ORIGINAL RESEARCH
Family Medicine

Doi: 10.29228/ejhh.90258
EurJHumHealth2026;6(1):9-16

Persistent Non-Prescription Antibiotic Use in Primary Care Despite Regulatory and Performance-Based Stewardship: A Policy-Practice Gap

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Abstract

Aim: Antimicrobial resistance is a growing global health concern largely driven by inappropriate antibiotic use. Non-prescription antibiotic use remains an important contributor to this problem, particularly in primary care settings where most antibiotic consumption occurs. In Türkiye, rational antibiotic use is a key performance indicator in primary care and antibiotic dispensing without prescription is legally restricted; however, non-prescription use may still occur in real-world practice. This study aimed to evaluate patterns of antibiotic use and the prevalence of non-prescription antibiotic use, and to examine their association with sociodemographic characteristics.

Methods: This cross-sectional study was conducted among 225 adult patients attending a Family Medicine outpatient clinic. Data were collected using a structured questionnaire assessing sociodemographic characteristics, infection history, antibiotic use, and non-prescription antibiotic use. Associations between variables were analyzed using the Pearson chi-square test.

Results: A total of 225 participants were included (mean age 30.7 years; 64.4% female). Overall, 76.0% reported at least one infection and 63.6% reported antibiotic use in the previous year. Upper respiratory tract infections were the most frequently reported conditions (43.1%). Non-prescription antibiotic use was reported by 8.0% of participants. Significant associations were observed between non-prescription antibiotic use and age group ($p < 0.001$), marital status ($p = 0.033$), income level ($p = 0.034$), and occupation ($p = 0.021$), while no significant associations were found for gender or education level ($p > 0.05$).

Conclusion: Antibiotic use remains common in primary care populations, and non-prescription antibiotic use, although relatively low, persists despite regulatory restrictions and performance-based stewardship efforts, indicating a gap between policy and real-world practice. Sociodemographic factors play an important role in shaping these behaviors. Addressing this gap requires integrated, behavior-focused antimicrobial stewardship strategies, with family physicians playing a central role in patient education and guiding appropriate antibiotic use.

Keywords: primary care; non-prescription antibiotic use; antimicrobial resistance; antimicrobial stewardship; policy–practice gap; sociodemographic factors

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Received: 22.03.2026 **Accepted:** 30.03.2026

Cite this article as: Mistik S. & Saglam Zengin Z. B. Persistent Non-Prescription Antibiotic Use in Primary Care Despite Regulatory and Performance-Based Stewardship: A Policy-Practice Gap Eur J Hum Health.2026;6(1):9-16.

Introduction

Antibiotics have transformed the management of infectious diseases and remain indispensable in modern medicine. However, their effectiveness is increasingly undermined by antimicrobial resistance (AMR), a major global public health threat. According to estimates from the Global Burden of Disease AMR Collaborators, bacterial antimicrobial resistance (AMR) was directly responsible for approximately 1.27 million deaths worldwide in 2019 and contributed to nearly 5 million deaths overall [1]. Projections from the Review on Antimicrobial Resistance suggest that, if current trends persist, this burden could reach up to 10 million deaths annually by 2050 [2]. Inappropriate and excessive antibiotic use in both healthcare and community settings is widely recognized as the principal driver of this crisis [3].

Irrational antibiotic use includes unnecessary prescribing, inappropriate dosing or duration, and the use of antibiotics without a physician's prescription. Such practices are particularly common in outpatient settings, where diagnostic uncertainty and patient expectations may influence prescribing decisions [4–6]. In this context, self-medication with antibiotics has emerged as a major contributor to misuse, with prevalence estimates approaching 40% in certain settings [7–9]. The availability of antibiotics without prescription further exacerbates inappropriate use, contributing to delayed healthcare seeking, incomplete treatment courses, and increased selection pressure for resistant organisms [10].

Primary care plays a central role in antibiotic consumption, as the majority of antibiotics are used in community settings. Importantly, antibiotic use in this context is shaped not only by clinician prescribing but also by patient behavior, including prior experiences, perceived illness severity, and access to medications such as leftover antibiotics [11–16]. Sociodemographic characteristics further influence these patterns, although their effects vary across healthcare systems and sociocultural contexts [17–21].

In Türkiye, antibiotic stewardship has been strengthened through national regulatory and policy initiatives, including the prohibition of non-prescription antibiotic sales since 2015 and the incorporation of rational antibiotic use into primary care monitoring frameworks [22]. However, despite these measures, non-prescription antibiotic use may still persist, suggesting a gap between policy and real-world practice. This discrepancy highlights a critical limitation of policy-driven approaches and underscores the need to better understand patient-level behaviors that sustain inappropriate antibiotic use.

Despite increasing awareness and stewardship efforts, inappropriate antibiotic use and non-prescription consumption remain prevalent worldwide. Real-world data on patient-driven antibiotic use behaviors in primary care remain relatively limited, particularly within specific local contexts. Given that most antibiotic exposure occurs in the community, context-specific evidence is essential to better understand usage patterns and their determinants. Therefore, this study aimed to evaluate patterns of antibiotic use and the prevalence of non-prescription antibiotic use among patients attending a primary care outpatient clinic, and to examine their association with sociodemographic characteristics.

Methods

Study Design and Setting

This cross-sectional study was conducted among adult patients attending the Family Medicine outpatient clinic of Erciyes University Faculty of Medicine Hospital. The study aimed to evaluate patterns of antibiotic use and non-prescription antibiotic use, and to examine their association with sociodemographic characteristics.

Participants and Sampling

Patients aged ≥18 years who presented to the outpatient clinic during the study period were consecutively invited to participate. Individuals who declined participation or were unable to complete the questionnaire were excluded.

The required sample size was calculated using power analysis, assuming a 95% confidence level and a 5% margin of error, yielding a minimum sample size of 210 participants. A total of 225 patients were ultimately included in the analysis.

Data Collection and Variables

Data were collected using a structured questionnaire administered face-to-face.

The questionnaire consisted of three main sections:

Sociodemographic characteristics: Age, sex, marital status, education level, income status, occupation, place of residence, and presence of chronic disease.

Antibiotic use patterns: History of infection in the past year, antibiotic use within the past year, use of antibiotics without a physician's prescription (self-medication).

Infection characteristics: Types of infections experienced in the last year (multiple responses allowed).

The primary outcome variable was non-prescription antibiotic use within the last year (yes/no).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics were presented as frequencies (n) and percentages (%) for categorical variables, and as mean ± standard deviation (SD) for continuous variables where appropriate.

Associations between categorical variables, particularly between sociodemographic characteristics and non-prescription antibiotic use, were evaluated using the Pearson chi-square test. When expected cell counts were small, appropriate exact tests were applied.

For variables allowing multiple responses (e.g., infection types), results were presented both as the percentage of participants and percentage of total responses.

All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Ethics Committee of Erciyes University (Approval No: 2024/95, dated 07.08.2024). All procedures were conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from all participants.

Results

A total of 225 patients were included in the study. The mean age of participants was 30.7 years (range: 18–79), with approximately half (50.7%) aged 18–24 years. The majority of participants were female (64.4%), single (67.1%), and had a university-level education (79.6%). Chronic disease was reported by 17.8% of participants. Detailed sociodemographic characteristics are presented in Table 1.

Overall, 76.0% of participants reported having experienced at least one infection in the previous year, and 63.6% reported antibiotic use during this period (Table 2).

Regarding infection types, upper respiratory tract infections were the most frequently reported, affecting 43.1% of participants and accounting for 60.7% of all reported cases. This was followed by the common cold (27.9% of participants; 39.3% of cases). Other infections were less common, including urinary tract infections (11.3%), dental and gingival infections (7.4%), and lower respiratory tract infections (3.9%). Additional infection types, such as ear and skin infections, were reported at low frequencies (Table 3).

Non-prescription antibiotic use was reported by 8.0% of participants. Significant associations were observed between non-prescription antibiotic use and several sociodemographic variables (Table 4). Age group was strongly associated with non-prescription use ($p < 0.001$), with the highest proportion observed among participants aged 25–35 years (66.7%), whereas individuals aged 18–24 years were more likely to report no such use (53.6%).

Marital status was also significantly associated ($p = 0.033$), with married participants more likely to report non-prescription antibiotic use compared to single individuals. Similarly, higher income levels were associated with increased likelihood of non-prescription use ($p = 0.034$), with participants in the highest income group representing the largest proportion of users (55.6%).

Occupational status showed a significant relationship with non-prescription antibiotic use ($p = 0.021$). Civil servants constituted the largest proportion among those reporting non-prescription use (50.0%), whereas students were more frequently represented among non-users (53.1%).

In contrast, no statistically significant associations were observed between non-prescription antibiotic use and gender or education level ($p > 0.05$).

Table 1. Sociodemographic Characteristics of Participants (n = 225)

Variable	n	%
Age group (years)		
18–24	114	50.7
25–35	48	21.3
36–45	31	13.8
46–55	16	7.1
≥56	16	7.1
Sex		
Female	145	64.4
Male	80	35.6
Marital status		
Single	151	67.1
Married	74	32.9
Education level		
University	179	79.6
High school	29	12.9
Middle school	7	3.1
Primary school	9	4.0
Illiterate	1	0.4
Income (TRY/month)		
1–20,000	133	59.1
20,001–40,000	26	11.6
≥40,000	66	29.3
Occupation		
Civil servant	60	26.7
Retired	12	5.3
Worker	11	4.9
Housewife	14	6.2
Student	114	50.7
Other	14	6.2
Residence		
Rural (district/village)	23	10.2
Urban (city)	202	89.8
Chronic disease		
Yes	40	17.8
No	185	82.2

Table 2. Infection History and Antibiotic Use in the Previous Year (n = 225)

Variable	n	%
Infection in the last year		
Yes	171	76.0
No	54	24.0
Antibiotic use in the last year		
Yes	143	63.6
No	82	36.4

Table 3. Types of Infections Reported in the Previous Year (Multiple Responses Allowed)

Infection type	n	% of participants	% of responses
Upper respiratory tract infection	88	43.1	60.7
Common cold	57	27.9	39.3
Urinary tract infection	23	11.3	15.9
Dental/gingival infection	15	7.4	10.3
Lower respiratory tract infection	8	3.9	5.5
Ear infection	5	2.5	3.4
Skin infection	2	1.0	1.4
Other	6	2.9	4.1

Percentages exceed 100% due to multiple responses.

Table 4. Association Between Sociodemographic Characteristics and Non-Prescription Antibiotic Use

Variable	Yes n (%)	No n (%)	P value
Age group (years)			<0.001
18–24	3 (16.7)	111 (53.6)	
25–35	12 (66.7)	36 (17.4)	
36–45	1 (5.6)	30 (14.5)	
46–55	1 (5.6)	15 (7.2)	
≥56	1 (5.6)	15 (7.2)	
Sex			0.218
Female	14 (77.8)	131 (63.3)	
Male	4 (22.2)	76 (36.7)	
Marital status			0.033
Single	8 (44.4)	143 (69.1)	
Married	10 (55.6)	64 (30.9)	
Education level			0.839
University	15 (83.3)	164 (79.2)	
Others	3 (16.7)	43 (20.8)	
Income (TRY/month)			0.034
1–20,000	6 (33.3)	127 (61.4)	
20,001–40,000	2 (11.1)	24 (11.6)	
≥40,000	10 (55.6)	56 (27.1)	

Occupation*			0.021
Civil servant	9 (50.0)	51 (24.6)	
Student	4 (22.2)	110 (53.1)	
Other	5 (27.8)	46 (22.3)	

Pearson chi-square test. *Categories with small sample sizes were combined.

Discussion

This study provides a comprehensive evaluation of antibiotic use patterns and non-prescription antibiotic use in a primary care population, highlighting the critical and independent role of sociodemographic factors in shaping patient-driven antibiotic use behaviors. The main findings can be summarized as follows: (i) antibiotic use within the previous year was highly prevalent, (ii) non-prescription antibiotic use, although relatively low (8.0%), persisted, and (iii) age, marital status, income level, and occupation were significantly associated with non-prescription antibiotic use.

The overall rate of antibiotic use observed in this study (63.6%) is consistent with prior reports indicating that antibiotic exposure remains common in community settings, particularly in primary care populations [3,5]. Upper respiratory tract infections were the most frequently reported conditions, aligning with existing literature demonstrating that antibiotics are often used for self-limiting respiratory illnesses despite limited clinical benefit [15]. These findings underscore the persistent challenge of distinguishing appropriate from inappropriate antibiotic use in outpatient care and reinforce the need for improved diagnostic stewardship and patient-centered prescribing strategies.

The prevalence of non-prescription antibiotic use in our study (8.0%) appears lower than estimates reported in systematic reviews, where rates of self-medication frequently exceed 40% in certain regions and settings, reflecting substantial geographic and sociocultural variability. This discrepancy likely reflects differences in healthcare systems, regulatory environments, and access to medical services. In Türkiye, the dispensing of antibiotics without a prescription is legally restricted, and rational antibiotic use constitutes a key performance indicator in primary care. However, the persistence of non-prescription antibiotic use in our findings suggests that policy-driven and performance-based interventions alone may not be sufficient to alter patient-level antibiotic use behaviors in real-world settings. This finding highlights a critical misalignment between policy-level interventions and patient-level practices, indicating that the persistence of inappropriate antibiotic use may be sustained by behavioral and access-related factors that are not fully addressed by current stewardship models. Possible explanations include the use of leftover antibiotics from previous prescriptions, informal access through social networks, or inconsistent enforcement of dispensing regulations. In addition, the self-reported nature of the data introduces the possibility of recall bias or misclassification. Taken together, these observations suggest that structural and regulatory measures, while essential, may have limited effectiveness in the absence of strategies that directly target patient behavior and real-world access pathways.

A key finding of this study is the significant association between sociodemographic characteristics and non-prescription antibiotic use. Individuals aged 25–35 years demonstrated the highest likelihood of self-medication, which may reflect greater autonomy in health-related decision-making and fewer perceived barriers to accessing medications. Similarly, higher income levels were associated with increased non-prescription use, potentially indicating greater purchasing power and flexibility in obtaining medications outside formal healthcare pathways. These findings are consistent with previous studies suggesting that socioeconomic position influences both access to antibiotics and patterns of use [19,23].

Marital status and occupational differences also emerged as relevant determinants. Married participants were more likely to report non-prescription antibiotic use, which may reflect shared decision-making within households or reliance on prior illness experiences. Occupational patterns further suggest that work-related constraints, including limited time and accessibility barriers, may influence self-medication behaviors. In contrast, students were less likely to report non-prescription antibiotic use, possibly reflecting greater

exposure to health information or more frequent interaction with structured healthcare services.

In contrast, no significant association was observed between non-prescription antibiotic use and gender or educational level. While education is often used as a proxy for health literacy, this finding suggests that formal education alone may be insufficient to influence antibiotic-related behaviors. This observation aligns with previous studies reporting inconsistent relationships between education level and rational antibiotic use, highlighting the complexity of behavioral determinants beyond traditional sociodemographic indicators [24].

From a public health perspective, these findings have important implications. Efforts to reduce inappropriate antibiotic use should extend beyond regulatory enforcement and performance monitoring to include behaviorally informed, patient-centered interventions. In this context, family physicians occupy a uniquely strategic position as the primary point of contact within the healthcare system. Their role in patient education, continuity of care, and prescribing oversight places them at the center of translating stewardship policies into real-world practice. Strengthening antimicrobial stewardship at the community level therefore requires not only system-level policies but also active engagement of primary care physicians in addressing patient expectations, improving health literacy, and limiting inappropriate access to antibiotics.

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inference regarding the relationship between sociodemographic factors and antibiotic use behaviors. Second, reliance on self-reported data may introduce recall bias and social desirability bias. Third, the single-center design may limit generalizability to other populations and healthcare settings. Finally, the absence of detailed clinical data precludes assessment of the appropriateness of antibiotic use, limiting the ability to distinguish rational from irrational use patterns.

Despite these limitations, this study provides valuable real-world insights into antibiotic use behaviors in a primary care population and highlights the persistence of non-prescription antibiotic use despite regulatory and performance-based efforts.

In conclusion, antibiotic use remains common in primary care settings, and non-prescription antibiotic use, although relatively low, persists. Sociodemographic factors play an important role in shaping these behaviors. These findings support the development of targeted, context-specific interventions to promote rational antibiotic use and to address the behavioral and structural drivers of antimicrobial resistance. Notably, the persistence of non-prescription antibiotic use despite regulatory restrictions and its recognition as a performance indicator in primary care highlights a gap between policy frameworks and real-world practice. This gap underscores that regulatory and performance-based measures alone may be insufficient to modify patient-level antibiotic use behaviors, emphasizing the need for integrated, behavior-focused antimicrobial stewardship strategies in which family physicians play a central role in translating policy into real-world practice.

Funding: This research received no external funding.

Conflict of Interest: The authors declare that they have no competing interests.

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