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Public Knowledge, Attitudes and Practices Regarding Antibiotic Use and Resistance in Türkiye: A Cross-Sectional Survey

Türkiye'de Antibiyotik Kullanımı ve Direncine İlişkin Halkın Bilgi, Tutum ve Uygulamaları: Kesitsel Bir Araştırma

Bensu KARAHALİL[1](İD), Aslınur ALBAYRAK[2](İD), Hasan Selçuk ÖZGER[3](İD)

[1] Department of Pharmaceutical Toxicology, Gazi University Faculty of Pharmacy, Ankara, Türkiye
[2] Department of Clinical Pharmacy, Süleyman Demirel University Faculty of Pharmacy, Isparta, Türkiye
[3] Department of Infectious Diseases, Gazi University Faculty of Medicine, Ankara, Türkiye

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ABSTRACT

Introduction: *Antimicrobial resistance is common due to inappropriate and overuse of antimicrobial agents. This study aimed to evaluate the knowledge, attitudes, and practices of the public about antibiotic use and resistance in Türkiye.*

Materials and Methods: *In this study, a cross-sectional study design was used for a population-based survey. An online survey was conducted from June to September 2021.*

Results: *937 people (87.5%) responded to the questionnaire. About half of the respondents answered correctly that amoxicillin was an antibiotic and ibuprofen was not an antibiotic. 31.8% of the respondents considered that antibiotics were effective against viruses. Most of the respondents (88.2%) disagreed with the idea that they would not be happy if the physician did not prescribe antibiotics. 63.7% of the respondents declared that they never stopped using antibiotics when they believed they were cured.*

Conclusion: *The study shows that the participants have a good attitude towards antibiotic use and resistance despite the lack of knowledge and practices.*

Key Words: *Antibiotic use; Bacterial resistance; Knowledge; Attitudes; Practices*

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ÖZ

Türkiye'de Antibiyotik Kullanımı ve Direncine İlişkin Halkın Bilgi, Tutum ve Uygulamaları: Kesitsel Bir Araştırma

Bensu KARAHALİL[1], Aslınur ALBAYRAK[2], HASAN SELÇUK ÖZGER[3]

[1] Gazi Üniversitesi Eczacılık Fakültesi, Farmasötik Toksikoloji Anabilim Dalı, Ankara, Türkiye
[2] Süleyman Demirel Üniversitesi Eczacılık Fakültesi, Klinik Eczacılık Anabilim Dalı, Isparta, Türkiye
[3] Gazi Üniversitesi Tıp Fakültesi, İnfeksiyon Hastalıkları Anabilim Dalı, Ankara, Türkiye

Giriş: *Antimikrobiyal ajanların uygunsuz ve aşırı kullanımı nedeniyle antimikrobiyal direnç giderek yaygınlaşmaktadır. Çalışmamızın amacı, Türkiye'de halkın antibiyotik kullanımı ve direnci ile ilgili bilgi, tutum ve uygulamalarını değerlendirmektir.*

Materyal ve Metod: *Bu çalışmada, popülasyon temelli anket için kesitsel çalışma tasarımı kullanılmıştır. Haziran-Eylül 2021 arasında çevrim içi bir anket yapılmıştır.*

Bulgular: *Ankete 937 kişi (%87.5) yanıt vermiştir. Ankete katılanların yaklaşık yarısı, amoksisilinin bir antibiyotik olduğunu ve ibuprofenin bir antibiyotik olmadığını doğru yanıtlamıştır. Ankete katılanların %31.8'i antibiyotiklerin virüslere karşı etkili olduğunu düşünmüştür. Ankete katılanların çoğu (%88.2) hekimin antibiyotik yazmaması durumunda mutlu olmayacakları fikrine katılmamıştır. Ankete katılanların %63.7'si ise iyileştiğine inandıklarında antibiyotik kullanmayı asla bırakmadıklarını belirtmiştir.*

Sonuç: *Araştırmamız, katılımcıların bilgi ve uygulama eksikliğine rağmen antibiyotik kullanımına ve direncine karşı iyi bir tutum içinde olduklarını göstermektedir.*

Anahtar Kelimeler: *Antibiyotik kullanımı; Bakteriyel direnç; Bilgi; Tutumlar; Uygulamalar*

INTRODUCTION

Antibiotics have revolutionized modern medicine as life-saving resources. However, they cause treatment failure due to the tendency of bacteria to develop resistance rapidly[1]. As a result of inappropriate and excessive use of antibiotics, antibiotic resistance is becoming increasingly common. Although this is a global problem, it is a more serious problem, especially for underdeveloped and developing countries[2,3].

Türkiye has one of the highest rates of antibiotic use among countries in the European region that are not affiliated with the European Union[4]. According to the 2015 report of the Organization for Economic Cooperation and Development's (OECD) Health Policy Studies, Türkiye had the highest consumption of antibiotics[5]. Türkiye has two major antimicrobial stewardship programs developed by the Ministry of Health of the Republic of Türkiye. The first was carried out in hospitals and the second was carried out in the community. Antimicrobial stewardship programs targeting the community contain the Rational Drug Use National Action Plan (2014-2017)[5]. On this basis, the measures implemented in Türkiye to restrict antibiotic consumption include monitoring and reporting antibiotic prescribing practices in primary healthcare services, providing training for physicians, pharmacists, and the general public, conducting media activities and publishing various materials, as well as enforcing legal regulations that limit the sale of antibiotics without a prescription[6,7]. Although Türkiye had one of the highest rates of antibiotic use among OECD countries, there has been a substantial reduction in antibiotic consumption, particularly since 2016. The amount of antibiotic consumption in Türkiye decreased from 41.1 defined daily doses per 1000 inhabitants per day (DID) in 2013 to 31.0 DID in 2018[7]. Nevertheless, further research is necessary to evaluate the effectiveness of the National Action Plan in achieving its objectives and to assess antibiotic awareness within the community. Therefore, understanding the knowledge, attitudes, and practices of the public regarding antibiotic use holds significant importance.

Our study aimed to assess the knowledge, attitudes, and practices of the Turkish public

regarding antibiotic use and resistance. Additionally, we sought to investigate the potential correlation between a better understanding, attitudes, practices, and sociodemographic characteristics of the participants.

MATERIALS and METHODS

Study area

The study was conducted in Türkiye, which is divided into seven regions: Central Anatolia, Marmara, Aegean, Black Sea, Southeastern, and Eastern Anatolia. The Marmara, Central Anatolia, and Mediterranean regions are the most populous regions. For the study, one major city was selected from each target region.

Study design and sampling

In our study, a *cross-sectional study design* was used for a *population-based* survey. A convenience sampling technique was adopted. The online survey was conducted from June to September 2021. This study was approved by Gazi University Ethics Committee (approved number and date 2021-508/06.04.2021). The survey was uploaded onto Google Forms. All participants were provided with detailed information about the research before their participation. They were informed that their involvement was completely voluntary, their participation would be kept anonymous, and their data would be treated with strict confidentiality. The Google form used for the survey was configured with the "Limit to 1 response" setting to prevent duplicate responses from participants. The first page of the survey contained information about the research. At the end of this page was the option to either accept or decline to participate in the survey. The survey link was shared electronically via the WhatsApp application. The study included participants who were 18 years of age or older and resided in any city in Türkiye. Only individuals who provided informed consent were included in the study. Healthcare professionals were excluded from the study population.

According to the 2022 data, Türkiye's official population is reported to be 84.680.273[8]. Using the Raosoft sample size calculator, with a 5% margin of error, a 95% confidence interval, and assuming a 50% response rate, the final sample size for the study was determined to be 385[9].

Data collection

A survey was developed based on the United States Agency for International Development module "Antimicrobial resistance module for population-based research" and previous studies[10-13].

The survey was prepared by two pharmacists and an infectious diseases specialist and tested on a sample of 30 people to ensure that the questions were understandable by everyone. The questionnaire consisted of 28 questions in total. The first eight questions focused on gathering demographic information from the respondents. Questions 9-17 were designed to assess the participants' knowledge regarding antibiotics. Questions 18-23 aimed to gauge their attitudes towards antibiotic use. Lastly, questions 24-28 were focused on evaluating the participants' antibiotic usage practices. According to the pre-test results, the questionnaire was found to be understandable therefore, no revisions were made to the final questionnaire. The reliability coefficient of the answers to the questionnaire was calculated using Cronbach's alpha score, which yielded a value of 0.763.

Data Analysis

The data collected in this study were analyzed using IBM SPSS version 20.0 software. Demographic characteristics and answers to the knowledge, attitudes, and practices questions were analyzed using descriptive statistics. All of the variables are categorical, expressed as a percentage. The Chi-square test was used to compare categorical variables.

The knowledge and attitudes of the respondents were assessed using the categories of "Yes" "No" and "Don't know" On the other hand, the questions regarding practices were evaluated using a 5-point Likert scale, which included the options of "Never" "Rarely" "Sometimes" "Often" and "Always". The answers to the knowledge and attitude questions were assigned a score of "1" for the correct answer, while incorrect or unknown answers were given a

score of "0". As for the questions on practices, responses were scored based on the five-point Likert scale, with a value of "1" representing the most suitable answer and "5" indicating the least suitable answer. Respondents who scored above the median were categorized as having "better knowledge" and "more positive attitudes" toward antibiotic use. Conversely, those who scored below the median were considered to have "better practices" in terms of antibiotic use.

A multivariate analysis was conducted using the binary logistic regression test. In this analysis, a logistic regression model was constructed by including variables that had a significance level of $p< 0.2$ in the univariate analysis and variables with a correlation matrix coefficient of less than 0.6. The logistic regression model was built using several variables for different aspects. For the assessment of knowledge, the model included variables such as gender, age, education level, monthly income, last antibiotic use time, and the number of antibiotics used. Regarding attitude, the variables considered were education level, last antibiotic use time, and the number of antibiotics used. As for practice, the model included variables such as gender, region, and education level. Odds ratio with 95% confidence intervals were calculated. The level of significance (α) was set at 0.05 for all statistical tests.

RESULTS

A total of 1070 surveys were distributed, and 937 individuals responded, resulting in a response rate of 87.5%. The socio-demographic characteristics of the respondents are presented in Table 4.

The answers given to the questions about antibiotics and the factors affecting the knowledge of antibiotics were evaluated and compared (Table 1 and Table 4).

Participants who were under the age of 60 years (<60 vs. ≥60, $p< 0.001$), who had a higher education level (<high school vs. ≥high school, $p< 0.001$), had a monthly income level of 5000 TL and above (<5000 TL vs. ≥5000 TL, $p= 0.017$), and had used antibiotics in the last year (<1 year vs. ≥1 year, $p= 0.049$) showed a better level of knowledge.

Attitudes

Antibiotics were prescribed by the physician to 68.5% of the respondents for upper respiratory tract infections, 13.9% for dental infections, 2.9% for gastrointestinal infections and, 5.4% for other infections. The answers of the participants to the questions about attitudes are presented in Table 2. The factors affecting the knowledge of antibiotics were evaluated and compared (Table 4). Higher education level (<high school vs. ≥high school, $p= 0.001$), and not using any antibiotics in the last year (0 vs. ≥1, $p< 0.001$) was associated with a better attitude.

Practices

Respondents learned about antibiotic treatment from their physicians (37.4%), from the patient information brochures (29%), from the pharmacists (13.6%), from the internet (12%), from television (5.5%), and from other HCPs (2.6%). The responses of the participants to the questions regarding their practices were compiled and presented in Table 3. The factors affecting antibiotics practices were evaluated and compared (Table 4). Higher education level (<high school vs. ≥high school, $p= 0.001$) was associated with better attitudes.

Multivariate analysis

Factors that may affect the level of antibiotic knowledge, attitude, and practices were evaluated with logistic regression models and are presented in Table 5.

DISCUSSION

In our study, we assessed individuals' knowledge, attitudes, and practices regarding antibiotic use and resistance in Türkiye. While there is a substantial body of research on this issue globally, there is a paucity of studies on this topic specifically conducted in Türkiye, and the existing studies tend to be regionally focused. In addition, some of the studies evaluate parents' knowledge attitudes, and practices[14-18]. The results of our study showed a good level of attitude although there are some deficiencies in the level of knowledge and practices. The results of our study were generally compatible with previous studies conducted in Türkiye.

Table 1. Responses to questions related to knowledge about antibiotic use

Variables	Item	n (%)
Amoxicillin is an antibiotic.	Yes	474 (50.6)
	No	453 (48.3)
	Don't know.	10 (1.1)
Ibuprofen is an antibiotic.	Yes	95 (10.1)
	No	497 (53)
	Don't know	345 (36.8)
Antibiotics are effective against viruses.	Yes	298 (31.8)
	No	547 (58.4)
	Don't know	92 (9.8)
Antibiotics are often necessary for flu and colds.	Yes	201 (21.5)
	No	692 (73.9)
	Don't know	44 (4.7)
Antibiotics can kill the good bacteria in our body	Yes	770 (82.2)
	No	62 (6.6)
	Don't know	105 (11.2)
Antibiotics do not have any side effects.	Yes	37 (3.9)
	No	835 (89.1)
	Don't know	65 (6.9)
Which one defines antibiotic resistance?	Increased bacterial resistance to antibiotics	409 (43.6)
	Increased body resistance to antibiotics	172 (18.4)
	Decreased body immune system	155 (16.5)
	Don't know	201 (21.5)
Drug-resistant bacteria can be passed from person to person.	Yes	415 (44.3)
	No	224 (23.9)
	Don't know	298 (31.8)
Inappropriate use of antibiotics alters the effectiveness of the treatment.	Yes	793 (84.6)
	No	53 (5.7)
	Don't know	91 (9.7)

There were some deficiencies in the knowledge level of the respondents in the studies conducted[14,15,18]. It was found that as the level of education increased, the level of knowledge also increased[14,15,17,18]. Contrary to previous studies conducted in Türkiye, our study yielded positive results, particularly regarding antibiotic attitudes. For example, in the study by Azap et al.[14], 24% of the participants asked for an antibiotic prescription when they went to the doctor. In the study conducted by Gul et al.[16], it was found that 64% of the participants requested antibiotics from doctors. However, in our study, only 2% of the participants stated

Table 2. Responses to questions related to attitudes towards antibiotic use

Variables	Item	n (%)
Do you pressure your doctor to prescribe antibiotics?	Yes	20 (2.1)
	No	909 (97)
	Don't know	8 (0.9)
Skipping a dose or two of antibiotics does not contribute to antibiotic resistance.	Yes	322 (34.4)
	No	457 (48.8)
	Don't know	158 (16.9)
If the doctor does not prescribe antibiotics, I would go to another one.	Yes	19 (2)
	No	909 (97)
	Don't know	9 (1)
If the doctor didn't prescribe antibiotics, I wouldn't be happy.	Yes	87 (9.3)
	No	826 (88.2)
	Don't know	24 (2.6)
If I take antibiotics when I have a fever, I will recover faster.	Yes	100 (10.7)
	No	753 (80.4)
	Don't know	84 (9)

Table 3. Responses to questions related to practices towards antibiotic use

Variables	Item	n (%)
If I think I am starting to get better, I will stop the antibiotic treatment.	Never	597 (63.7)
	Rarely	193 (20.6)
	Sometimes	72 (7.7)
	Often	27 (2.9)
	Always	48 (5.1)
I save leftover antibiotics for future use.	Never	528 (56.4)
	Rarely	223 (23.8)
	Sometimes	99 (10.6)
	Often	28 (3)
	Always	59 (6.3)
I use antibiotics beforehand to prevent infection.	Never	824 (87.9)
	Rarely	63 (6.7)
	Sometimes	39 (4.2)
	Often	8 (0.9)
	Always	3 (0.3)
Before using the antibiotic, I pay attention to the expiration date.	Never	14 (1.5)
	Rarely	36 (3.8)
	Sometimes	21 (2.2)
	Often	72 (7.7)
	Always	794 (84.7)

Table 4. Responses to questions related to knowledge, attitudes, and practices in relation to antibiotics use

	Knowledge Level			Attitude Level			Practices Level		
Variables	**Less n (%)**	**Better n (%)**	**p**	**Less n (%)**	**Better n (%)**	**p**	**Less n (%)**	**Better n (%)**	**p**
Gender n (%)									
Male 405 (43.2)	129 (55.5)	276 (44.5)	0.001	29 (7.2)	376 (92.8)	0.409	150 (37)	255 (63)	<0.001
Female 532 (56.8)	118 (41.3)	414 (58.7)		31 (5.8)	501 (94.2)		130 (24.4)	402 (75.6)	
Age group n (%)									
18-29 (20.1)	29 (15.4)	159 (84.6)	<0.001	6 (3.2)	182 (96.8)	<0.001	62 (33)	126 (67)	0.027
30-44 (22.1)	51 (24.6)	156 (75.4)		24 (11.6)	183 (88.4)		76 (36.7)	131 (63.3)	
45-59 (31.2)	75 (25.7)	217 (74.3)		10 (3.4)	282 (96.6)		74 (25.3)	218 (74.7)	
≥60 (26.7)	92 (36.8)	158 (63.2)		20 (8)	230 (92)		68 (27.2)	182 (72.8)	
Regional Distribution of Respondents n (%)									
Marmara 181 (19.3)	60 (33.1)	121 (66.9)	0.029	14 (7.7)	167 (92.3)	<0.001	45 (24.9)	136 (75.1)	<0.001
Central Anatolia 280 (29.9)	76 (27.1)	204 (72.9)		13 (4.6)	267 (95.4)		84 (30)	196 (70)	
Black Sea 17 (1.8)	3 (17.6)	14 (82.4)		0 (0)	17 (100)		2 (11.8)	15 (88.2)	
Mediterranean 385 (41.1)	96 (24.9)	289 (75.1)		21 (5.5)	364 (94.5)		104 (27)	281 (73)	
Aegean 39 (4.2)	10 (25.6)	29 (74.4)		1 (2.6)	38 (97.4)		12 (30.8)	27 (69.2)	
Eastern Anatolia 14 (1.5)	2 (14.3)	12 (85.7)		1 (7.1)	13 (92.9)		14 (100)	0 (0)	
Southeastern Anatolia 21 (2.2)	0 (0)	21 (100)		10 (47.6)	11 (52.4)		19 (90.5)	2 (9.5)	
Education level									
Primary school 65 (6.9)	21 (32.3)	44 (67.7)	<0.001	18 (27.7)	47 (72.3)	<0.001	21 (32.3)	44 (67.7)	0.018
Secondary school 76 (8.1)	40 (52.6)	36 (47.4)		0 (0)	76 (100)		10 (13.2)	66 (86.8)	
High school 203 (21.7)	38 (18.7)	165 (81.3)		4 (2)	199 (98)		62 (30.5)	141 (69.5)	
University 497 (53)	128 (25.8)	369 (74.2)		34 (6.8)	463 (93.2)		153 (30.8)	344 (69.8)	
Postgraduate 96 (10.2)	20 (20.8)	76 (79.2)		4 (4.2)	92 (95.8)		34 (35.4)	62 (64.6)	

Table 4. Responses to questions related to knowledge, attitudes, and practices in relation to antibiotics use (continue)

	Knowledge Level			Attitude Level			Practices Level		
Variables	**Less n (%)**	**Better n (%)**	**p**	**Less n (%)**	**Better n (%)**	**p**	**Less n (%)**	**Better n (%)**	**p**
Monthly income n (%)									
≤5000 TL 395 (42.2)	120 (30.4)	275 (69.6)	0.045	21 (5.3)	374 (94.7)	0.310	110 (27.8)	285 (72.2)	0.022
5000-10.000 TL 404 (43.1)	89 (22)	315 (78)		32 (7.9)	372 (92.1)		114 (28.2)	290 (71.8)	
10.000-15.000 TL 94 (10)	28 (29.8)	66 (70.2)		6 (6.4)	88 (93.6)		36 (38.3)	58 (61.7)	
≥15.000 TL 44 (4.7)	10 (22.7)	34 (77.3)		1 (2.3)	43 (97.7)		20 (45.5)	24 (54.5)	
When was the last time you used antibiotics? n (%)									
6 months ago 266 (28.4)	60 (22.6)	206 (77.4)	0.143	11 (4.1)	255 (95.9)	0.188	71 (26.7)	195 (73.3)	0.399
6-12 months ago 94 (10)	22 (23.4)	72 (76.6)		6 (6.4)	88 (93.6)		30 (31.9)	64 (68.1)	
≥1 year ago 577 (61.6)	165 (28.6)	412 (71.4)		43 (7.5)	534 (92.5)		179 (31)	398 (69)	
Number of antibiotics used within last year, n (%)									
0 474 (50.4)	112 (23.6)	362 (76.4)	<0.001	15 (3.2)	459 (96.8)	<0.001	145 (30.6)	329 (69.4)	0.434
1 269 (28.7)	92 (34.2)	177 (65.8)		17 (6.3)	252 (93.7)		74 (27.5)	195 (72.5)	
2 130 (13.9)	36 (27.7)	94 (72.3)		18 (13.8)	112 (86.2)		37 (28.5)	93 (71.5)	
≥3 64 (6.8)	7 (10.9)	57 (89.1)		10 (15.6)	54 (84.4)		24 (37.5)	40 (62.5)	

that they pressured the physician to write a prescription, and only 2% stated that they would seek another physician if their physician did not write a prescription.

About half of the respondents agreed with the statement "Amoxicillin is an antibiotic", which was lower than a study conducted in Bhutan[19] (69.6%) and higher (32.3%) compared to a study conducted in Nepal[11]. In our study, 31.8% of the respondents agreed that antibiotics can be used in the treatment of infections caused by viruses. While this rate was 26.8% in the study conducted in Sweden[20], 35.4% of the respondents in the study conducted in Pakistan[21] and 13.5% in the study conducted in Malaysia[22] did not agree with this statement. 21.5% of the respondents agreed that "Antibiotics are often necessary for flu and colds". It was a lower percentage than the study done in Britain (24%)[23]. In our study, 89.1% of the respondents did not agree with the statement, "Antibiotics do not cause any side effects". This rate was considerably higher than the studies in Malaysia (45.6%)[19,22] and Pakistan (53.5%)[21].

Table 5. Odds ratios (ORs) of having better knowledge, more appropriate attitudes, and better practices in relation to antibiotic use

Variables	Knowledge Level			Attitudes Level			Practices Level		
	OR	95% CI	p	OR	95% CI	p	OR	95 %CI	p
Gender									
Female	2.051	1.442-2.918	<0.001	N/A	N/A	N/A	1.819	1.371-2.413	<0.001
Male	1	1		1	1		1	1	
Age (years)									
<60	1.507	1.071-2.121	0.019	N/A	N/A	N/A	N/A	N/A	N/A
≥60	1	1		1	1		1	1	
Regional Distribution of Respondents									
Mediterra-nean	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Others	1	1		1	1		1	1	
Education level									
≥High school	2.171	1.425-3.307	<0.001	N/A	N/A	N/A	N/A	N/A	N/A
<High school	1	1		1	1		1	1	
Monthly income									
≥5000 TL	1.718	1.232-2.396	0.001	N/A	N/A	N/A	N/A	N/A	N/A
<5000 TL	1	1		1	1		1	1	
When was the last time you used antibiotics?									
<1 year	2.554	1.592-4.096	<0.001	6.977	3.645-13.356	<0.001	N/A	N/A	N/A
≥1 year	1	1		1	1		1	1	
Number of antibiotics used within last year									
0	2.348	1.473-3.744	<0.001	10.623	5.436-20.758	<0.001	N/A	N/A	N/A
≥1	1	1		1	1		1	1	

OR: Odds ratio.
Reference categories: 1 and better or more appropriate
Respondents scoring higher than the median were rated as having "better knowledge", and "more appropriate attitude" and lower than the median having "better practices" about antibiotic use. In these comparisons, those with p <0.2 were included in the model, and those with a correlation matrix coefficient of <0.6 were included.

There was some lack of knowledge about antibiotic resistance. Those who gave the correct answer to the definition of antibiotic resistance constituted 43.6% of the respondents. This rate was quite low compared to studies in developed countries such as Sweden and Britain[20,23]. About half of the respondents did not agree with the statement, "Skipping a dose or two of antibiotics does not contribute to antibiotic resistance." This result was consistent with studies conducted in Nepal and Palestine[11,24].

Numerous studies have addressed patient expectations as a crucial factor for prescribing antibiotics[25-27]. It has also been reported that physicians often prescribe antibiotics under patient pressure, despite their belief that antibiotics are not needed[26]. In our study, the majority of respondents (88.2%) disagreed with the notion that they would be unhappy if the physician did not prescribe antibiotics. Additionally, a significant majority (97%) did not endorse pressuring their doctor to prescribe antibiotics or seeking another physician. These results indicate a high level of trust in physicians among the respondents.

Interestingly, in our study, only 13.6% of the respondents reported learning about antibiotic

treatment from pharmacists, which was even lower than the percentage of those who obtained information from patient information leaflets (29%). In addition, the percentage of pharmacists informing the public about antibiotics was lower than in other studies[21,28]. We believe that the pharmaceutical care practices of pharmacists would greatly contribute to the knowledge, attitudes, and practices of the public regarding antibiotics.

In our study, approximately 56% of the respondents stated that they would never store antibiotics for future use. However, this rate is relatively low, indicating that antibiotics are being shared within the family or with others. Such practices contribute to the misuse of antibiotics. 63% of the respondents in our study indicated that they would never stop using antibiotics if they started to feel better. Although this rate was higher than what has been observed in studies conducted in developing countries, it still highlights certain deficiencies in the practices of respondents regarding antibiotic use[12,22].

Most of the respondents (87.9%) stated that they never used antibiotics to prevent infection, and 84.7% of them stated that they paid attention to the expiration date, which is a positive result compared to other countries[11,12]. These results could potentially be attributed to the positive impacts of the National Rational Drug Use Action Plan, as previous studies have demonstrated that the implementation of such a national action plan leads to a reduction in antibiotic consumption and positively influences antibiotic knowledge, attitudes, and behaviors[29-32].

In our study, as in many other studies, gender, age, education level, and income level are factors associated with the level of knowledge about antibiotic use[11,33-35]. We found that the female gender had better knowledge and attitude about antibiotic use. This was a result consistent with most studies[21,33,36]. But a study in Sweden found the opposite[37]. As in the study of Hernandez et al.[38] we showed that not using antibiotics in the last year also leads to better antibiotic knowledge and attitudes.

In this study, a high response rate of 87.5% was achieved, indicating a strong level of participation. It is noteworthy that there is a limited amount of regional research on this topic in Türkiye. Thus, we consider this study to be a current and valuable contribution that reflects the knowledge, attitudes, and practices of the general public in Türkiye. However, it is important to acknowledge the limitations of this study. One limitation is the non-homogeneous distribution of participants in terms of regional representation and education level. Additionally, we were unable to reach individuals who were illiterate or did not have access to smartphones or the ability to complete the online questionnaire via WhatsApp. This may have limited the representativeness of the study population. However, considering the high literacy rate (97%) and the widespread use of smartphones (96%) according to TÜİK data, we believe that the impact of this limitation on our study results was relatively minimal[39,40]. It is important to acknowledge that the proportion of individuals with a high school education or above was significantly high in our study. This may have potentially led to an increased likelihood of false positive results. Furthermore, we must acknowledge that we lacked information regarding the knowledge, attitudes, and practices of individuals before the implementation of the national rational drug use action plan. Nevertheless, we believe that the continuation of National Action Plans for Rational Drug Use in the future is crucial.

The study reveals that participants exhibit a positive attitude toward antibiotic use and resistance, despite gaps in knowledge and practices. This suggests that the National Action Plan for Rational Drug Use has been successful and should be sustained in the future. It is crucial to continue educating the public, physicians, and pharmacists on antibiotic use and resistance. Additionally, training and sanctions should be implemented not only in primary health care services but also in secondary and tertiary health care settings.

ETHICS COMMITTEE APPROVAL

This study was approved by Gazi University Ethics Committee (Decision no: 2021-508, Date: 06.04.2021).

CONFLICT of INTEREST

The authors have no conflicts of interest to declare that are relevant to the content of this article.

AUTHORSHIP CONTRIBUTIONS

Concept and Design: AA, BK

Analysis/Interpretation: All of authors

Data Collection or Processing: AA, BK

Writing: All of authors

Review and Correction: All of authors

Final Approval: All of authors

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Address for Correspondence/Yazışma Adresi

Dr. Aslınur ALBAYRAK

Süleyman Demirel University Faculty of Pharmacy, Isparta-Türkiye

E-posta: a.albayrak007@gmail.com