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Knowledge and Attitudes Towards Antibiotics Use and an Examination on Patient's Unrealistic Health Symptoms in Turkey

Robab Ahmadian [1]*, Yesim Uncu [2], Ilker Ercan [1], Ozlem Toluk [1]

[1] Department of Biostatistics, Bursa Uludag University, Nilufer, Bursa, TURKEY
[2] Department of Family Medicine, Bursa Uludag University, Nilufer, Bursa, TURKEY
***Corresponding Author:** robabahmadian@outlook.com

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ABSTRACT

Background: This study aimed to assess the attitudes and knowledge of adult individuals about antibiotics. Since in Turkey, antibiotics are not sold without a prescription, it was also investigated whether Turkish people compelled physicians to prescribe antibiotics by showing unrealistic symptoms.

Methods: A self-administered cross-sectional survey involving 1,057 respondents was conducted using a validated questionnaire. The questionnaire was prepared in four sections. The first section included attitude assessment and a five-point Likert scale has collected information. In the second section, knowledge questions examined participants' knowledge about antibiotics with Three-point Likert scale. The third section contained a sensitive question, and using the crosswise model was indirectly asked whether the participant has forced the physician to prescribe an antibiotic. The reliability test results for the attitude scale showed the α-value of Cronbach was 0.767, and KR-21 reliability for the knowledge scale was 0.713. Test-retest reliability coefficients for attitude scale was r=0.697, the coefficients for knowledge scale was r=0.887.

Results: Turkish people's awareness about antibiotics is insufficient but at an acceptable level. The public is aware that antibiotics rapidly develop resistance when used widely and incorrectly. Nevertheless, %17 of them resort to showing unrealistic symptoms to force the physician to prescribe antibiotics.

Conclusion: To conclude, Turkish people's knowledge and attitudes about antibiotics are insufficient but acceptable. However, a noticeable rate of patients resorts to showing unrealistic symptoms to force the physician to prescribe antibiotics.

Keywords: antibiotic misuse, attitudes, crosswise model, public health, public knowledge

INTRODUCTION

The discovery of antibiotics is known as one of the most crucial turning points in human history, and it is an undeniable fact that it has saved millions of lives. However, antibiotic resistance has reduced the clinical effectiveness of antibiotics and has become a major public health concern globally [1,2]. In addition to excessive and inappropriate use of antibiotics, an irrational prescribing by the physician can be counted as the leading cause of antibiotic resistance [3].

According to the national use of antibiotics research in six southern and eastern European countries and regions and seven newly independent states, Turkey had the highest antibiotic consumption in European countries [4]. According to the Ministry of Health Prescription Information System 2016 reports, among the total e-prescriptions of family physicians and other physicians in 2013-2015, the prescription rates containing antibiotics are above 30% [5]. To reduce this rate in February 2003, the Ministry of Health in a national regulation for antibiotic restriction, considered piperacillin/tazobactam, carbapenems, glycopeptides, and ticarcillin/clavulanate as restricted antibiotics that could only be used with the approval of an infectious disease specialist. By comparing before and after the regulation, it has been observed that the use of antibiotics in unrestricted ones is significantly higher than those in restricted antibiotics [6]. Within the scope of this program, public campaigns that prevent inappropriate use of antibiotics were initiated, and in 2015, antibiotic sales without a prescription were prohibited.

As a result, in 2017, the antibiotic prescription rate decreased to 25%; also, a national study was examined patterns of antibiotic use in Turkey between 2001 and 2006 [7]. In this study, a systematic increase in total antibiotic consumption was reported throughout the country. The study reported an increase in total antibiotic sales from 14.62 to 31.36 DDD/1000 inhabitant-days. According to this study, while the most prescribed antibiotics were penicillins, this antibiotic along with cephalosporins, macrolides, and lincosamides, fluoroquinolones, quinolones, and tetracyclines had the highest consumption rates [8]. In another study, the antibiotic use of 422 patients who were hospitalized in Ankara Training and Research Hospital was examined. According to the results of this study, the rate of inappropriate antibiotic use in the hospital, especially in the surgical clinics, was 62% [9]. Also, it was emphasized that excessive antimicrobial prescribing by

physicians to prevent therapeutic failure [10]. The pressure of the patients to take antibiotics for colds and respiratory diseases was also reported to contribute to this problem. Recent researches showed that 49.3% of participants for reasons such as common cold, flu, sore throat, fever, cough, abdominal pain, weakness, urinary burning, and skin infection had been started to antibiotic treatment without consulting a physician [10,11].

Features on physical examination, such as fever, sputum, abnormal respiratory exam, and tonsil exudate, are the main factors in prescribing antibiotics. The patient's request for antibiotics may also be another factor in prescribing behavior. In a study, 38.5% of physicians stated that they refused the patient's request for antibiotics. However, it was observed that physicians working for more than 11 years were affected by the patient's insistence on prescribing antibiotics [12]. Although pressure to the physician for antibiotic prescribing is not discussed in detail, it is clearly seen in the Leblebicioglu et al., research [10]. Therefore, antibiotics have continued to be over-prescribed. As result, while there has been a decrease in the frequency of antibiotic use, it is still one of the most frequently used drug groups. Therefore, the development of resistance to some antibiotics has come to the fore [13].

In Turkey, among the reasons for inappropriate use of antibiotics, besides the patients' lack of awareness, knowledge, and education, lack of awareness of physicians on this issue.

In line with antibiotic awareness in the country as a health policy program, public campaigns that prevent inappropriate use of antibiotics were initiated, and antibiotic sales without a prescription were prohibited.

As mentioned, although the Ministry of Health has launched public campaigns on the inappropriate use of antibiotics, in Donmez et al research was seen clearly that Turkish people continue to take their own antibiotics on the pretext that physicians will prescribe the same drugs [11]. The question at this glance is: Since antibiotics are not sold without a prescription, do the Turkish people force physicians to prescribe antibiotics by showing unrealistic symptoms?

The aim of this study was after evaluating the attitudes and knowledge of adults about antibiotics, to find out the proportion of patients who tried to oblige physicians to prescribe antibiotics by showing unrealistic symptoms.

METHODS

Study Design

The questionnaire was adapted and modified from [14]. It has been translated from English to Turkish, then content validation of the questionnaire was undertaken by family physicians. Aiming to the examination of the scale's reliability, 30 randomly selected subjects participated in a pilot test. The participants were able to understand and respond to the given questionnaire. The reliability testing was also conducted. The reliability test results for the attitude scale showed the α-value of Cronbach was 0.767, and KR-21 reliability for the knowledge scale was 0.713. Test-retest reliability coefficients for attitude scale was r=0.697 (p<0.001), the coefficients for knowledge scale was r=0.887 (p<0.001). As shown in the results, the reliability of the questionnaire was acceptable.

Table 1. Attitude domain questions

Attitude questions
I take antibiotics to help me get better in a common cold.
I expect to prescribe antibiotics by the physician for common colds.
I stop using antibiotics when I begin to feel better.
I give antibiotics to a family member when he/she gets sick.
I normally have antibiotic stocks for emergencies.
I use once prescribed antibiotics, for my current respiratory disorders.
I use antibiotics according to instructions on the label.
I normally look at the expiration date before using antibiotics.

Table 2. Knowledge domain questions

Knowledge questions
Antibiotics are useful for bacterial infections.
Antibiotics can treat viral infections.
Antibiotics can treat cold, flu, and most coughs.
Antibiotics can destroy bacteria that live in the skin and intestines.
Bacteria normally living in skin and intestines are useful for health.
Antibiotics are the same as medications used to relieve pain and fever.
Penicillin is an antibiotic.
Antibiotics can cause allergic reactions.
Antibiotics do not cause side effects.
Excessive use of antibiotics long may cause losing its effectiveness.
Once symptoms have improved, it is correct to stop taking antibiotics.
It is healthier to use fewer antibiotics than prescribed antibiotics.

The questionnaire was prepared in four sections. The first section included eight attitude items. For the attitude assessment, a five-point Likert scale with points as "never", "rarely", "sometimes", "often", and "always" have collected information about the participant's behavior and attitude about antibiotics. The attitude questions asked within the scope of the study are as given in **Table 1**.

The answers given to the attitude scale were scored as (1=strongly disagree; 2=disagree; 3=not sure; 4=agree; and 5=strongly agree). Two questions of the scale were reverse scored. After scoring, the general attitude score was obtained. The score is a continuous value between 8 and 40. While low values were defined as positive attitudes, the high values were determined as negative attitudes.

In the second section, 12 knowledge items were asked. Knowledge questions examined participants' real knowledge about antibiotics with "yes", "no", or "not sure" answers. The knowledge questions asked within the scope of the study are as given in **Table 2**.

In the knowledge questions, 1 point was given for correct answers, and 0 points for selected "not sure" answers and incorrect answers. After scoring, the general knowledge score was obtained. The score is a continuous value ranged between 0 and 12.

As the attitude and knowledge general scores were obtained as continuous values, the correlations between the 5-Likert attitude and the knowledge scale were possible.

The third section contained a sensitive question, and using the crosswise model was indirectly asked whether the participant has forced the physician to prescribe an antibiotic. In the fourth part, participants were asked about their demographic information.

Study Participants and Data Collection

For the sample size in our study at α=0.05 significance level and d=0.0265 margins of error regarding the p=0.25 rate [7] a sample size of 1,057 was determined for the survey.

The survey was held in Bursa city. Bursa is a large city located in northwestern Turkey within the Marmara Region. It is the fourth most populous city in Turkey and one of the most industrialized metropolitan centers in the country. As of 2018, The population of Bursa is 2,994,521.

A restricted stratified random sampling method was used covering the province of Bursa. For the sample size of 1,180, the proportion of each district in the population was calculated, then the sample size was divided into districts proportionally. The representativeness of the sample was ensured by randomization of the subjects divided into districts. Also, the used stratified randomization includes restricting randomization by age and gender to ensure that participants are evenly distributed in the sample. In order to measure the representativeness of the sample, descriptive statistics were obtained to detect statistically significant differences in the study variables according to gender and age, and significance tests were performed accordingly. Being over 18 years old was defined as inclusion criteria. The survey was implicated in between June 2018-July 2019.

In the study 1,180 questionnaires was distributed, 1,152 questionnaires were returned. The response rate was 97.6%. 95 questionnaires of returned questionnaires were incomplete. The final sample included 1,057 questionnaires.

Crosswise Model

In surveys, the crosswise model has developed for sensitive questions in which participants are hesitant to answer directly. In this method, participants receive two items which one of them is a sensitive question, and another one is non-sensitive. The probability of the non-sensitive question is known to the researcher. Participants are asked to select “A” if both items have the same answer (both yes or no), or they are asked to choose “B” if the two items do not have the same answer (one answer is yes, the other is no). Since no one can determine which question the participants answer with yes or no, privacy is protected, the sensitive question was not asked directly. The privacy protection gives the participant the confidence to provide the correct answer.

In this study, the sensitive question asks respondents if they force the physician to prescribe antibiotics with complaining of unrealistic health symptoms. The non-sensitive item asked respondents about their birthday: “Is your birthday in January, February, or March?” The known probability of answering “yes” to the birthday item is 0.25 (i.e., 3 mounts/12 months).

Question 1: Is your birthday in January, February, or March?

Question 2: I make unrealistic health complaints to direct my physician to prescribe antibiotics.

After collecting the answers containing both question answers, the probability of the sensitive item is estimated with the Crosswise model. The prevalence of sensitive question is calculated according to the maximum likelihood estimate [15], as follows:

$$\pi = \frac{\lambda + p - 1}{2p - 1}, \qquad p \neq 0.5$$

With an estimated variance of

$$Var(\pi) = \frac{[\lambda(1-\lambda)]}{[n(2p-1)^2]},$$

Table 3. Sociodemographic characteristics of respondents included in the study (n=1,057)

	n(%) or median(min-max)
Gender	
Male	611 (57.8)
Female	446 (42.2)
Age	35 (18-76)
Male	35 (18-76)
Female	33 (18-71)
Marital status	
Single	403 (38.1)
Married	653 (61.8)
Educational level	
Lower than the high school diploma	113 (10.7)
High school diploma	356 (33.8)
University	585 (55.5)

where π is the probability of the sensitive item and λ is the probability of the respondents answering with A, i.e. both answers are the same.

Ethical Approval

This study was reviewed and approved by the Bursa Uludag University Ethics Committee of Health Sciences Research and Publication (session number: 2018-03) in terms of respecting the autonomy and confidentiality of the participants and being the least damaging observational study.

Statistical Analysis

Shapiro-Wilk test was used to determine whether the data were suitable for normal distribution. Normally distributed variables are summarized by mean±standard deviation and non-normal variables are summarized by median (minimum-maximum). Knowledge, attitude scores, and demographic characteristics were summarized by descriptive statistics. The two independent groups were compared by the Mann-Whitney test. Variables with more than two categories were analyzed by the Kruskal-Wallis test. The Dunn-Bonferroni post hoc test was applied following a significant Kruskal-Wallis test. Spearman’s correlation coefficient was used to examine the relationship between antibiotic knowledge and attitude scores with age. α=0.05 was considered statistically significant in all statistical analyses. Data were analyzed using SPSS® version 20.0.

RESULTS

Sociodemographic Characteristics

A total of 1,057 adults across Bursa city completed all items of the questionnaire. The demographic characteristics of respondents are shown in **Table 3**. 57.8% of the participants were male and 42.2% were female. The median age 33 with a range of (18-71), with no statistically significant difference between men and women. Women and men were homogeneously represented across all age groups. Most of the respondents (56.7%) were at a university level of education.

Knowledge in Antibiotic Use

The information levels of the participants about the knowledge questions are given in **Table 4**. Generally, the knowledge of antibiotics in the Turkish people, who participate in our study, has a median of 7 in the range (0-12). It was found that 58.3% of the participants knew that antibiotics were

Table 4. Descriptive characteristics of knowledge scale questions

Knowledge questions	Informed	Not informed
Antibiotics are useful for bacterial infections.	616 (58.3%)	440 (41.7%)
Antibiotics can treat viral infections.	257 (24.3%)	798 (75.5%)
Antibiotics can treat cold, flu, and most coughs.	416 (39.6%)	634 (60.4%)
Antibiotics can destroy bacteria that live in the skin and intestines.	422 (40.1%)	630 (59.9%)
Bacteria normally living in skin and intestines are useful for health.	516 (49.3%)	530 (50.7%)
Antibiotics are the same as medications used to relieve pain and fever.	674 (64.1%)	378 (35.9%)
Penicillin is an antibiotic.	512 (48.5%)	543 (51.5%)
Antibiotics can cause allergic reactions.	772 (73.2%)	282 (26.7%)
Antibiotics do not cause side effects.	796 (75.8%)	254 (24.2%)
Excessive use of antibiotics long may cause losing its effectiveness.	747 (70.8%)	308 (29.2%)
Once symptoms have improved, it is correct to stop taking antibiotics.	374 (35.5%)	679 (64.5%)
It is healthier to use fewer antibiotics than prescribed antibiotics.	634 (60.0%)	423 (40.0%)

beneficial for bacterial infections. However, only 24.3% of the participants knew that antibiotics could not cure viral infections, which was one of the highest incorrect responses in the knowledge questions. The majority of the participants (70.8%) were aware that over the long term, excessive use of antibiotics could lead to loss of efficacy; however, 64.5% of respondents stated it is correct to stop taking antibiotics when symptoms improved. Finally, in line with the previous question, 40.0% of respondents thought it was healthier to use fewer antibiotics than prescribed.

Comparisons for demographic characteristics with knowledge scale are shown in **Table 5**. Women were significantly more knowledgeable than men (p<0.001). There was no correlation between the women's age and their knowledge about antibiotics, whereas older men were more knowledgeable (p=0.023). It was shown that as the education level increases, information about antibiotics increases both in men and women (p<0.001). Finally, no significant relationship was found between marital status and knowledge questions.

Table 6. Descriptive characteristics of attitude scale questions

Attitude questions	n	Median (min-max)
I take antibiotics to help me get better in a common cold.	1057	1 (1-5)
I expect to prescribe antibiotics by the physician for common colds.	1057	2 (1-5)
I stop using antibiotics when I begin to feel better.	1049	3 (1-5)
I give antibiotics to a family member when he/she gets sick.	1052	1 (1-5)
I normally have antibiotic stocks for emergencies.	1046	1 (1-5)
I use once prescribed antibiotics, for my current respiratory disorders.	1053	1 (1-5)
I use antibiotics according to instructions on the label.	1052	5 (1-5)
I normally look at the expiration date before using antibiotics.	1052	5 (1-5)

*Reverse scoring was used for statements 7 and 8

Attitudes on Antibiotic Use

The median value for the attitude scale was 34 (13-40). Generally, positive attitudes of participants were observed except for statement 3 (**Table 6**). Statement 3 were asked participants if they stop using antibiotics when they begin to feel better; the median point for this statement was 3 (1-5). Comparisons for demographic characteristics with attitude scale are shown in **Table 7**. Women had a significantly positive attitude than men (p<0.001). There was no correlation between women's age and their attitude, whereas older men have more positive attitudes (p=0.005). Again, it was shown that as the education level increases, attitudes about antibiotics were more positive (p<0.001). Finally, there was a significant relationship found between marital status and attitude scale that shows married participants have more positive attitudes (p=0.006).

The Attitude-Knowledge Relationship

A significant relationship was found between attitude and knowledge scale (r=0.298, p<0.001). The r coefficients for male and females was respectively 0.234 and 0.335 (p<0.001). In the male participants with high school and university level of

Table 5. Comparisons for demographic characteristics with knowledge scale

Knowledge questions	n	Summary statistics*	p-value	Post hoc comparisons	Post hoc p-value
Overall knowledge	1,057	7 (0-12)	-	-	-
Gender					
Male	611	6 (0-12)	**<0.001**	-	-
Female	446	7 (0-12)			
Age	1,056	0.060	0.056		
Male	653	0.093	**0.023**	-	-
Female	403	0.057	0.211		
Education (male)					
Lower than high school (1)	46	4 (0-11)	**<0.001**	1-2	**0.024**
High school (2)	261	5 (0-11)		1-3	**<0.001**
University (3)	288	7 (0-12)		2-3	**<0.001**
Education (female)					
Lower than high school (1)	61	6 (0-12)	**<0.001**	1-2	1.000
High school (2)	89	6 (0-11)		1-3	**<0.001**
University (3)	282	8 (0-12)		2-3	**<0.001**
Marital status					
Married	653	7 (0-12)	0.890	-	-
Single	403	7 (0-12)			

*Summary statistics has shown as median (minimum-maximum) or r correlation coefficient

Table 7. Comparisons for demographic characteristics with attitude scale

Attitude questions	n	Summary statistics*	p-value	Post hoc comparisons	Post hoc p-value
Overall attitude	1,057	34 (13-40)	-	-	-
Gender					
Male	611	33 (14-40)	**<0.001**	-	-
Female	446	35 (13-40)			
Age	1,034	0.079	**0.011**		
Male	601	0.115	**0.005**	-	-
Female	433	0.057	0.235		
Education (male)					
Lower than high school (1)	46	30.5 (14-40)	**0.004**	1-2	0.256
High school (2)	261	32 (17-40)		1-3	**0.010**
University (3)	288	34 (17-40)		2-3	0.082
Education (female)					
Lower than high school (1)	61	33 (13-40)	**<0.001**	1-2	1.000
High school (2)	89	33 (15-40)		1-3	**0.003**
University (3)	282	35 (18-40)		2-3	**0.001**
Marital status					
Married	653	34 (13-40)	**0.006**	-	-
Single	403	32 (17-40)			

*Summary statistics has shown as median (minimum-maximum) or r correlation coefficient

education, there were significant relationships between attitude and knowledge scale (r=0.123, p=0.046 and r=0.266, p<0.001). In the female participants, only with the university level of education, a significant relationship was found between attitude and knowledge scale.

The Sensitive Question: The Rate of Asking for Antibiotic Prescriptions by Showing Unrealistic Symptoms

Out of 1,057 participants, 1,044 persons (98.8%) answered to the sensitive information via the Crosswise model. Our results show that 16.86% of respondents force the physician to prescribe antibiotics by complaining of unrealistic health symptoms. This prevalence in men (17.99%) is more than women (15.31%). The prevalence of this deceitful behavior in singles (17.86%) is more than married participants (16.05%). Participants with an education level of less than high school had the highest prevalence of forcing the physician (31.42%).

DISCUSSION

Insufficient public knowledge about antibiotics and, as a result, misuse, overtreatment expectancy (like use in cold, flu, etc.) and the pressure on physicians to prescribe antibiotics are essential factors in the case of antibiotic abuse is the main findings of this study. The results have shown that the antibiotic awareness of the study population is insufficient but is at an acceptable level.

The highest incorrect responses in the knowledge questions were for the question: “antibiotics can treat viral infections”; as stated in similar studies in the literature. 73.4% of participants in our study, %67.2 of in [16], and %70 in [17], it is not known that antibiotics are not effective for viral infections. Another important finding of this study was that participants were highly aware of the side effects of antibiotics. In the present study, the overall score of participants from knowledge questions was satisfactory (median=7). However, we should still examine the total score cautiously, because half of the participants could not say that penicillin was an antibiotic or %65.2 stated that painkillers and antibiotics are the same drugs.

In many studies, it was found that the level of knowledge and a positive attitude about antibiotic use correlated with education, age, ethnicity, and income level [14, 16, 18, 19]. In the present study, the knowledge level was correlated with gender, education, age (in men). It was found that women are more conscious than men. Also, high education levels have a positive effect on knowledge both in men and women. There was no correlation between women’s age and their knowledge about antibiotics. However, older men were more knowledgeable. In the relationship between attitude about antibiotics and demographic characteristics, it was observed that women had a more positive attitude compared to men. Finally, high education levels have a positive effect on attitude in both men and women. Also, it was found older men had more positive attitudes, and there was a significant positive relationship between attitude and knowledge scale both in men and women.

According to studies in the literature, one of the most important factors in prescribing antibiotics to patients was shown as pressure from patients [20-22]. Trying to protect the physician-patient relationship, lack of time, lack of energy to resist the patient’s medicine demands, and fear of medico-legal problems are the main factors in overprescribing antibiotics [21]. It was shown that 51% of the participants expected the physician to prescribe antibiotics, and patients with respiratory symptoms had higher expectations for antibiotics [22]. It was also shown that 55% of physicians prescribing antibiotics are general practitioners [16, 23]. The finding that should be emphasized in the prescribing behavior of the physician is not whether the general practitioner is prescribing or not; it is the relationship between prescribing behavior and the patient’s expectation [22]. Also, In Turkey, it was reported that the pressure of the patients to take antibiotics for colds and respiratory diseases [10]. Another recent research showed the 49.3% of participants for reasons such as common cold, flu, sore throat, fever, cough, abdominal pain, weakness, urinary burning, and skin infection have been started to antibiotic treatment without consulting a physician; they have used the antibiotics in their old prescriptions [9, 11]. In the present study, according to the answer to the sensitive question, a noticeable rate (16.86%) of participants resort to showing unrealistic symptoms to force the physician to

prescribe antibiotics. The prevalence of this behavior was high in men compared to women. Also, the rate in the single participants was higher than married subjects. Education level lower than high school also played an active role in showing unrealistic symptoms. We believe that we have made a significant contribution to the studies carried out in this field with the crosswise model used in our study. It would be expected to respond incorrectly or incompletely when the patients are directly asked if they force a physician to prescribe antibiotics. There is not much research asking this behavior. In this study with applying the crosswise model, near to 17% of the respondents stated that they forced their physicians to prescribe antibiotics. It is noteworthy that this rate increases to 31%, especially as the level of education decreases.

CONCLUSIONS AND LIMITATIONS

Our study shows Turkish people's knowledge and attitudes about antibiotic awareness are insufficient but acceptable. The public knows that antibiotics should not be used unless prescribed by a physician; however, a noticeable rate of them resort to showing unrealistic symptoms to force the physician to prescribe antibiotics. There is still a need for education. Family physicians also need to be more careful in prescribing antibiotics. While society becomes aware of rational antibiotic use, physicians should also be empowered. Success in the struggle against resistant infections can be achieved through mutual communication with informed healthcare providers and healthcare managers and informing the public.

The validity of the crosswise model used for the rate of forced prescribing depends on the assumption that all participants adhere to the instructions. Participants may not understand the method or answer the question randomly, so the rate obtained may be misleading.

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