

Antibiotic Use Behaviors and Influencing Factors Among Adult Patients Attending Family Health Centers: A Theory of Planned Behavior Approach

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Abstract

Objective: This study aimed to assess antibiotic use behaviors among adults attending family health centers in a district of İstanbul, using the *Theory of Planned Behavior*. The study also examined socio-demographic variables influencing attitudes, subjective norms, and intentions related to antibiotic use.

Materials and Methods: A cross-sectional survey was conducted among 151 literate adults aged 18 and above. A structured questionnaire measured demographic data and antibiotic-related knowledge, attitudes, subjective norms, and intentions. Data were analyzed using Mann-Whitney U and Kruskal-Wallis tests due to non-normal distribution.

Results: Of the participants, 64.2% were female and the mean age was 43.88 (standard deviation [SD] = 15.04). Most participants reported using antibiotics upon physician recommendation (92%) and refrained from using antibiotics without a prescription (90.7%). However, 27.8% kept leftover antibiotics at home. Gender was not significantly associated with attitude or intention scores, but men had significantly higher subjective norm scores than women ($p=0.01$), indicating greater influence by others. Households with more members showed higher susceptibility to social influence. Participants who believed injectable antibiotics were more effective had significantly more favorable attitudes toward antibiotic use ($p=0.001$). Keeping antibiotics at home and requesting antibiotics from physicians were both significantly associated with stronger intentions to use antibiotics without medical advice.

Conclusion: While general awareness of appropriate antibiotic use was high, misconceptions such as favoring inject-

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ables and keeping antibiotics in reserve persisted. Gender and household size influenced social norms, and behavioral intentions were shaped by access and past practices. Interventions should prioritize educational programs, early health literacy efforts, and physician-patient communication to reduce misuse.

Keywords: Antibiotic use, public health, theory of planned behavior, social norms, health literacy, medication misuse

INTRODUCTION

The irrational use of drugs (IUDs) continues to pose a significant threat to global public health. According to the World Health Organization (WHO), approximately half of all medications worldwide are prescribed, dispensed, or sold inappropriately, and a similar proportion of patients do not adhere to their prescribed treatments (1). The IUDs encompasses a range of problematic practices, including polypharmacy, overprescription of injectable medications, use of expensive alternatives despite equally effective, affordable options, underuse of essential medications, inappropriate self-medication, and particularly the excessive and improper use of antibiotics (1-3). These behaviors not only undermine treatment outcomes but also increase the risk of adverse drug reactions, contribute to the inefficient use of healthcare resources, and erode public trust in healthcare systems.

Antibiotic misuse is one of the most urgent dimensions of IUDs. A retrospective study examining antibiotic use, resistance, and trade dynamics in Türkiye and European Union (EU) countries between 2005 and 2015 revealed that Türkiye, which ranked second among EU nations in antibiotic consumption in 2005, became the leading country by 2015 (3). In a context where antibiotic use is alarmingly frequent, the need to promote rational antibiotic practices becomes even more pressing. The WHO defines rational antibiotic use as the selection of the appropriate agent, dose, duration, and route of administration, tailored to the patient's diagnosis and disease severity, and based on clinical evidence (4). However, irrational patterns such as polypharmacy, overprescription, unnecessary use without clear clinical indications, and consumption without physician oversight remain widespread in Türkiye (5-7).

The consequences of such misuse are profound. Inappropriate antibiotic use leads to increased healthcare costs, elevated morbidity and mortality rates, and the emergence of antibiotic resistance, a global crisis with far-reaching implications (8). Particularly in low- and middle-income countries, these challenges are exacerbated by factors such as limited access to healthcare services, poor sanitation infrastructure, lack of awareness, and a tendency toward self-medication (9,10). Moreover, literature suggests that the most common reason for an-

tibiotic use in the general population is upper respiratory tract infections, many of which are viral in origin and do not require antibiotic therapy (11).

The WHO has declared antimicrobial resistance a critical threat to the sustainability of modern medicine and public health worldwide (12). In light of this, understanding the factors that drive antibiotic use at the community level is essential for designing effective interventions. Public knowledge and beliefs play a key role in shaping these behaviors. Antibiotic resistance is a global health concern, and inappropriate use of antibiotics remains widespread. To better understand the psychological and social determinants of antibiotic use, the present study was informed by the *Theory of Planned Behavior* (TPB). According to TPB, an individual's behavior is shaped by three main constructs: attitudes (personal evaluation of the behavior), subjective norms (perceived social pressure to perform or not perform the behavior), and perceived behavioral control (perception of ease or difficulty in performing the behavior). Together, these constructs influence behavioral intention, which is considered the most immediate predictor of actual behavior. Previous studies have successfully applied TPB to explore health-related behaviors such as medication adherence, vaccination uptake, and antibiotic use, highlighting its usefulness in identifying modifiable targets for behavioral interventions (13,14). By integrating this framework, our study aims to provide a more comprehensive understanding of the factors influencing antibiotic use intentions within the Turkish population."

This study aims to explore antibiotic use behaviors among adult patients attending family health centers (FHCs) located in a district of İstanbul. Using the TPB as a conceptual framework, which emphasizes the influence of attitudes, subjective norms, and behavioral intentions on individual actions, the study seeks to identify determinants of both appropriate and inappropriate antibiotic use. By addressing these behavioral drivers, the findings aim to inform future strategies for promoting rational antibiotic use in primary care settings.

MATERIALS AND METHODS

This study was designed as a descriptive cross-sectional survey. It was conducted among literate adults aged ≥ 18 years attended three FHCs located in a district of İstanbul.

bul. A structured questionnaire consisting of 44 items was administered to participants. The questionnaire included 22 multiple-choice questions, 3 open-ended questions, and 19 items based on a 5-point Likert scale.

The survey instrument comprised three main sections: 1) sociodemographic information (e.g., gender, age, economic status, and monthly household income), 2) questions regarding antibiotic use habits, and 3) the validated and reliable Antibiotic Use Scale developed by Atik and Doğan (15). The inclusion of sociodemographic variables was intended to explore their potential influence on antibiotic-related behaviors.

All participants completed the survey anonymously. Trained research assistants conducted the data collection through structured face-to-face interviews in private consultation rooms at the FHCs. No identifying information (e.g., names, contact details) was recorded, and participants were reassured that their responses would remain confidential. This approach was chosen to maximize response accuracy while ensuring anonymity, as some items concerned potentially sensitive behaviors such as using antibiotics without a prescription. The study employed convenience sampling to recruit participants.

Data were analyzed using SPSS Statistics for Windows, Version 25 (IBM Corp., Armonk, NY, USA). Frequency and percentage distributions were calculated, and Mann-Whitney U and Kruskal-Wallis tests were employed to assess statistical significance. A p -value of <0.05 was considered statistically significant.

The 5-point Likert items were scored as follows for positively worded statements: “Strongly Agree” = 5, “Agree” = 4, “Somewhat Agree” = 3, “Disagree” = 2, and “Strongly Disagree” = 1. Reverse scoring was applied for negatively worded items.

The scale was developed in line with the TPB, aiming to interpret individuals’ antibiotic-related behaviors based on three core components: attitude, subjective norms, and behavioral intention (15). According to the TPB, individuals consider the consequences of their actions, form intentions accordingly, and then act to achieve desired outcomes.

Attitude was assessed through statements reflecting participants’ emotional and cognitive evaluations of antibiotic use. For example:

- “I feel more comfortable when I take antibiotics.”
- “Being ill makes me very unhappy; I want to take antibiotics to recover quickly.”

Participants rated their level of agreement on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher

mean scores indicated more favorable attitudes toward antibiotic use.

Subjective norms were evaluated by examining perceived social pressures or influences regarding antibiotic use. Statements included:

- “If a friend offers me antibiotics for a cold or flu, I would accept.”
- “I see no harm in using antibiotics based on someone’s recommendation without seeing a physician.”

High scores in this section suggested that participants were more likely to be influenced by social factors in their antibiotic-related decisions.

Behavioral intention was considered the most direct predictor of antibiotic use. It reflects the individual’s commitment to engaging in such behavior. Statements included:

- “I keep leftover antibiotics for future use.”
- “If I experience similar symptoms, I would not hesitate to reuse antibiotics without a prescription.”

Again, responses were rated on a 5-point Likert scale, and higher average scores indicated stronger intentions to use antibiotics independently.

The study was conducted in accordance with the principles of the Declaration of Helsinki. It was approved by the Marmara University Clinical Research Ethics Committee on December 3, 2021 (Decision No: 09.2021.1336) and by the Provincial Directorate of Health. All participants were informed about the purpose of the study and the ethics approval, and verbal consent was obtained prior to participation.

RESULTS

Data was obtained from 151 participants. Of the participants, 64.2% were female and the mean age was 43.88 (standard deviation [SD]=15.04) (Table 1). Among the participants, 88.74% ($n=134$) reported that no one in their household was a regular antibiotic user, while 11.26% ($n=17$) reported having at least one regular antibiotic user in their household.

Regarding antibiotic use in the past year due to infections, the vast majority (92%, $n=58$) stated that they used antibiotics based on a physician’s recommendation. Additionally, 90.7% of the participants reported that they would not use antibiotics without a physician’s prescription, while 9.2% admitted to using antibiotics without a prescription.

Table 1. Demographic characteristics of participants.

	n (%)
Sex	
Male	54 (35.8)
Female	97 (64.2)
Last graduated school	
Literate	5 (3.3)
Primary school	38 (25.2)
Secondary school	13 (8.6)
High school	53 (35.1)
University	42 (27.8)
Income	
More than expenses	53 (35.1)
Equal to expenses	69 (45.7)
Less than expenses	29 (19.2)
Insurance	
Public health	97 (63.8)
Private	13 (8.6)
Other	11 (7.5)
None	30 (20.1)
Marital status	
Single	29 (19.2)
Married	112 (74.2)
Divorced / Others	10 (6.6)
Total	151 (100.0)

A total of 72.19% (n=109) of participants stated that they did not keep antibiotics at home as a backup, whereas 27.81% (n=42) reported keeping backup antibiotics. When asked about the source of these backup antibiotics, the most common responses were leftover antibiotics from previous treatments and antibiotics prescribed earlier by a physician.

Furthermore, 79% of the participants indicated that they would not request antibiotics from their physician, while

21% stated that they had asked their physician to prescribe antibiotics. Regarding perceptions of antibiotic efficacy, 69% (n=98) believed that injectable antibiotics are more effective than oral ones.

A large proportion of participants (74.8%, n=113) reported that they read the package leaflet of medications. When asked about possible side effects of antibiotics, 62.9% mentioned kidney damage, 53.8% stomach upset, 48.3% liver damage, 43.37% diarrhea, and 41.7% allergic skin rashes (Table 2).

To investigate the relationship between participants' intention scores (based on the Antibiotic Use Scale) and their behavior of requesting antibiotics from a physician, the normality of the data was assessed using Quantile-Quantile (Q-Q) plots and the Kolmogorov-Smirnov test. The data were found not to follow a normal distribution.

The median intention score for participants who did not request antibiotics was 1.2, while it was 2.0 for those who

Table 2. Participants' views on the adverse effects of antibiotics.

Adverse Effects	n (%)
Nephrotoxic	
Yes	95 (62.9)
No	56 (37.1)
Diarrhea	
Yes	66 (43.7)
No	85 (56.3)
Allergic rash may occur as a side effect	
Yes	63 (41.7)
No	88 (58.3)
Gastrointestinal irritation	
Yes	88 (58.3)
No	63 (41.7)
Hepatotoxic	
Yes	73 (48.3)
No	78 (51.7)
Total	151 (100)

Table 3. Analysis of gender differences in attitude, subjective norms, and intention scores.

Sex	Attitude		Subjective Norm		Intention	
	Median (IQR)	<i>p</i>	Median (IQR)	<i>p</i>	Median (IQR)	<i>p</i>
Female	4.6 (2.6)	0.449	1.6 (0.9)	0.01	1.0 (1.6)	0.057
Male	4.8 (2.05)		1.8 (1.45)		1.9 (2.0)	

IQR: Interquartile range.

did request antibiotics. This difference was analyzed using the Mann-Whitney U test and was found to be statistically significant ($p=0.044$).

DISCUSSION

In this study our findings reveal that while many patients adhere to prescription-only antibiotic use, misconceptions still persist. Our data revealed that 90.7% of participants reported not using antibiotics without a physician's prescription. This suggests a high level of awareness among individuals regarding the importance of prescription-based antibiotic use. In a thesis conducted in Denizli, 65% of participants responded similarly (16). These findings are also comparable to those of Gül et al. (17), who evaluated the knowledge and attitudes of Ankara residents regarding self-medication with antibi-

otics. While demographic characteristics in both studies were similar (mean age=37.1 years; 70% with high school or university education), our results differed in terms of behaviors such as keeping antibiotics at home and requesting them from physicians. In our study, 27.81% of participants reported keeping antibiotics at home, and 21% stated that they had requested antibiotics from a physician. In contrast, Gül et al. (17) reported these rates as 64.9% and 64%, respectively. This discrepancy may be due to differences in gender distribution or regional antibiotic practices.

Significant progress has been made in Türkiye to promote rational drug use, largely due to initiatives under the National Rational Drug Use Action Plan (18). Contributions from universities, healthcare professionals, and the pharmaceutical sector have supported governmental efforts to enhance public awareness regarding the

Table 4. Comparison of attitude, subjective norms, and intention scores by participants' beliefs and behaviors regarding antibiotic use.

		Attitude		Subjective norm		Intention	
		Median (IQR)	<i>p</i>	Median (IQR)	<i>p</i>	Median (IQR)	<i>p</i>
IM antibiotics more effective than oral ^a	Yes	5.0 (2.8)	0.003	1.8 (1.4)	0.068	1.4 (2.0)	0.034
	Not Sure	4.1 (1.8)		1.4 (0.9)		0.8 (1.3)	
	No	4.8 (2.8)		1.2 (1.8)		0.8 (1.2)	
Keeping antibiotics at home ^b	Yes	4.9 (2.5)	0.223	1.6 (1.4)	0.697	2.3 (1.3)	<0.001
	No	4.6 (2.4)		1.6 (1.0)		0.8 (1.4)	
Requested antibiotics from physician ^b	Yes	4.5 (2.9)	0.920	1.6 (1.3)	0.789	2.0 (2.1)	0.044
	No	4.6 (2.2)		1.6 (1.2)		1.2 (1.6)	

IM: Intramuscular, IQR: Interquartile range.

^aKruskal-Wallis test.^bMann-Whitney U test

rational use of medications. Additionally, a nationwide study conducted in 2016 revealed that the prevalence of non-prescription drug use in the general population was 80.48% (19).

When evaluating knowledge of the purpose of antibiotics, 84.4% of participants in our study stated that antibiotics are used to treat infections and inflammation, indicating strong awareness of their proper use. In comparison, only 58% of participants in Gökçe's study (16) answered this correctly. Understanding the purpose of antibiotics is essential for preventing antibiotic resistance across populations.

Regarding the statement, 'I would not hesitate to use previously prescribed antibiotics without a prescription if I experienced similar symptoms,' 52.3% of participants strongly disagreed. In a study by Artantaş et al. (20), evaluating adult patients visiting family medicine clinics in Ankara, 75% of participants reported they would use the antibiotic previously prescribed by their physician in cases of similar symptoms. Despite similar demographics between the two studies, the differing responses may stem from regional variations or potential social desirability bias affecting participants' transparency.

Although education, occupation, and income did not significantly affect behaviors. However, the persistence of inappropriate practices like storing antibiotics and self-prescription indicates behavioral reinforcement beyond formal knowledge.

In our study, 74.8% of participants reported reading the drug information leaflet. When asked about the appropriate time to stop using antibiotics, 59.6% answered "as advised by the physician." In comparison, Karakurt et al. (21) found that 83.6% of university students in Erzincan read drug leaflets, while 45.8% stopped using medication based on physician advice and 47.9% stopped when symptoms were resolved. This discrepancy may be attributed to differences in age and sample size. It may also suggest that younger populations require more structured education on responsible medication use.

When asked about the side effects of antibiotics in a multiple-choice format, the most commonly selected answer was kidney damage (62.9%), followed by stomach discomfort (58.3%). Similarly, Kenesari and Özçakar (21) found that mothers most often cited kidney damage and stomach discomfort both before and after a brief educational intervention (22). These findings support the results of our study, given the similar age and education levels of participants.

Beliefs regarding the efficacy of injectable antibiotics were also assessed. A total of 69% of our participants

believed that injectable antibiotics are more effective than oral forms. In Gökçe's study (16), only 13% of participants stated that there was no difference between injectable and oral antibiotics. This suggests a persistent misconception in the general population, highlighting the need to educate patients that injectable antibiotics should only be used when deemed necessary by a healthcare professional and should not be requested indiscriminately. The perception that injectable antibiotics are more effective contributes to positive but potentially risky attitudes. Social influence is stronger among men and those from larger households, indicating a need for targeted interventions.

Lastly, 92% of participants in our study stated that they used antibiotics only upon their physician's recommendation. This finding indicates a high level of awareness regarding the importance of using antibiotics only under medical supervision.

Limitations

This study has some limitations that should be acknowledged. First, although the study assessed behavioral intentions regarding antibiotic use, actual behavior was not objectively verified through prescription records or pharmacy data. This restricts the ability to explore potential discrepancies between reported intentions and real-world practices.

Second, the sample was drawn from only three FHCs, and more than half of the participants (62.9%) had a high school or university education. This relatively high educational level and limited geographic coverage may limit the representativeness of the sample and reduce the generalizability of the findings to the broader Turkish population.

Third, contextual factors should be considered when interpreting the results. In Türkiye, antibiotics are legally restricted and cannot be purchased without a prescription. This regulatory environment may have influenced participants' reported behaviors and intentions, potentially leading to underreporting of non-prescription use.

Fourth, although the study utilized the Antibiotic Use Scale, the Methods section does not provide sufficient detail regarding the scale's items, subdimensions, and scoring system. This may reduce transparency and replicability in future studies.

Finally, as with all self-reported data, the findings are subject to social desirability bias. Participants may have provided responses that aligned with socially acceptable practices rather than their actual behaviors, especially concerning sensitive issues such as self-medication with antibiotics. Despite these limitations, the study provides

valuable insights into behavioral intentions surrounding antibiotic use, offering useful implications for public health interventions and policies.

CONCLUSION

This study highlights that the majority of participants show appropriate attitudes and behaviors toward antibiotic use, including reliance on physician prescriptions and awareness of potential side effects. However, misconceptions still persist, particularly regarding the perceived superiority of injectable antibiotics and the tendency to keep antibiotics at home for future use.

Comparative findings from similar regional studies suggest that variations in behavior may be influenced by

factors such as age, education level, gender distribution, and regional healthcare practices. While overall awareness appears to be increasing, targeted public health interventions and educational campaigns remain necessary, especially to correct misinformation about antibiotic administration routes and to discourage self-medication practices.

Improving antibiotic literacy among all age groups is crucial for combating antimicrobial resistance and promoting rational drug use. Future research should consider larger and more diverse populations to further explore sociocultural factors that influence antibiotic-related behavior.

Ethical Approval: The study was approved by the Marmara University Clinical Research Ethics Committee on December 3, 2021 (Decision No: 09.2021.1336) and by the Provincial Directorate of Health.

Informed Consent: All participants were informed about the purpose of the study and the ethics approval, and verbal consent was obtained prior to participation.

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vision – Ş.P., N.E.L., A.G.T.; Fundings – Ş.P., N.E.L., A.G.T.; Data Collection and/or Processing – Ş.P., N.E.L., A.G.T., N.S., S.Ş., F.E.B., M.E., E.K.; Analysis and/or Interpretation – Ş.P., N.S., S.Ş., F.E.B., M.E., E.K.; Literature Review – Ş.P., N.E.L.; Writer – Ş.P., Ö.T.; Critical Reviews – Ş.P., Ö.T.

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