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Assessments of Students' Numeracy Knowledge Levels in Health Literacy and Their Knowledge, Attitude, and Behavior Regarding Antibiotic Use

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Abstract

Objectives: Rational antibiotic use (RAU), which is examined under the heading of rational drug use, draws an important road map in the prevention of antibiotic resistance development, which is a global problem that threatens future generations. It was aimed to evaluate the factors that determine the antibiotic use behaviors of students and the level of numeracy knowledge in health literacy, which is effective in reducing unnecessary or incorrect antibiotic use.

Methods: In the study, in which 212 students voluntarily participated, a questionnaire consisting of questions was used, in which socio-demographic characteristics, knowledge, attitudes, and behaviors related to antibiotic use were examined, as well as the level of numerical knowledge in health literacy.

Results: It was found that the average age of participants was 20.33±2.50, and 53.8% were females. It was determined that 77.4% of the participants preferred to go to the doctor when they had any health problems, and the most common reason for using antibiotics was fever (51.4%). The answer given for the "disease that requires antibiotic use" question was bacterial infections with 64.6%. Participants' numeracy level in health literacy was questioned with six different questions, and their average score was determined to 8.1±2.0. It was determined that the highest numeracy knowledge level score among the departments belonged to the students of the anesthesia and first and emergency departments. Moreover, it was found that the numeracy knowledge level score in health literacy for females was higher than that of males.

Conclusion: It has been determined that students studying in health sciences have sufficient knowledge about RAU and numeracy, but they do not have an excellent level of knowledge yet despite being health students. It is believed that the regulation of the " rational antibiotic use" course, which is included in the education curriculum, will be effective in solving this problem.

Keywords: Rational Antibiotic Use, University Student, Antibiotic Resistance, Numeracy in Health Literacy

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INTRODUCTION

Antibiotic resistance is an urgent global public health threat that killed at least 1.27 million people worldwide and was associated with nearly 5 million deaths in 2019, according to CDC reports. Globally, antibiotic and antifungal use is increasing, especially in low- and middle-income countries, as antibiotics become accessible and affordable. Given that global human consumption of antibiotics increased by 65% between 2000 and 2015, antibiotic consumption is projected to increase by 200% worldwide between 2015 and 2030 (1). In recent years, the global "One Health" movement has captured the attention of the entire world. In societies that are not aware of ‘’One Health’’, antibiotic resistance ratios are much higher (2). The irrational use of antibiotics due to the type of antibiotic supply, the reason for antibiotic use, and errors in the frequency of use lead to antibiotic resistance (3). It is reported that antibiotic resistance caused by inappropriate antibiotic consumption will threaten the lives of 10 million people worldwide by 2050 (4, 5). As microorganisms become resistant to anti-infective agents and drugs, available treatment options decrease in parallel with this situation. Infection is caused by resistant microorganisms that threaten human and animal health and cause prolonged disease processes, long-term hospitalization, and an increase in cost, morbidity, and mortality ratios (6, 7). Studies have reported that approximately 50% of all prescribed drugs are antibiotics (7, 8). The right attitude, adequate knowledge, and appropriate use of antibiotics are key components in the fight against antibiotic resistance. It is the responsibility of health authorities, the pharmaceutical industry, and all health professionals to find solutions to the antimicrobial resistance caused by the irrational use of antibiotics.

The frequency of antibiotic use is generally higher in outpatient treatment rather than in hospitalization. High ratios of resistance to antibiotics used in the treatment of common bacterial infections such as sexually transmitted infections, especially urinary tract infections, have been observed worldwide. For example, it has been reported that the rate of resistance to ciprofloxacin used in the treatment of urinary tract infections ranges from 8.4% to 92.9% for Escherichia coli and between 4.1% and 79.4% for Klebsiella pneumoniae (9). For this reason, the ratios of described resistant bacteria are reported to be higher than they should be (10,11). The idea that the use of antibiotics is a panacea despite little harm increases and even popularizes the inappropriate use of antibiotics by individuals, especially in developing countries. Although the biggest reason for the increase in antimicrobial resistance is the public's self-administration of antibiotics, the tendency of doctors to prescribe antibiotics for viral infections and/or the tendency of

pharmacists to sell antibiotics without a prescription also have a significant effect on the increase of antimicrobial resistance (12). Whereas, adherence to the drug regimen is essential to increase treatment efficacy and reduce the antimicrobial resistance ratio. The most common problem related to adherence to treatment is that individuals miscalculate the time to take the medications or do not take the medication on time. The compliance ratio of patients with the treatment regimens planned for them is reported to be 50%, including in developed countries (13, 14).

Ratios of self-medication are alarmingly high, especially in developing countries (15). Although there is no report describing the antimicrobial resistance ratio throughout the country in Turkish Republic of Northern Cyprus (TRNC), it was reported that the resistance ratio determined between 2010 and 2014 in a private hospital was lower than in other developing countries (16). Studies conducted in Middle Eastern countries report that irrational antibiotic use by students due to a lack of knowledge, attitude, and practice negatively affects the fight against antibiotic resistance (17-21). TRNC is a more developing country than the Middle East but does not have an administrative policy regarding antibiotic resistance. As emphasized in the results of the study evaluating the over-the-counter antibiotic sales of community pharmacists in TRNC, individuals can easily buy antibiotics without a prescription from any pharmacy (22).

Health literacy has a positive and significant effect on an individual's ability to cope with diseases and maintain their health status. There is a correlation between the increase in health literacy and less use of emergency care services, better general health, appropriate medication use, and better label reading of labels (23). In addition to reading and writing skills, individuals need basic math skills and an understanding of numbers needed to construct meaning in text, tables, or charts. In health literacy, one of the important parameters is numerical information about health. Basic computation and mathematics, namely numeracy, affect the individual's decision-making in health behaviors and accordingly the perception of the risks and benefits of the results (24). The use of antibiotics requires skills from problem-solving to decision-making, prospectus reading, and numeracy literacy. The inadequacy in knowledge of numeracy in the field of health affects the quality of communication with the physician negatively, as well as being an obstacle for the individual to manage himself (24, 25). Regarding infections, health literacy and the availability of numeracy tools are limited. Therefore, antimicrobial resistance ratios result from events that begin with self-treatment and eventually lead to antimicrobial resistance.

Raising the awareness of society, which is seen as a potential consumer, can only be achieved by increasing the knowledge of antimicrobial resistance with effective education and communication, and reducing the tendency of unnecessary antibiotic use. The current study, it was aimed to evaluate the factors that determine the antibiotic use behaviors of students and to evaluate the level of numeracy knowledge in health literacy, which is effective in reducing unnecessary or incorrect antibiotic use.

METHODS

Participants

At the beginning of the questionnaire form presented in our study, in which participation was based on volunteerism, the participants were informed about the purpose and content of the research. A total of 212 students voluntarily participated in our sample group, which consisted of 2nd-year students studying at a vocational school of health services at a private university. After obtaining the necessary permissions from the Near East University Scientific Research Ethics Committee (Appro. No. 74-935/2019), a questionnaire was conducted on the participants between December 1 and 30, 2019. After giving verbal information and signing the consent form by the participants, a questionnaire was applied to the students. The research was a questionnaire to evaluate the knowledge, attitudes, and behaviors of the 2nd-year vocational school of health services students in a private university regarding antibiotic use and their numerac skills related to health literacy.

Study Design

The questionnaire was adapted and developed through a literature review (26). Cronbach's coefficient for the current study result was 0.77. The questionnaire was composed of 5 sections: (a) socio-demographic characteristics; (b) ways of needing and obtaining antibiotics; (c) reasons for and frequency of antibiotic use; (d) antibiotic use information; and (e) knowledge levels of numeracy in health literacy. Knowledge levels of numeracy in health literacy of the participant was evaluated with a total of six questions using the parameters given in Table 1 (24). Scoring for each answer given to 6 questions in which the level of numeracy knowledge in health literacy of the student was questioned was as follows: the answers were "correct=2 points", "false, and left blank expression=0 points". The total score ranged from 0 (min) to 12 (max). A 9-12-point range represented an excellent level of numeracy knowledge in health literacy. The participants were asked whether they had received training on antibiotic use before and were asked to evaluate their level of knowledge on the subject according to their own statements. According to their own statements, their level of knowledge on antibiotic use was evaluated by using the Quintette Likert Scale from very poor (1) to excellent (5).

Table 1. The questions asked and the parameters evaluated in the calculation of the average level of general knowledge about numeracy knowledge in health literacy of the students participating in the research (n=212)

Evaluated parameters	Questions
risk percentage calculation	If 2 out of 10 people have a chance of getting a cold, what would be the risk of getting a cold?
duration of antibiotic treatment	Your doctor prescribed you an antibiotic for 7 days, you started taking the medication on the 1 October, when is your last day for taking the medication?
frequency of antibiotic use	Your doctor gives you an antibiotic and tells you to take it every 6 h. If you take your first tablet at 12 a.m., when do you take your next pill?
total daily dose calculation	If you take an antibiotic (625 mg) 2 times per day, how many total mg of antibiotics would you take in two days?
ratio conversion	If your antibiotic mixture contains 200 mg of medication per 2.5 ml. How many mg of medication is in a 50 ml bottle?
individual dose calculation	If your medicine bottle says the concentration is 10 mg/ml and your dose is 500 mg. How many ml should you take per dose?

Study Limitations

The research was limited to Vocational School of Health Services students aged 18 and over who resided in TRNC and agreed to participate in the research. The research was carried out in a certain time period.

Statistical Analysis

Descriptive and comparative statistical data were analyzed using the Statistical Package for the Social Sciences Program (SPSS; Ver. 24.0, free edition) (IBM Corp.; Armonk, NY, USA). Kolmogorov Smirnov and Shapiro Wilk tests were used to verify if the data conforms to a normal distribution. One-Way Anova and/or Kruskal-Wallis H tests were used to compare the relationship between the participants' socio-demographic characteristics and knowledge, attitude, behavior about antibiotic use, medical adherence and knowledge levels of numeracy in health literacy. The statistical significance value was taken as $p < 0.05$ in the analysis.

RESULTS

According to socio-demographic data, the average age of students was 20.33 ± 2.50. 53.8% (n = 114) of the participants were female, 97.6% were single (n = 207), and 41.5% (n = 88) lived in the dormitory. There were students in 23 different education programs at the vocational school of health services. It was determined that most of the questionnaire was taken from the department of first and emergency aid (42.9%; n = 91) (Table 2).

When the participants were asked whether they needed antibiotic use by themselves in the presence of any disease, 20.8% (n=44) stated that they needed "antibiotic use". When the participant students were asked what they do when they have health problems, 77.4% said they would "see a doctor". When asked how they provided the antibiotic when needed, 85.4% (n = 164) stated demanding antibiotics from a doctor (Table 3). Students stated that they used antibiotics most frequently in the presence of bacterial infections (63.2%) and fever as clinical findings (49.5%). The ratio of those who answered the question "How many times did you go to the doctor in the last year" as "once" was 34.4%, and the ratio of those who

have not been prescribed antibiotics after the doctor's examination was 47.2% (Table 3).

Table 2. Socio-demographic features of students participating in the research (n=212)

Characteristics		n	%
Age	18-20	138	65.1
	21-23	43	20.3
	24-26	27	12.7
	26^{+}	4	1.9
Gender	Female	114	53.8
	Male	98	46.2
Marital Status	Married	5	2.4
	Single	207	97.6
Place of residence	Dormitory	88	41.6
	House (Housemates)	66	31.1
	House (Family)	45	21.2
	House (Alone)	13	6.1
Nationality	Turkey	167	78.8
	TRNC	45	21.2
Healthcare personnel in family	Yes	57	26.9
	No	155	73.1
Departments	ODH, ORS, BDT, CDL, HDT, MWT, PST, ENT, WHS, LVH, AUT, OPT, OPO, PLT, PRF, RTT, MDS, MLR, ECT	77*	36.3
	Medical Imaging Technician	10	4.7
	Physiotherapy Technician	11	5.2
	First and Emergency Aid	91	42.9
	Anesthesia Technician	23	10.9

TRNC: Turkish Republic of Northern Cyprus *Departments with less than 10 participating students. ODH: Oral and Dental Health Support Personnel, ORS: Operating Room Services, BDT: Biomedical Device Technology, CDL: Child Development, and Learning HDT: Hemodialysis Technician, MWT: Midwifery, PST: Pharmacy Services, ENT: Electro-neurophysiology Technician, WHS: Worker Health and Safety, LVH: Laborant and Veterinary Health, AUT: Audiometry Technician, OPT: Optician, OPO: Orthopedic Prosthesis and Orthotics, PLT: Pathology Laboratory Technician, PRF: Perfusion Technician, RTP: Radiotherapy Technician, MDS: Medical Documentation and Secretarial, MLT: Medical Laboratory Technician, ECT: Elderly Care Technician

The knowledge, attitudes, and behaviors of the students regarding antibiotic use were questioned under the following headings: their reading habits of the prospectus, antibiotic intake method, duration of antibiotic use, and storage conditions. The percentage of students who read the instructions before using the antibiotic is 78.8%, and the ratio of participants who preferred to eat some food before taking the drug during antibiotic use was 84.9%. When the students were questioned about how long they used the prescribed antibiotic, 45.2% replied that they continued to use the drug until the symptoms of the disease disappeared. “Do you know enough about the storage conditions of antibiotics that do not require special storage conditions?” Although 81.6% of the students answered the question as sufficient, only 47.6% of the students stated that they store antibiotics at room temperature (Table 4).

Table 3. Behaviors related to antibiotic use, ways of providing antibiotics, Reasons and frequency of use of antibiotics of students participating in the study (n=212)

		Yes n (%)	No n (%)
Do you use antibiotics on your own when you have any health problems?		44 (20.8)	168 (79.2)
What do you do when you have any health problems?	See a doctor	164 (77.4)	48 (22.6)
	No specific treatment	39 (18.4)	173 (81.6)
	Self-medicated	9 (4.2)	203 (95.8)
How do you provide antibiotics?	left at home	12 (5.7)	200 (94.3)
	from friend	1 (0.5)	211 (99.5)
	from the pharmacy after being prescribed by a doctor	181 (85.4)	31 (14.6)
	pharmacy without prescription	2 (0.9)	210 (99.1)
Reason		**n**	**%**
Infections types	Viral	71	33.5
	Bacterial	134	63.2
	Parasitic	7	3.3
Symptoms	Pain	62	29.3
	Nausea/diarrhea	45	21.2
	Fever	105	49.5
Frequency		**n**	**%**
Seeing a doctor	Never	67	31.6
	1	73	34.4
	2	35	16.5
	> 2	37	17.5
Antibiotic prescription by a doctor	Never	100	47.2
	1	66	31.2
	2	23	10.8
	> 2	23	10.8

Table 4. Students' knowledge, attitudes, and behaviors about antibiotic use (n=212)

Antibiotics use	**n (%)**			
Reading prospectus	Yes 167 (78.8)	No 45 (21.2)		
Antibiotic intake method	before eating 22 (10.4)	while eating 4 (1.9)	after eating 180 (84.9)	doesn't matter 6 (2.8)
Duration of antibiotic use	until the box is finished 33 (15.6)	duration of prescribing 83 (39.2)	until the symptoms disappear 96 (45.2)	
Storage conditions	refrigerator 72 (34.0)	room temperature 101 (47.6)	dark place 39 (18.4)	

When the relationship between gender and independent variables was examined; it was determined that there was a significant difference between gender and self-use of antibiotics at home, obtaining antibiotics from the pharmacy after the doctor's prescription,

frequency of visiting a doctor in the previous year, prospectus reading habits, and eating before antibiotic intake (Table 5, $p<0.05$).

There was no significant difference between gender and duration of antibiotic use, storage conditions, and the reason for antibiotic use. When the relationship between the residence of the students and the frequency of the doctor's prescription of antibiotics was examined, a significant difference was found. According to this difference, the frequency of being prescribed antibiotics by doctors for the students living in the dormitory was significantly higher than the students living in other places ($p<0.05$). A significant difference was found between the place of residence of the students and the frequency of prescribing antibiotics by the doctor. It was determined that there was a significant difference between the "presence of health personnel in the family" data and the antibiotic intake duration of the participants. It has been determined that the ratio of use of the prescribed antibiotic during the prescribed duration among students who have health personnel in their families was significantly higher than that of those who do not have health personnel in their families ($p<0.05$).

Table 5. Dependent variables affected by gender, residence place, and having a health professional in the family.

Gender n (%)				**Female**	**Male**	**p**
Frequency of doctor visits	Never			26 (12.2)	43 (20.3)	**0.010***
	1			40 (18.9)	33 (15.5)	0.830
	2			18 (8.5)	15 (7.1)	0.916
	> 2			30 (14.2)	7 (3.3)	**0.000***
Prospectus reading	Yes			96 (45.3)	71 (33.5)	**0.037***
	No			18 (8.5)	27 (12.7)	**0.040***
antibiotic intake method	After eating			104 (48.8)	77 (36.3)	**0.017***
	Before eating			6 (3.0)	16 (7.6)	**0.020***
	While eating			2(1.0)	2 (0.9)	0.113
	Doesn't matter			2(1.0)	3 (1.4)	0.096
Place of residence n (%)		**Family**	**Dormitory**	**Housemates**	**Alone**	**p**
Frequency of doctor's prescription of antibiotic	Never	20 (9.4)	40 (18.9)	29 (13.7)	11 (5.2)	**0.045***
	1	14 (6.6)	28 (13.2)	22 (10.4)	2 (0.9)	0.071
	2	9 (4.3)	9 (4.2)	5 (2.3)	-	0.211
	> 2	2 (0.9)	11 (5.2)	10 (4.7)	-	0.062
Symptoms	Pain	8 (3.7)	29 (13.6)	23 (10.8)	2 (0.9)	0.053
	Diarrhea	10 (4.7)	19 (9.0)	15 (7.1)	1 (0.5)	0.074
	Fever	27 (12.7)	40 (18.9)	28 (13.2)	10 (4.7)	**0.044***
Healthcare personnel in the family n (%)				**Yes**	**No**	**p**
Antibiotic intake duration	until symptoms disappear			33 (15.6)	63 (29.7)	**0.009***
	until box is finished			9 (4.2)	24 (11.3)	0.183
	during the prescription			15 (7.1)	68 (32.1)	**0.012***

*, $p < 0.05$ and **, $p < 0.01$

Table 6. Comparison between the general knowledge level average score about numeracy knowledge in health literacy against socio-demographic data of the students participating in the study

Features	n	%	Av. Score ± SD	Min	Max	p
Gender						
Female	114	53.8	8.8 ± 2.0	4	14	0.021*
Male	98	46.2	7.5 ± 2.1	2	14	
Age						
18-20	138	65.1	7.2 ± 1.0	2	14	0.084
21-23	43	20.3	7.4 ± 2.1	4	14	
24-26	27	12.7	8.3 ± 1.1	4	14	
26+	4	1.9	8.1 ± 1.2	4	14	
Marital Status						
Married	5	2.4	7.5 ± 1.0	4	14	0.74
Single	207	97.6	7.4 ± 1.3	2	14	
Place of residence						
Dormitory	88	41.5	8.1 ± 1.0[a]	4	14	0.037*
House (Housemates)	66	31.1	7.1 ± 1.2 [a]	4	14	
House (Family)	45	21.2	7.8 ± 1.1 [a]	2	14	
House (Alone)	13	6.1	6.5 ± 1.4[b]	4	14	
Nationality						
Turkey	167	78.8	7.7 ± 2.3	4	14	0.81
TRNC	45	21.2	7.5 ± 2.1	2	14	
Healthcare personnel in family						
Yes	57	26.9	7.8 ± 1.4	4	14	0.78
No	155	73.1	7.7 ± 1.3	2	14	
Department						
ODH, ORS, BDT, CDL, HDT, MWT, PST, ENT, WHS, LVH, AUT, OPT, OPO, PLT, PRF, RTT, MDS, MLR, ECT	77*	36.3	6.9 ± 1.3 [a]	2	12	
Medical Imaging Technician	10	4.7	7.1 ± 1.2 [a]	4	14	
Physiotherapy Technician	11	5.2	7.3 ± 1.1 [a]	4	14	
First and Emergency Aid	91	42.9	8.7 ± 1.3 [b]	6	14	0.003**
Anesthesia Technician	23	10.9	9.2 ± 1.6 [b]	6	14	0.002**

*, $p < 0.05$ and **, $p < 0.01$

None of the students who self-evaluated their knowledge of antibiotic use rated their knowledge level as excellent. It was determined that the average score of knowledge level regarding antibiotic use, which was evaluated with a five-point Likert scale, was moderate for 70.7% of the students (Figure 1).

The mean scores of numeracy knowledge level in health literacy of the students were determined to be 8.1 ± 2.0. According to this score, it was determined that the numeracy in health literacy skills of the health services vocational school students was good. When the students' numeracy knowledge levels in health literacy were evaluated according to gender, it was determined that the mean score of female students was significantly higher than that of male students ($p < 0.05$; Table 6). When the

numeracy knowledge levels in health literacy of students were evaluated according to age groups, marital status, nationality, or the presence of healthcare personnel in their family, no statistically significant difference. When the numeracy knowledge levels in health literacy of students were evaluated according to their place of residence, a significant difference was found. It has been determined that the numeracy knowledge levels in health literacy of the students who live alone at home are lower than those who live in the dormitory, with a roommate, or with their family ($p < 0.05$). In our study, the relationship between the departments of the students in the vocational school of health services and their numeracy knowledge levels in health literacy was also evaluated. It was determined that the numeracy knowledge levels in health literacy of the students of the anesthesia technician and first and emergency aid departments were higher than the students of other departments participating in the research ($p < 0.01$).

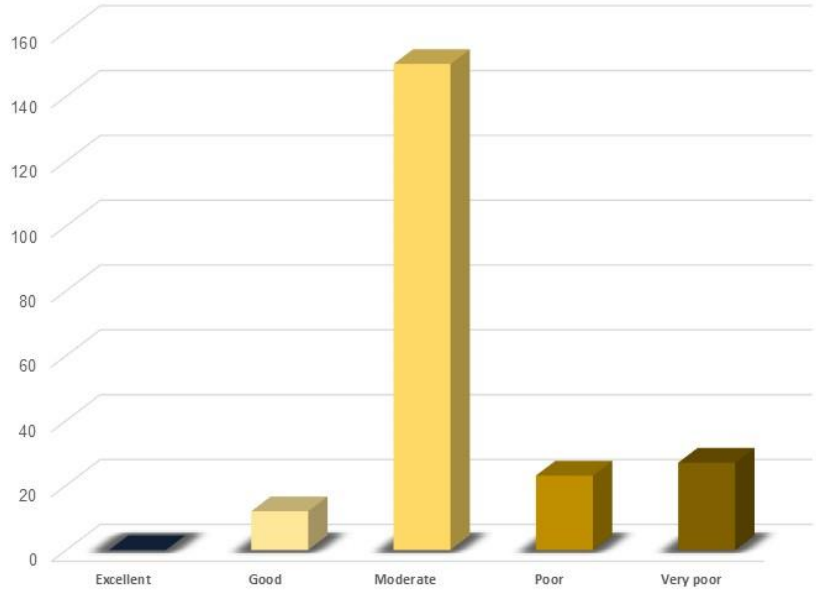

Figure 1. Students' self-assessed knowledge level of antibiotic use

DISCUSSION

In this study; the way of providing antibiotics, reason and frequency of use, and antibiotic use information (habit of reading the prospectus, taking an antibiotic when hungry or full, the duration to continue the antibiotic, and storage conditions) were investigated. The findings suggest gender, place of residence, and

having healthcare personnel in the family affected participants' knowledge, attributes, and behaviors about the usage of antibiotics. The most intensive participation in the study, based on volunteering, was provided by first and emergency aid (42.9%) and anesthesia technician department (10.8%) students. Moreover, it was determined that the highest knowledge score about numeracy in health literacy belonged to the students of these two departments. The reason why students studying in these departments both have higher participation and knowledge scores can be attributed to the fact that they received more training on drugs in accordance with the education curriculum in order to be authorized to use drugs, and thus their awareness increased.

In a study conducted among students studying in health sciences and non-health fields, it was determined that 36.1% of students studying in health sciences used self-medication in case of illness (27). According to the results we obtained, 77.4% of the students consult a doctor in the presence of a health problem, while 18.4% try to overcome their health problem without using medication. Our results, as found in the literature, determined that the ratio of self-medication was lower than expected and in line with the education received by our participant group. Our results, in a way, emphasize that the general health status of the individual is an important issue for the participants in the study.

The sources from which individuals obtain information about the antibiotics they use differ from country to country. One out of every three Europeans gets the information from their doctor, and 10% get it from their pharmacist. In Sweden, 98% of respondents to the questionnaire said that they took antibiotics with their doctor's prescription, while in Greece this rate was only 79% (28). Other studies emphasize that most people use drugs without consulting a doctor, and the most commonly used drugs are painkillers and antibiotics (29, 30). In our results, it was determined that the rate of using prescription antibiotics under the supervision of a doctor (85.4%) was higher than the rate of self-use of antibiotics. The fact that students participating in the study stated that they do not need antibiotics at a ratio of 79.2% when they encounter any health problem. The results can be considered evidence that the awareness of inappropriate antibiotic use has increased due to their education and that the expectation of the doctor to prescribe antibiotics has decreased. Below this positive result; public service announcements made by health authorities and restrictions on the over-the-counter sale of antibiotics (31).

A study reported that 35.6% of university students expected antibiotics to be prescribed for viral upper respiratory tract infections such as colds and flu. In the same study, they

emphasized that 77.8% of the students knew the role of antibiotics in the treatment of bacterial infections, but only 27.4% knew that antibiotics were not for viral infections (32). In our study, bacterial infections were determined as the type of disease requiring antibiotics at a ratio of 63.2%. In the definition of disease requiring antibiotic use, the ratio of students reporting viral infections was 33.5%. Considering the increase in the frequency of bacterial infections in parallel with the weakening of the immune system due to viral infections, our results were compatible with the literature. In our study, it was determined that the most common reason for antibiotic use was 'fever' with 49.5%. In the results of the research conducted with families, it was determined that the primary reason for starting antibiotics for the children of parents was fever (33). In similar studies, it has been found that the ratio of those who use antibiotics without the need for doctor control in viral infections such as the flu and cold was quite high (34).

The fact that the universe chosen for our research consisted of students and that 41.5% of the students stayed in dormitories can be explained as the reason for going to the doctor once last year. 47.2% of the students who went to the doctor in the previous year were not prescribed antibiotics, and 31.2% of the students have prescribed antibiotics once. In the study conducted in the TRNC, it was determined that pharmacists sell antibiotics without a prescription at a ratio of 41.5%.20 According to the data in our study, the low frequency of prescribing antibiotics confirms that antibiotics have ceased to be miracle drugs and that the attitudes and behaviors of all stakeholders on this subject have changed rationally.

Thanks to the developing technology, in our age where the speed of access to information is very high but information pollution on every subject is quite intense, patients can easily access information about the drugs they use. A study reported that as age increases, the frequency of obtaining information from physicians and pharmacists about drug use increases, but the frequency of reading/learning instructions for drug use decreases. As a result of the same research, it was determined that there was not a significant difference between the age groups of individuals and the status of regular drug prospectus reading depending on the presence of chronic disease (30). The fact that the rate of reading the prospectus of the students participating in the research is high (78.8%) suggests that this may be due to the fact that they are healthcare professionals despite their young average age. The information on whether to take antibiotics on an empty stomach or on a full stomach is not fully settled among the public. In this regard, the responsibility of all health professionals, especially physicians, and pharmacists, comes to the fore. It is of great importance to convey

the usage information or the points that need attention according to the drug properties to the patients, especially during the delivery of the drug to the patient. 84.9% of the students stated that they had a habit of eating before using antibiotics. With such a habit, the risk of drug-food interactions and/or delay in emptying stomach contents due to antibiotic use can be avoided.

The statement given by 45.3% of the participants regarding the duration of antibiotic use, which will contribute to the formation of antibiotic resistance, is that “they use the antibiotic given to them until the symptoms disappear”. Among the different answers, the ratio of participants stating that "it continues during the prescription", which is the ideal usage period, was 39.1%. Although these two ratios obtained from our results were close to each other, they were lower than the ratio (70%) of students who stated that they were "continuing during the prescription" as a result of the study conducted by Mete et al., (35). Kaya et al. found that 62.2% of the participants stopped using the drug when the symptoms of the disease disappeared, 25.7% changed the drug dose and 18.2% did not use the drug on time (36). While the results of the study conducted on the duration of antibiotic use emphasize the lack of general knowledge in this regard, the results of the current studies in the literature differ considerably from each other. When the responses given to the suggestions about the treatment were evaluated, it was determined that 10.4% of the patients used the antibiotic when they remembered, and 76.9% used it at the same time every day. RAU is an important point in the development of positive behaviors regarding antibiotic use. With the ratio of 76.9% obtained from our research, it is possible to say that the students received the necessary information from the doctor about the use of antibiotics after the examination and that they followed the antibiotic usage instructions given to them by the pharmacists while supplying their medicines.

Attention to the storage conditions of the drugs after opening the lid during use; in some cases, is important for drugs that lose their properties even in a short time such as the duration of treatment. Another responsibility of the health personnel is to warn the patients about the subject during drug supply and to provide the necessary information. In the study of Güngör et al., parents stated that they kept the antibiotics prescribed to their children in the refrigerator at a ratio of 59.5% (37). In our study results, it was stated that our students had stored antibiotics at room temperature with a ratio of 47.6%. In the study carried out by Sorensen et al., in Belgium, it was found that 1/3 of the participants hid the drugs under inappropriate conditions (38). It can be assumed that our students don't yet know enough about this topic because our findings don't entirely overlap with the literature.

In terms of antibiotic use of knowledge, attitudes, and behaviors of the participants; there was a statistically significant difference in the presence of gender, residence, and family health personnel. The effect of gender differences on the results is thought to be that the social responsibilities of females cause them to be more careful and detailed. The effect of students whose residence place is a dormitory on the results; in order to continue their education without interruption by taking their own responsibilities, they are more attentive to their general health status than other students. The fact that the presence of health personnel in the family has a meaningful effect on the results is thought to be an indication that the transfer of some known errors on the subject from parents to children is still continuing. Our results were consistent with the results of the study by Çelik et al. (39). It was determined that the level of knowledge of our students studying in the field of health, such as diseases that require antibiotic use, discrimination of symptoms, compliance with antibiotic treatment, and storage conditions, is not lower than the current literature data.

Studies on the level of numeracy knowledge in health literacy have generally been conducted on chronic diseases, and the number of studies evaluating the use of antibiotics and numeracy knowledge levels in health literacy in acute diseases is very limited. Our findings showed that the numeracy knowledge level of health services school students was good but not excellent. This negative result, which we encounter even in health students with middle and high education levels, can be considered a reflection of the fact that the situation can be worrying in individuals with standard education. As a result of a study, it was emphasized that the ratio of parents who believe that antibiotics will cure all kinds of viral, bacterial, and fungal infections is almost half of the individuals included in the study (40). Parents especially have problems giving the appropriate dose of liquid medicines to their children (41). Hasan et al. stated that there is a relationship between numeracy knowledge in health literacy and antibiotic resistance and side effects (24). It is also suggested that numeracy skills show parallelism with the patient's age, education level, and socioeconomic characteristics (42). Although the sample of our study consisted of second-year students studying in the field of health, no perfect positive relationship was found between education level and health literacy numerical knowledge level. However, 14.7% of the students scored above 9 points. This result highlights the fact that it is not easy to manipulate the numeracy level of health literacy knowledge of patients with adequate health literacy and education.

CONCLUSION

It is known that health literacy education for health professionals has the potential to

improve patient outcomes. Health literacy is an indicator of how individuals use their skills and even process health information according to demands. The main purpose is to improve communication between the patient and the healthcare professionals and to restore the health of the individual who requests healthcare services. Therefore, health literacy, which is the main guideline of the education programs of health professionals, should focus on reading, writing, and numeracy. It has been determined that students studying in the health sciences have sufficient knowledge about rational drug use and numeracy in health literacy, but they do not have an excellent level of knowledge yet despite being health students. It would be beneficial to organize the "rational antibiotic use" course in the education curriculum and to include courses that will improve students' numerical skills.

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