbadem Mehmet Ali Aydınlar University and Acıbadem Healthcare Institutions Medical Research Ethics Commitee meeting and approvement was provided with the decision numbered 2022-14/18. The study was conducted in accordance with the institutional research committee's ethical standards and the principles of the 2008 Helsinki Declaration.

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