

Assessment of Community Pharmacists' Awareness of Antibiotic Resistance and Practice of Antibiotic Use for Urinary Tract Infections in North Cyprus

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Abstract

BACKGROUND/AIMS: Uncontrolled antibiotic use significantly contributes to antimicrobial resistance, thereby impacting public health and healthcare costs. Given the rise in antimicrobial resistance, community pharmacists should adhere to regulations on antibiotic dispensing. Community pharmacists should actively educate patients about appropriate antibiotic use. This study aimed to assess the awareness of community pharmacists regarding antibiotic resistance and to investigate their practices in dispensing antibiotics for urinary tract infections (UTIs) in North Cyprus.

MATERIALS AND METHODS: This cross-sectional study was conducted over a 3-month period. The proposed sample size was 184 community pharmacies, calculated using Raosoft® software.

RESULTS: Two hundred and seven out of 350 community pharmacists agreed to participate in this study. 188 (90.8%) had good awareness about antibiotic resistance, while 19 (9.17%) had poor awareness. Furthermore, 65.7% of community pharmacists agreed that antibiotic resistance is a public health issue. There was a statistically significant association between gender and awareness ($p=0.006$), as well as between age and awareness ($p=0.02$). Additionally, a statistically significant association was found between education status and awareness ($p<0.001$), as well as between experience and awareness ($p<0.001$).

CONCLUSION: This study showed that community pharmacists dispense antibiotics without prescription because they are confident in their knowledge of antibiotic use for treating UTIs. We suggest that educational programs to promote reasonable antibiotic use should be organized by the Ministry of Health of North Cyprus and the Cyprus Turkish Pharmacists Association.

Keywords: Antibiotic, urinary tract infections, community pharmacists, North Cyprus

INTRODUCTION

Urinary tract infections (UTIs) are one of the most prevalent bacterial infections globally, constituting 25% of all infections. UTIs are the most recurrent bacterial infections among females, and antibiotic resistance rates have been increasing in recent years.¹ UTIs can affect

the urethra, bladder, or kidneys, with symptoms varying depending on the location, and are classified as uncomplicated or complicated. Complicated UTIs are linked to structural or neurological abnormalities which increase the susceptibility to infections.² Uncomplicated UTIs, also known as cystitis or lower UTIs, present with symptoms like painful

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voiding, urgency, frequent urination, suprapubic pain, and hematuria. Uncomplicated UTIs, which affect up to 50% of women during their lifetime, are primarily caused by *Escherichia coli* by the fecal flora. This bacterium colonizes the vagina and urethra before infecting the bladder.³ Although most cases of uncomplicated UTI resolve without treatment,⁴ most individuals with UTIs visit pharmacies either before or after seeing their general practitioner (GP). Therefore, pharmacist interventions can improve antimicrobial use for UTIs by enhancing patient knowledge, preventive care, and self-care skills and offering appropriate consultations.⁵ Global guidelines discourage routine urine cultures, and GPs often start empirical antibiotic therapy based on the likely consideration of possible infecting organisms and local resistance patterns.⁶ As a result, diagnosis of UTI is based primarily on signs and symptoms. When a patient presents with both dysuria and increased frequency of urination, the probability of a UTI is greater than 90%.⁷ Community pharmacists often are the primary source of information regarding UTI symptoms. In some countries, such as Canada, Australia, and the United Kingdom, they can independently manage lower UTIs from diagnosis until follow-up. Thus, pharmacists, as well as other health professionals, must understand UTI clinical presentation, diagnosis, and treatment options.⁸ Approximately 80% of global antibiotic consumption occurs outside hospital settings, and more than 50% of antibiotics are sold without a prescription.^{9,10} Access to antibiotics without prescriptions significantly contributes to the development of antimicrobial resistance.¹¹ Although studies have focused on the public's understanding and awareness of antibiotic resistance, the practices of community pharmacists in North Cyprus have not been assessed. This study aimed to assess the awareness of community pharmacists regarding antibiotic resistance and to investigate their practices in dispensing antibiotics for UTIs in North Cyprus.

MATERIALS AND METHODS

A cross-sectional study was conducted over a three-month period from November 2022 to January 2023. North Cyprus has six districts: 131 out of 350 community pharmacies in Nicosia, 97 in Famagusta, 131 in Girne, 20 in Güzelyurt, 17 community pharmacies in İskele, and 11 community pharmacies in Lefke.

The number of community pharmacists in North Cyprus was 350. Sample size calculation was performed using Raosoft, Inc. (Seattle, WA, USA), based on a margin of error of 5%, a 95% confidence level, and a population of 350 community pharmacists. The proposed sample size was 184 community pharmacies, calculated using Raosoft® software.¹² All community pharmacists actively working in North Cyprus were included in this study. However, community pharmacists who did not complete the survey were excluded. The study was explained to the participants in detail by the researchers, and verbal consent was obtained from the participants.

An expert panel was formed to develop the questionnaires, consisting of three clinical pharmacists, one pharmacologist and one active community pharmacist from North Cyprus. The questionnaire was developed and modified from previous studies.¹³⁻¹⁶ The questionnaires were administered to 20 randomly selected community pharmacists. The pilot study data were included in the total dataset. Although the recommended sample size was 184, we aimed to increase the validity of our findings by inviting all community pharmacists in North Cyprus to participate. Two hundred and seven out of 350 community pharmacists, 207 agreed to participate in the survey in this study. The final sample

size exceeded the minimum recommended sample size and provided a more comprehensive assessment of the population in this study.

The survey in this study had four parts. The first part consisted of five questions on the demographic information of community pharmacists. The second part included eight questions about the practice of antibiotic use by community pharmacists for UTI. The third section contained 5 questions about the reasons for prescribing antibiotics without prescription. The fourth part consisted of four questions on the awareness of community pharmacists of antibiotic resistance.

Ethical approval was obtained from the Scientific Ethics Committee of the Near East University (approval number: NEU/2022/107-1614, date: 10.11.2022).

Statistical Analysis

The study data were evaluated using SPSS version 21. Demographic information of community pharmacists and data on other questionnaire parts are presented as percentages and frequencies. Cronbach's alpha was used to measure the internal consistency or reliability in this study. The Pearson chi-square test was used to determine the association between demographic characteristics and awareness. The significance level was accepted as 0.05.

RESULTS

Three hundred fifty community pharmacists were reached, and only 277 agreed to participate in the survey. In this study, 66.2% of community pharmacists were female, and 46.9% were younger than 30 years old (Table 1).

	n	%
Gender		
Male	70	33.8%
Female	137	66.2%
Age		
<30 years old	97	46.9%
30-39 years old	72	34.8%
40-50 years old	21	10.1%
>50 years	17	8.2%
Nationality		
Turkish Republic of North Cyprus	191	92.3%
Republic of Türkiye	2	1.0%
Others	14	6.8%
Education status		
Bachelor of pharmacy	75	36.2%
Master's in pharmacy	104	50.2%
PhD	21	10.1%
Others	7	3.4%
Experience		
<5 years	90	43.5%
6-10 years	64	30.9%
11-15 years	17	8.2%
16-20 years	8	3.9%
>20 years	28	13.5%

The community pharmacist practice of dispensing antibiotics for UTI treatment had a total score was 2.43 ± 0.40 , and Cronbach's alpha was 0.64. Furthermore, 93.7% stated that they inquired about patients' history of drug allergies before dispensing antibiotics for UTIs, while 92.3% stated that they inform patients about the side effects of antibiotics and how to manage them when dispensing antibiotics for UTIs (Table 2).

Regarding community pharmacist awareness of antibiotic resistance, the total score was 2.65 ± 0.52 and Cronbach's alpha was 0.74. The study revealed that out of the 277 community pharmacists surveyed, 188 (90.8%) demonstrated good awareness of antibiotic resistance, whereas 19 (9.2%) had poor awareness. In addition, 87.4% of patients who self-administered antibiotics had an increased risk of developing antibiotic resistance. 79.2% agreed that discontinuation of antibiotics either before or after treatment may increase antibiotic resistance (Figure 1).

Regarding community pharmacist reasons for dispensing antibiotics without a prescription, the total score was 2.52 ± 0.45 and Cronbach's alpha 0.61 was 0.61 (Figure 2).

There was a statistically significant association between gender and awareness ($p=0.006$), as well as between age and awareness ($p=0.02$). There was a statistically significant association found between education

status and awareness ($p<0.001$), as well as between experience and awareness ($p<0.001$) (Table 3).

DISCUSSION

UTIs are one of the most common infections among the public. The most common symptoms in patients with UTIs are pain and burning during urination, fatigue, fever, frequent urination, and pain in the lower abdomen.¹⁷ Patients with UTIs frequently prefer to visit community pharmacies to control and manage their infections.

A study conducted in different regions in 2021 found that Lebanese pharmacists had good knowledge of UTIs. In addition, they showed that they have a good attitude and practice in this field.¹⁸ The findings from Swart et al.'s¹⁹ systematic review indicated that pharmacist-led UTI management provides a cost-effective alternative to GP-led management, benefiting patients with UTIs. Beahm et al.'s²⁰ study findings revealed that UTI management by pharmacists was effective and safe. On the other hand, a previous study showed that patient satisfaction with patient care was high level.²⁰ This study revealed that 90.3% of community pharmacists are confident in their knowledge of antibiotic use for UTI treatment. We believe that continuous training on UTI management and prevention can be provided by organizing

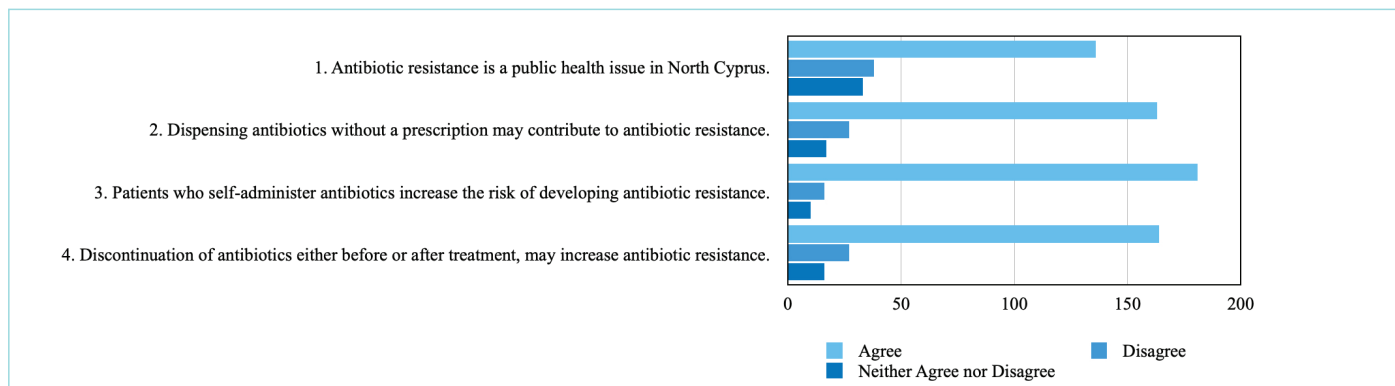


Figure 1. Community pharmacists' awareness of antibiotic resistance.

	Yes (%)	No (%)	Don't remember (%)	Score (mean ± SD)
1. Is dispensing antibiotics without prescription a common practice in UTI treatment in pharmacies?	85 (41.1%)	120 (58%)	2 (1.0%)	1.83±0.98
2. Do you dispense antibiotics without prescription at the patient's request for UTI treatment?	85 (41.1%)	120 (58%)	2 (1.0%)	1.83±0.98
3. Do you recommend or dispense antibiotics without prescription based on the patient's situation and symptoms?	91 (44.0%)	112 (54.1%)	4 (1.9%)	1.9±0.99
4. Do you recommend referring patients with symptoms of urinary tract infections to a physician?	172 (83.1%)	27 (13.0%)	8 (3.9%)	2.70±0.69
5. Do you recommend over-the-counter treatment for patients with UTI symptoms?	153 (73.9%)	50 (24.2%)	4 (1.9%)	2.50±0.86
6. Do you have a history of drug allergies before dispensing antibiotics for UTIs?	194 (93.7%)	12 (5.8%)	1 (0.5%)	2.88±0.47
7. Do you provide information to your patients regarding the potential side effects and their management when prescribing antibiotics for UTIs?	191 (92.3%)	9 (4.3%)	7 (3.4%)	2.88±0.44
8. Do you recommend that your patients complete the full course of antibiotics dispensed for their UTI treatment?	200 (96.6%)	1 (0.5%)	6 (2.9%)	2.96±0.22
Total score				2.43±0.40

UTI: Urinary tract infections, SD: Standard deviation.

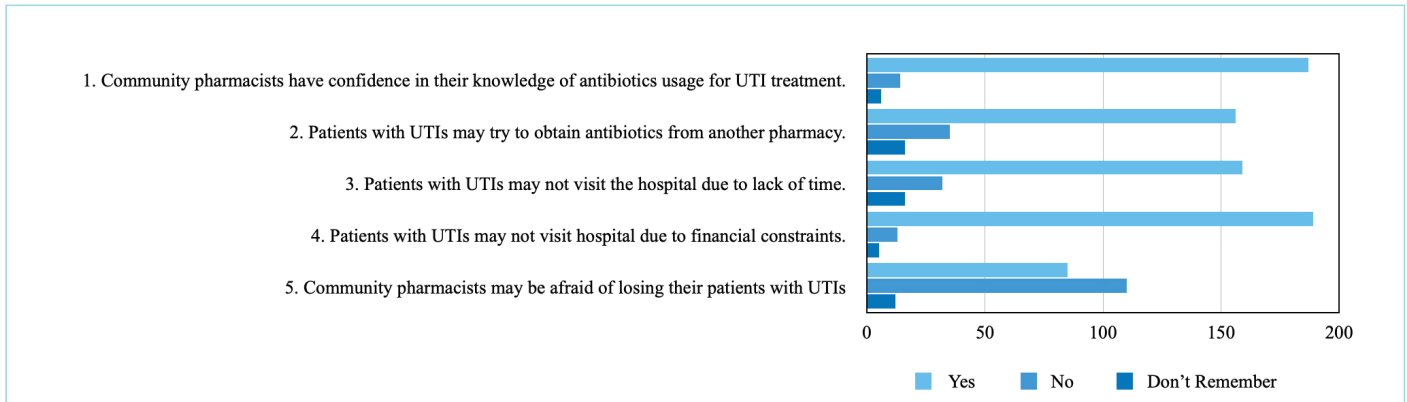


Figure 2. Reasons for dispensing antibiotics without prescription for urinary tract infection treatment.

Table 3. Relationship between demographic factors and community pharmacists' antibiotic resistance awareness

	Good	Poor	p
Gender			
Male	69	1	0.006
Female	119	18	
Age			
<30 years old	93	4	0.020
30-39 years old	65	7	
40-50 years old	16	5	
>50 years	14	3	
Nationality			
Turkish Republic of North Cyprus	173	18	0.867
Republic of Türkiye	2	0	
Others	13	1	
Education			
BPharm or PharmB	65	10	0.0001
MPharm	100	4	
PhD	20	1	
Others	3	4	
Experience			
<5 years	85	5	0.0001
6-10 years	64	0	
11-15 years	11	6	
16-20 years	7	1	
>20 years	21	7	

training programs for community pharmacists and the public facilitated by pharmacy faculties, the Ministry of Health, and the Pharmacists' Association in North Cyprus. Such programs can enhance the knowledge and awareness of UTIs and their management.

A study conducted in Jordan in 2016 showed that most antibiotics are dispensed without prescription in Jordan. Of the antibiotics dispensed with a prescription (31.5%) or without a prescription, 24.6% were appropriate for dosage and duration.²¹ In another study conducted with community pharmacists in Jordan, there was insufficient knowledge about antibiotics and antibiotic resistance.²² In this study, 65.7% of

community pharmacists stated that antibiotic resistance is a public health concern. Given their awareness of antibiotic resistance, we believe that community pharmacists can effectively manage UTIs in North Cyprus by implementing continuous training programs.

The presence of resistant bacteria in UTIs can cause significant challenges in treatment. Overuse or misuse of antibiotics can lead to the development of antibiotic-resistant strains, such as extended-spectrum beta-lactamase-producing *Escherichia coli* and *Klebsiella pneumoniae*, as well as Methicillin-Resistant *Staphylococcus aureus*. Inappropriate treatment of UTIs due to antibiotic resistance can cause several significant problems, such as persistent infections, increased morbidity and mortality, and higher healthcare costs.^{23,24} In addition, community pharmacists can no longer dispense antibiotics without a prescription in North Cyprus. The justifications for this regulation include preventing antibiotic resistance, ensuring proper diagnosis and treatment, and promoting the rational use of drugs.

Study Limitations

The study was conducted with only 207 community pharmacists actively working in North Cyprus. Therefore, the data in this study cannot be generalized to the entire Cypriot population.

CONCLUSION

According to the findings, community pharmacists dispense antibiotics without prescription due to their confidence in their knowledge of antibiotic use for treating UTIs. In response to this situation, we suggest that educational programs for rational antibiotic use should be jointly organized by the Ministry of Health of North Cyprus, Cyprus Turkish Pharmacists Association, and pharmacy faculties.

MAIN POINTS

- Most of community pharmacists had good awareness of antibiotic resistance in North Cyprus.
- Antibiotic resistance is a common public health concern according to community pharmacists in North Cyprus.
- Community pharmacists dispense antibiotics without prescriptions because they are confident in their knowledge of antibiotic use for treating urinary tract infections in North Cyprus.

ETHICS

Ethics Committee Approval: Ethical approval was obtained from the Scientific Ethics Committee of the Near East University (approval number: NEU/2022/107-1614, date: 10.11.2022).

Informed Consent: Verbal consent was obtained from the participants.

Authorship Contributions

Concept: B.O., N.B., M.D.A., Design: B.O., N.B., M.D.A., Data Collection and/or Processing: B.O., N.B., M.D.A., Analysis and/or Interpretation: B.O., N.B., M.D.A., Literature Search: B.O., N.B., M.D.A., Writing: B.O., N.B., M.D.A.

Footnotes

Conflict of Interest: No conflict of interest was declared by the authors.

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