



NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF CLINICAL PHARMACY

**EVALUATION OF COMMUNITY PHARMACISTS' PRACTICE OF ANTIBIOTIC
USE FOR URINARY TRACT INFECTIONS AND AWARENESS OF ANTIBIOTIC
RESISTANCE IN NORTHERN CYPRUS**

M.Sc. THESIS

BASMA OMAR

Nicosia
June, 2023

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M.Sc. THESIS

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Approval

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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Basma Omar

01/06/2023

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Abbreviations

Abbreviation	Word
UTIs	Urinary Tract Infections
UPEC	Uropathogenic Escherichia coli
E. coli	Escherichia coli
NSAIDs	Nonsteroidal Anti-Inflammatory Medicines
TMP-SMX	Trimethoprim-Sulfamethoxazole
AMR	Antimicrobial Resistance
WHO	World Health Organization
OTC	Over-the-counter

Abstract

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

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Background: Urinary tract infections (UTIs) are among the most common bacterial infections treated with antibiotics, especially in primary care. Community pharmacists play an important role in the appropriate antibiotic use and management of UTIs.

Objectives: The study aimed to evaluate the practices of community pharmacists in North Cyprus concerning antibiotic use for UTIs and their awareness of antibiotic resistance.

Methodology: A cross-sectional study conducted among community pharmacists in Northern Cyprus, using a questionnaire to assess their practices of antibiotic use in UTIs.

Results: A total of 207 community pharmacists participated in the study. Findings reveal that 41.1% of the pharmacists routinely dispensed antibiotics without a prescription for UTI treatment, while an equal percentage provided antibiotics without a prescription upon the patient's request specifically for UTI management.

Conclusions: Interventions should focus on enhancing knowledge and awareness of antibiotic resistance, promoting compliance with evidence-based antibiotic use guidelines and addressing the underlying factors contributing to antibiotic dispensing practices by community pharmacists.

Keywords: *pharmacists, clinical pharmacy, infections, urinary tract infection.*

CHAPTER-1-

INTRODUCTION

1.1 Background

Bacterial infection can be treated effectively using antibiotics (Organization, 2019). The overuse and misuse of antibiotics over years have developed antibiotics resistance. It is currently one of the major global health issues. (Mittal, Bhardwaj, Mishra, & Rajput, 2020). Bacteria with antibiotic resistance affects the prognosis of patients in terms of morbidity and even mortality. In addition, the current antibiotics are being useless which necessitates the need for creating novel antibiotics to overcome these resistant strains. (Rather, Kim, Bajpai, & Park, 2017). Although it is established that antibiotic resistance is a global health dilemma, the solution is complex, as the policy makers need to take protective measures to restrain the overuse of antibiotics, also, to improve the public knowledge about antibiotics (Abimbola., et al ., 2021). Furthermore, the healthcare professionals need to be involved in stewardship programs. (Rahman et al., 2022).

Among the common infections that needs to be treated with antibiotics, urinary tract infections (Tan & Chlebicki, 2016). Patients usually seek pharmacists to get help and treat their symptoms, hence, pharmacists play crucial role in prescribing antibiotics for patients with UTI (Peiffer-Smadja et al., 2020; Sabra et al., 2022). However, the incorrect use of antibiotics such as prescribing without culture could lead to ineffective treatment. This inappropriate usage of antibiotics is cornerstone in the emergence of bacteria resistance (Cantón, Horcajada, Oliver, Garbajosa, & Vila, 2013)

Hence, investigating the knowledge of community pharmacists and how they build upon their decisions to choose antibiotics to treat UTI is crucial, also, the practices and attitudes of community pharmacists toward this issue. (Darwish et al ., 2021)

This in one of the most important steps into preventing and controlling bacteria resistance. (Hashempour-Baltork et al ., 2019)

There are studies which explored the use of antibiotics to treat UTIs in several settings such as hospitals, emergency departments, and primary care. (Al Benwan, Al Sweih, & Rotimi, 2010;

Caneiras, Lito, Melo-Cristino, & Duarte, 2019; Hebert et al., 2020; Takhar & Moran, 2014). On the other hand, practices of community pharmacists is not well studied, and there is a need for research among this population especially in Northern Cyprus.(Cantas et al ., 2016)

Antibiotic resistance is a big problem for the global health, and using antibiotics in the wrong way makes it even worse.(Alanis ., 2005)

Community pharmacists are really important in treating infections and giving antibiotics. However, studies found that pharmacists do not always follow the guidelines and proper prescribing of antibiotics. This questions their knowledge and attitudes about antibiotics and antibiotics resistance (Abdelaziz et al., 2019; Al-Halawa, Seir, & Qasrawi, 2023; Al-Taani et al., 2022; Alkadhimi, Dawood, & Hassali, 2020; Bhardwaj, Shenoy, Baliga, & Unnikrishnan, 2021; Goswami, Dahal, Shrestha, Kc, & Mallik, 2020; Lambert et al., 2022; Mudenda et al., 2020).

Studies have confirmed that pharmacist are the first healthcare professional to be contacted seeking for medications, perhaps because of their availability and being free of charge service (Gidman & Cowley, 2013; Kelly, Young, Phillips, & Clark, 2014). Hence, patients with UTI also seek the pharmacist firstly looking for treatment to his condition (Booth et al., 2013; Sanyal, Husereau, Beahm, Smyth, & Tsuyuki, 2019).

It is worth noting that many countries have rules restrains on prescribing antibiotics without prescription. On the other hand, much more countries do not restrain the pharmacist and he is allowed to prescribe antibiotics without prescription. Even the public can enter and name antibiotics and purchased over-the-counter (Al-Halawa et al., 2023; Alkadhimi et al., 2020; Bahta, Weldemariam, Tesfamariam, Tesfamariam, & Russom, 2021; Majid Aziz et al., 2021; Paget et al., 2017). Of course, these practices and this easy access to antibiotics make them prone to over usage, and this overuse will lead to antibiotic resistance. (Llor & Bjerrum ., 2014).

It is important for community pharmacists to know much about antibiotics and antibiotics resistance. (Saleem et al ., 2019)

Despite that all healthcare professionals including, physicians, nurses, and pharmacists. The pharmacists play huge role in assuring proper use of antibiotics because of their access,

especially when patients approach the pharmacists first to manage their infections.(Tonna et al ., 2020)

Hence, it is essential to have clear understanding of how community pharmacists in Northern Cyprus prescribe antibiotics. Also, the knowledge and awareness regarding antibiotic resistance. As if they are equipped with proper knowledge they will be responsible and prevent overuse of antibiotics and eventually preventing resistance.

This study aims at examining how community pharmacists in Northern Cyprus prescribe antibiotics for urinary tract infections. Also, to assess the level of their knowledge about this disease. The findings from this study will provide valuable information about the actual situation in Northern Cyprus in terms of antibiotics uses. In addition, the findings can be a guide for policy makers and authorities into making policies and strategies to restrain antibiotics use in the country.

1.2 Problem Statement and Rationale of the Study

Urinary tract infections are a common type of infections caused by bacteria. In order to treat the disease, a course of certain antibiotics needs to be prescribed. However, incorrect use of antibiotics can lead to antibiotic resistance. Antibiotic resistance is major global health issue. (Wagenlehner & Naber ., 2006)

Community pharmacists have an important role in managing UTIs because they usually prescribe antibiotics to patients without prescription. Some studies have claimed that community pharmacists lack the knowledge to treat such condition, which leads to increasing the problem and leads to more antibiotic resistance.(Peiffer-Smadja et al ., 2020)

In northern Cyprus, there are no research on how community pharmacists prescribe antibiotics for UTI and how much they know about antibiotic resistance. (Süer et al ., 2019)

Hence, there is a need for research that delves into this issue and investigate the knowledge, attitudes, and practices of pharmacists towards prescribing antibiotics for UTI and antibiotic resistance.

1.3 Research Questions

1. What is the current practice of community pharmacists in North Cyprus regarding antibiotic use for UTIs?

2. To what extent are community pharmacists in North Cyprus aware of antibiotic resistance?
3. What factors contribute to inappropriate antibiotic use among community pharmacists in North Cyprus?
4. What strategies can be suggested to improve the practice and awareness of antibiotic use among community pharmacists in North Cyprus?

1.4 Objectives of the Study

1.4.1 General Objectives

The general objective of this study is to evaluate the community pharmacists' antibiotic dispensing practices for urinary tract infections and their awareness of antibiotic resistance in North Cyprus to identify areas where improvement is needed to promote rational antibiotic use and reduce the development of antibiotic resistance.(Süer et al ., 2019)

1.4.2 Specific Objectives

- To assess the extent of appropriate antibiotic use by community pharmacists for the treatment of urinary tract infections in North Cyprus.
- To explore the knowledge and attitudes of community pharmacists regarding antibiotic resistance and its causes in North Cyprus.
- To identify potential factors contributing to inappropriate antibiotic use and inadequate awareness of antibiotic resistance among community pharmacists in North Cyprus.
- To provide insights into the role of community pharmacists in promoting rational antibiotic use and combating antibiotic resistance in North Cyprus.
- To suggest strategies for improving the practice and awareness of antibiotic use among community pharmacists in North Cyprus based on the findings of this study.

1.5 Significance of the Study

Antibiotic resistance is a major global health problem that is considered a threat to humans' ability to treat their infections. (Fymat ., 2017)

This study is a step toward preventing antibiotic resistance by delving into the causes that increase it. Northern Cyprus is considered a destination for a large number of students and tourists coming from various parts of the world, which leads to an indiscriminately high rate of antibiotic use. Because the information is very limited about how to dispense antibiotics, that's why we did the study.

Being a crucial part of the healthcare professionals, community pharmacists need to be equipped with proper knowledge about antibiotic resistance. We can enhance the quality of care for patients with UTIs in Northern Cyprus by providing the correct antibiotics or proper referral. Furthermore, this research will contribute to the global health knowledge to deal with antibiotic resistance.

CHAPTER-2-

LITERATURE REVIEW

2.1 Overview

Antibiotic resistance is a growing public health concern worldwide, with antibiotic misuse and overuse as major contributing factors. Community pharmacists are frontline healthcare providers crucial in promoting responsible antibiotic use and combating antibiotic resistance. (Abduelkarem et al ., 2019)

However, studies have shown that pharmacists' knowledge, attitudes, and practices regarding antibiotics and their use are often inadequate, and they may contribute to inappropriate prescribing and dispensing of antibiotics. Therefore, reviewing the existing literature on pharmacists' knowledge, attitudes, and practices related to antibiotics and their role in promoting responsible antibiotic use is important.(Hadi et al ., 2016)

The literature review is structured in the following sections to achieve this purpose. A thorough overview of urinary tract infections is given in the first section. The role of pharmacists in promoting antibiotic resistance is briefly discussed in the second part. The final portion focuses on the significance of prudent antibiotic usage and the contribution of neighborhood pharmacists to its promotion. The fourth section, which focuses on UTIs, evaluates the material that is currently available on pharmacists' knowledge, attitudes, and practices surrounding antibiotics and their use for common infections. The study will conclude by summarizing the important findings and their implications for future research and practice.

This study aims to contribute to the development of effective strategies and interventions to promote responsible antibiotic use and combat antibiotic resistance by providing a thorough overview of the existing literature on pharmacists' knowledge, attitudes, and practices regarding antibiotics and their use.

2.2 Urinary tract infections

According to John, Mbotto, and Agbo (2016), urinary tract infections (UTIs) are among the most frequent bacterial diseases seen in clinical practice, affecting people of all ages and genders. (John et al ., 2016)

Healthcare workers still struggle to effectively manage UTIs, which are a major cause of morbidity and mortality across the globe (Foxman, 2010). With an estimated 150 million cases each year, UTIs are among the most prevalent bacterial illnesses globally. According to Okojie and Omorokpe (2018), women experience UTIs more frequently than men do, with a female to male ratio of 8:1. UTIs are a substantial cause of morbidity and mortality in older persons and their frequency rises with age.(Okojie et al ., 2018)

2.2.1 Classifications

Based on where the infection is located within the urinary tract, urinary tract infections (UTIs) can be categorized. Lower urinary tract infections, which affect the bladder and urethra, are the most typical type of UTI. Depending on the location, this infection is also referred to as urethritis or cystitis. Painful urination, frequent urine, and an urgent desire to urinate are some signs of a lower UTI. (Kolman, 2019).

Conversely, kidney and ureteral infection of the upper urine tract. Pyelonephritis is the name for this kind of infection, which can be more serious than a lower UTI. In addition to the symptoms of a lower UTI, an upper UTI may also include fever, chills, nausea, and vomiting.(Klein & Hultgren ., 2020)

Additionally, UTIs can be categorized as simple or complex. Uncomplicated UTIs happen to normally healthy people, whereas complicated UTIs happen to those who have conditions that make them more susceptible to infection, such as diabetes, a weaker immune system, or structural issues with the urinary tract.(Garg & Kapoor ., 2023)

UTIs can also be categorized according to how frequently they recur. Two or more UTI infections in a six-month period, or three or more infections in a 12-month period, are considered recurrent UTIs. Recurrent UTIs may result from inadequate initial therapy, reinfection with the same bacterial strain, or colonization of the urinary system by germs resistant to antibiotics.(Alaryan et al., 2022; Hernández-Hernández, Padilla-Fernández, Ortega-González, & Castro-Díaz, 2021).

2.2.2 Signs and Symptoms

The signs and symptoms of urinary tract infections (UTIs) might vary depending on the location that is afflicted. Urinary urgency, frequency and pain or a burning feeling while

urinating are the most typical signs of UTI. In addition, some individuals may report blood in the urine, foul-smelling or murky urine, or pelvic pain in female patients.(Colgan et al ., 2004)

The most typical UTI, cystitis, is accompanied by symptoms of the lower urinary tract include urgency, frequency, and dysuria. Hematuria, cloudy or foul-smelling urine, and suprapubic discomfort are other symptoms of cystitis.(Bono et al ., 2022)

In contrast, pyelonephritis, an infection of the upper urinary system, frequently has more severe symptoms such fever, chills, nausea, and vomiting. Along with flank pain, discomfort over the afflicted kidney, and systemic infection symptoms, pyelonephritis patients may also suffer these symptoms.(Nicolle, 2012).

UTIs may appear with unusual symptoms including confusion, delirium, or incontinence in elderly individuals or those with underlying diseases like diabetes or immunosuppression. (Godbole, Cerruto, & Chavada, 2020; Petrino, Tua, & Salvi, 2018).

It is crucial to remember that despite having bacteria in their urine, some patients, especially those with asymptomatic bacteriuria, may not show any symptoms. So, in order to confirm the UTI diagnosis, laboratory testing is required.

2.2.3 Diagnosis

Typically, a clinical examination, patient history, and laboratory tests are used to diagnose UTIs. The most prevalent clinical signs of UTIs are suprapubic discomfort, urgency, and frequent urine. Any recent instrumentation, sexual activity, past UTIs, and any other UTI risk factors should be disclosed in the patient's medical history.(Schmiemann, Kniehl, Gebhardt, Matejczyk, & Hummers-Pradier, 2010).

Urine dipstick test and urine cultures are commonly utilized in laboratory tests to confirm a UTI diagnosis. Nitrites and leukocyte esterase, which are signs of bacterial infection, can be found in the urine and can be found using a urine dipstick test, which is a quick diagnostic procedure. To detect the type of bacteria causing the infection and the proper antibiotic treatment, a urine culture involves culturing bacteria from a urine sample in a lab.(Wilson & Gaido, 2004).

According to Harrington and Hooton (2000), female gender, sexual activity, pregnancy, menopause, age, history of UTIs, diabetes, abnormalities of the urinary system, and immunosuppression are risk factors for UTIs. (Harrington & Hooton, 2000).Because the urethra in women is shorter than it is in men; it is simpler for bacteria to enter the urinary tract and

spread an illness. Additionally, sexual activity can spread bacteria to the urinary system.(Dason, Dason, & Kapoor, 2011). Urinary stasis and reduced bladder tone during pregnancy can increase the incidence of UTIs. The urinary tract may alter as a result of menopause, increasing the risk of UTIs. (Czajkowski, Broś-Konopielko, & Teliga-Czajkowska, 2021).

2.2.4 Pathogenesis

The pathogenesis of urinary tract infections (UTIs) is a multifactorial process that includes host susceptibility, pathogen virulence factors, and environmental variables. Uropathogenic Escherichia coli (UPEC), which has developed to colonize and infect the urinary tract, is the main cause of UTIs.(Terlizzi, Gribaudo, & Maffei, 2017).

The pathogenesis of UTIs begins with bacterial adhesion to the uroepithelium. Type 1 and P fimbriae, two specialized adhesins, are used in UPEC to bind to certain receptors on the uroepithelial cells. When bacteria adhere to the uroepithelium, they can create biofilms that offer defense against the host's defenses and antimicrobial agents.(Terlizzi et al., 2017).

Following attachment, UPEC has the ability to enter and multiply within the uroepithelial cells, which can lead to recurrent infections. The bacteria can also cause the uroepithelial cells to undergo apoptosis, which can result in tissue damage and inflammation.(Flores-Mireles et al ., 2015)

Other bacterial pathogens, such as Klebsiella pneumoniae, Proteus mirabilis, and Enterococcus faecalis, can also cause UTIs in addition to UPEC. The capacity of these pathogens to colonize and infect the urinary tract is facilitated by certain virulence factors. .(Flores-Mireles et al ., 2015)

The pathogenesis of UTIs is significantly influenced by host variables as well. Immune health, sex, pregnancy, and age can all alter a person's vulnerability to UTIs. Women's shorter urethras and the proximity of the urethral opening to the anus, for instance, make them more susceptible to UTIs than men.(Hosman, Roić, & Lamot, 2022; Lewis & Gilbert, 2020).

UTIs are also influenced by environmental variables, such as the usage of antibiotics. The normal flora of the urinary system can be upset by antibiotic use, causing harmful germs to overgrow.(Rashid et al ., 2012)

In conclusion, bacterial virulence factors, host susceptibility, and environmental variables interact to cause UTIs. This multifactorial process is characterized by the development of UTIs.

Creating efficient prevention and treatment plans requires an understanding of the pathogenesis of UTIs.

2.2.5 Treatment

Urinary tract infections (UTIs), which commonly affect the kidneys, bladder, and urethra, are brought on by bacterial infections that damage the urinary system. The severity, location, and agent that caused the infection all have an impact on how UTIs should be treated and managed. *Escherichia coli* (*E. coli*) is the most frequent cause of UTIs. *Staphylococcus saprophyticus*, *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Enterococcus faecalis* are additional bacteria that can result in UTIs.(Jump et al., 2018).

Antibiotics, painkillers, and hydration are a few of the methods used to treat UTIs. Typically, the first line of treatment for UTIs is antibiotics. The selection of an antibiotic is based on the kind, location, and results of a culture and sensitivity test, as well as the severity and location of the infection. Treatment with antibiotics typically lasts three to seven days. Among the most often prescribed antibiotics for the treatment of UTIs are nitrofurantoin, ciprofloxacin, trimethoprim-sulfamethoxazole, and amoxicillin-clavulanate.(Takhar & Moran, 2014).

In addition to antibiotics, painkillers such acetaminophen or nonsteroidal anti-inflammatory medicines (NSAIDs) might help reduce the discomfort brought on by UTIs. To aid in flushing the bacteria from the urinary system, it's crucial to stay hydrated by drinking lots of water and other liquids.(Akhter et al ., 2010)

UTIs can occasionally come back, especially in women. Prophylactic antibiotics may be administered in these situations to stop reoccurring UTIs. In general, prophylactic antibiotics are taken for six months to a year in modest doses. Antibiotic resistance, however, may emerge as a result of prophylactic antibiotic use.(Fisher et al ., 2018)

Utilizing non-antibiotic treatments, such as cranberry juice and probiotics, is another strategy for treating UTIs. It has been demonstrated that cranberry juice lowers the risk of UTIs, particularly in women who experience repeated UTIs. By restoring the normal balance of bacteria in the urinary tract, probiotics like *Lactobacillus* can help lower the risk of UTIs.(Akgül & Karakan, 2018; Bergamin & Kiosoglous, 2017).

In addition to treating UTIs, it's critical to prevent them from recurring. Good personal hygiene practices including wiping from front to back after urination and bowel motions, urinating after

sexual activity, and drinking lots of water are examples of preventive methods. Wearing cotton underwear and limiting the use of irritants like douches and powders are further protective measures.(Lybrand ., 2014)

2.2.6 Antibiotics for UTI

Antibiotics are frequently used to treat urinary tract infections, or UTIs. The clinical presentation of the patient and the findings of urine cultures influence the antibiotic decision. Nitrofurantoin, trimethoprim-sulfamethoxazole (TMP-SMX), and fosfomycin tromethamine are the first-line antibiotics for uncomplicated cystitis cases. The selection of antibiotics for severe UTIs is influenced by the underlying medical problems of the patient, their history of antibiotic use, and the possibility of antimicrobial resistance.(Abbo & Hooton, 2014; Chu & Lowder, 2018; Colgan & Williams, 2011; Tan & Chlebicki, 2016).

While awaiting the outcomes of urine culture and sensitivity testing, empirical treatment is started. Acute, simple cystitis is treated empirically without waiting for the findings of a urine culture. Urine culture and sensitivity testing are essential for identifying the etiologic agents and the antibiotic susceptibility patterns of bacteria in cases of severe UTIs or pyelonephritis. The results of the urine culture guide the choice of antibiotics and help to minimize the development of antibiotic resistance(Beahm, Nicolle, Bursey, Smyth, & Tsuyuki, 2017).

Depending on the type of medicines used and the severity of the illness, the length of antibiotic therapy for UTIs varies. For mild UTIs, a 3–7 day course of antibiotics is usually sufficient. A 7–14 day course of antibiotics is advised for complex UTIs or pyelonephritis.(Kang et al., 2018).

When treating UTIs, antibiotic resistance is a major concern. Fluoroquinolones and TMP-SMX are two regularly used antibiotics whose resistance rates have considerably risen in recent years. As a result, second-line antibiotics such nitrofurantoin and fosfomycin tromethamine are being used more frequently.(Gupta et al ., 2001)

Aside from allergic reactions, diarrhea, and the growth of *Clostridioides difficile* infections, the use of antibiotics for the treatment of UTIs is linked to negative side effects. Antibiotic resistance, which can make treating infections difficult, can also be brought on by the overuse of antibiotics.(Ventola ., 2015)

The major method of treating UTIs is with antibiotics, and the selection of medications is based on the kind and severity of the UTI. The length of antibiotic therapy varies based on the kind of infection and is started while waiting for the results of urine culture and sensitivity testing. The care of UTIs raises serious concerns about antibiotic resistance; hence antibiotics should be used sparingly to avoid the emergence of resistance. There are non-antibiotic methods for treating UTIs, but their use is restricted due to the paucity of data demonstrating their efficacy.(Pietropaolo ET AL ., 2018)

2.3 Overview of antibiotic resistance

Antimicrobial resistance (AMR) is a major hazard to human health that is becoming a global issue (Jindal, Pandya, & Khan, 2015). It happens when bacteria, viruses, fungi, or parasites change over time and develop a resistance to the medications used to treat infections. In this section, we'll talk about AMR's causes, symptoms, and preventative measures.

When microorganisms, such as bacteria, viruses, fungi, or parasites, develop defenses against the effects of antimicrobial medications intended to cure illnesses, this phenomenon is known as antimicrobial resistance (AMR). Antibiotics, antivirals, antifungals, and antiparasitics are some of these medications. Resistance may develop spontaneously or as a result of selective pressures brought on by the excessive and inappropriate use of these medications.(Arip et al ., 2022)

Microorganisms, including bacteria, viruses, fungus, and parasites, have the capacity for fast reproduction and environmental adaptation. They are susceptible to genetic alterations that change their underlying genetic structure and enable them to live and procreate in the presence of antimicrobial medications. Without any outside stimulus, these alterations can happen on their own and result in the emergence of antimicrobial drug resistance.(Coates et al ., 2002)

microbes can acquire resistance genes from other microbes through horizontal gene transfer in addition to genetic mutations. Through this approach, genes that confer resistance to antimicrobial medicines can be quickly acquired and shared by microbes. Different methods, such as conjugation, transformation, and transduction, can lead to horizontal gene transfer.(Huddleston ., 2014).

By providing selected pressures that promote the survival and spread of resistant bacteria, the overuse and misuse of antibiotics has sped up the emergence of AMR. Antibiotics used in human and veterinary medicine, agriculture, and aquaculture can cause this selective pressure.

Additionally, an environment where resistant bacteria have an edge over vulnerable germs in terms of survival can result from the overuse of antibiotics. This is so that only bacteria that are resistant to antibiotics can survive and procreate (Uddin et al., 2021).

A multimodal strategy is needed to avoid the emergence and spread of AMR, which includes limiting antibiotic usage, enhancing infection prevention and control procedures, and encouraging the development of novel medicines and complementary therapies.(Zingg et al ., 2019)

AMR can be slowed down by using fewer antibiotics in human and veterinary treatment, agriculture, and aquaculture. Only when absolutely required, doctors should provide antibiotics, and they should only administer the proper medication for the correct infection, duration, and dosage.(Pea & Viale 2009)

The transfer of resistant organisms can be decreased by improving infection prevention and control procedures in healthcare facilities, neighborhoods, and homes. This involves comprehensive antimicrobial stewardship programs, the use of personal protective equipment, environmental cleaning and disinfection, and good hand hygiene. Additionally, raising public awareness and educating people about AMR can aid in lowering unnecessary antibiotic use and promote responsible behavior.(Siegel et al ., 2007)

2.3.1 UTI and antimicrobial resistance

UTIs are caused by bacteria, primarily *Escherichia coli*, part of the normal gut flora. When these bacteria colonize the urinary tract, they can cause infection, leading to symptoms such as dysuria, frequency, and urgency. Typically, antimicrobial medications, such as antibiotics, are used to treat UTIs. However, due to the increasing use of antimicrobial medications, resistant bacterial strains have emerged and are becoming more common, making the treatment of UTIs more difficult. (Foxman ., 2010)

A number of mechanisms, such as gaining resistance genes, genetic mutations, and the development of biofilms, can lead to AMR in UTIs. The acquisition of resistance genes can occur through horizontal gene transfer, where bacteria exchange genetic material with other bacteria, allowing them to acquire resistance to antimicrobial drugs. Genetic mutations can lead to resistance to antimicrobial drugs, and the formation of biofilms can protect bacteria from the effects of antimicrobial drugs. (Goel, N., et al., 2021)

Antimicrobial resistance in UTIs is a developing issue since it reduces the efficiency of conventional medicines, lengthens healing times, and raises the risk of complications.(Ogeer-Gyles et al ., 2006)

A comprehensive study and meta-analysis that was published in 2021 found that uropathogenic bacteria that cause UTIs are becoming more and more resistant to antibiotics. The review examined data from studies conducted between 2000 and 2020 and discovered that ampicillin, trimethoprim-sulfamethoxazole, and ciprofloxacin resistance rates were high in a number of geographic areas.(Bunduki, G. K., et al., 2021)

Antimicrobial resistance in UTIs is problematic because it reduces the efficacy of conventional medicines, leaving patients with fewer treatment alternatives. Longer recovery durations and potential consequences like sepsis, pyelonephritis, and renal failure may be the result of this. Additionally, the use of broad-spectrum antibiotics to treat UTIs may promote the formation of bacteria that are multidrug resistant, which is much more dangerous for the general public's health.(Wagenlehner et al ., 2020)

Several researches have emphasized the antibiotic resistance burden in UTIs across the globe. For instance, a 2018 study indicated that over 10% of the bacteria that cause UTIs in the United States are multidrug resistant, with approximately 50% of these bacteria being resistant to at least one antibiotic.(Waller et al ., 2018)

Antibiotic misuse in clinical practice, insufficient patient education regarding antibiotic usage, and poor sanitation and hygiene practices are just a few of the causes of the emergence of antimicrobial resistance in UTIs. Additionally, a significant factor in the rising prevalence of antibiotic resistance in UTIs is the global expansion of bacterial strains that are resistant to antibiotics, including *Escherichia coli*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*.(Iqbal et al ., 2021)

Antimicrobial resistance in UTIs has drawn the attention of several different techniques. Promoting the prudent use of antibiotics is one of them, as are strengthening infection prevention and control procedures, raising patient awareness and education, and creating fresh antibiotics and non-pharmaceutical treatments like probiotics and immunotherapy. The early diagnosis and treatment of antibiotic-resistant UTIs can also benefit from increased study on the mechanisms underlying antibiotic resistance and the creation of quick diagnostic tools for UTIs.(Bodro et al ., 2018)

2.4 Role of community of Pharmacists in responsible antibiotic use

Public health is endangered by antibiotic resistance, a serious worldwide health issue. Antibiotic resistance has been considerably facilitated by antibiotic overuse and abuse. Utilizing antibiotics responsibly is essential to addressing this expanding issue. As members of the medical community, pharmacists play a critical role in encouraging prudent antibiotic usage. (Machowska & Stålsby Lundborg ., 2019).

A thorough literature study was done to determine the pharmacist community's contribution to encouraging prudent antibiotic use. The study showed that pharmacists could support prudent antibiotic usage in a number of ways. First, pharmacists may make sure that only necessary prescriptions for antibiotics are filled. They might check prescription orders to make sure that the right amount and duration of medication are given to patients. Before prescribing antibiotics, they can also look for drug interactions, allergies, and contraindications. (Lambert et al ., 2022)

Second, pharmacists may inform consumers and medical professionals about how to use antibiotics properly. They can offer details on the value of finishing the complete course of antibiotics, the dangers of antibiotic resistance, and possible antibiotic side effects. Additionally, pharmacists can offer guidance on non-antibiotic treatments for illnesses.

Thirdly, pharmacists can encourage healthcare facilities to implement antibiotic stewardship programs. These initiatives seek to minimize the emergence of antibiotic resistance and maximize the usage of antibiotics. To create and administer these programs, monitor antibiotic use, and offer input on prescribing techniques, pharmacists can work with other healthcare experts. (Lambert et al ., 2022)

Further reading of the literature reveals that in recent years, there has been a major increase in interest in the role of pharmacists in encouraging ethical antibiotic use. The engagement of pharmacists in promoting ethical antibiotic use is supported and encouraged by a number of organizations and initiatives. For instance, the World Health Organization (WHO) has developed recommendations on how to use antibiotics responsibly, highlighting the crucial role that pharmacists play in promoting responsible antibiotic use (Organization, 2014).

A study looked into how pharmacists may help fight antimicrobial resistance (AMR) in developing nations and found ways to strengthen that role. A number of databases were searched for publications released between 2000 and August 2017 in the review. The main conclusions

show that while pharmacists' roles in patient care are comparatively limited in developing countries, they have increased in developed countries to provide a variety of services that lead to better health outcomes and lower healthcare expenditures. Success stories of initiatives run by pharmacists in the fight against AMR show that properly trained pharmacists can contribute to the answer to meet this worldwide challenge. In addition to advising their medical colleagues on prudent prescribing, pharmacists can inform patients about the proper use of antibiotics. The analysis comes to the conclusion that pharmacists who are properly trained and incorporated into the healthcare system can greatly reduce the overuse of antibiotics in developing nations and strengthen their role in combating AMR globally. (Sakeena, Bennett, & McLachlan, 2018).

The body of research implies that encouraging wise antibiotic use is a major responsibility of the pharmacy profession. Studies have shown that pharmacist-led programs are beneficial in lowering antibiotic use and encouraging prudent prescribing. A step in the right direction in the fight against antibiotic resistance is the creation of policies and programs to encourage pharmacist involvement in advocating ethical antibiotic usage. (Gulumbe et al., 2022)

2.5 Community pharmacists and UTI

Community pharmacists are medical specialists who are essential to the efficient and safe administration of medication. They are in a unique position to offer timely and appropriate treatment for illnesses like urinary tract infections (UTIs) because they are frequently the initial point of contact for patients seeking assistance on minor ailments. (Takhar & Moran., 2014)

According to studies, community pharmacists can be quite helpful in the treatment of UTIs. The distribution of antibiotics is one of the primary functions of community pharmacists in the treatment of UTIs. A total of 170 general practitioners and 76 pharmacists responded to an online survey, with the results indicating minimal GP support for patient-initiated treatment. In contrast, after doing a probability check, the majority of pharmacists agreed to dispense antibiotics. Concerns regarding the overuse of antibiotics with easy access were highlighted by both parties. Overall, the study emphasizes the necessity for additional dialogue and teamwork among medical specialists to ensure the secure and efficient treatment of recurrent UTIs. (van der Zande et al., 2021).

Before and after the UTI pamphlets that were intended to be distributed to service users were tested, data were gathered through surveys and interviews with pharmacists and service users.

The findings revealed that a sizable fraction of service users approached a pharmacist for assistance first and felt at ease discussing their urinary issues in a confidential setting. Although they recognized the need for a distinct patient referral pathway, more funds, staff, and prescription alternatives, community pharmacists were confident in their capacity to manage simple UTIs. All community pharmacists acknowledged contributing to the management of antibiotic resistance on a daily basis. According to the study, community pharmacists could be more effective at treating simple UTIs by working with general practitioners and having more prescribers who work in community pharmacies (Peiffer-Smadja et al., 2020).

2.5.1 Community pharmacists and antibiotics for UTI

According to studies, individuals seeking treatment for UTIs frequently start their search for a pharmacist in their local neighborhood. Community pharmacists can offer helpful guidance on the proper administration of antibiotics for UTIs due to their accessibility and knowledge of drugs (Booth et al., 2013).

However, a significant issue is the improper administration of antibiotics for UTIs by community pharmacists. Studies have shown that community pharmacists overprescribe antibiotics and employ inappropriate prescribing techniques, such as dispensing medicines without a prescription or prescribing antibiotics for non-bacterial UTIs. Antibiotic resistance and the rise of multidrug-resistant microorganisms are the results of this. (Ahmad et al., 2022), (Leung et al., 2021)

This is, as far as we are aware, the first study in Northern Cyprus to evaluate community pharmacist knowledge of antibiotics used in UTIs. In comparison to other frequent infections including upper respiratory tract infections, community pharmacists were more likely to recommend antibiotics for UTIs, according to a study done in Turkey. The study also discovered that most community pharmacists were not following established recommendations for the treatment of UTIs, such as prescribing antibiotics for longer than advised or failing to take the needs of the patient into account. (Gaygsz, Lajunen, & Gaygsz, 2021).

In NHS Greater Glasgow and Clyde's ten neighborhood pharmacies, a study on the role of community pharmacists in controlling UTIs was carried out in 2010. To increase patient access to care, the pharmacists were able to provide trimethoprim under patient group direction (PGD) for moderate-to-severe uncomplicated UTIs. PGD is a written directive that enables medical

personnel, including pharmacists, to give medications to a certain group of patients without requiring a prescription for each one of them. According to the survey, pharmacists want and support community pharmacies' ability to provide antibiotic therapy for UTIs without a prescription. The study found that community pharmacists can be very helpful in addressing UTIs, thereby lightening the load on general practitioners and preserving antibiotic stewardship (Booth et al., 2013).

To improve community pharmacists' proper administration of antibiotics for UTIs, a number of treatments have been suggested. These interventions include developing guidelines and protocols for the treatment of UTIs in community pharmacy settings, implementing antibiotic stewardship programs to monitor and improve antibiotic use, and using education and training programs to increase knowledge and awareness of appropriate antibiotic use.(Saleh, Abu Farha, & Alefishat, 2021; Saleh, Abu Farha, & Darwish El-Hajji, 2021).

The emergence of antibiotic resistance is a big worry due to community pharmacists' inappropriate use of antibiotics for UTIs. The proper use of antibiotics for UTIs by community pharmacists requires interventions such as education and training programs, guidelines and procedures, and antibiotic stewardship initiatives.(Peiffer-Smadja et al., 2020).

2.5.2 Community pharmacists and UTI in Northern Cyprus

There aren't many studies that directly address how community pharmacists in Northern Cyprus manage UTIs, according to a literature search. However, a number of studies have looked at the function of neighborhood pharmacists in encouraging sensible antibiotic use abroad.

For instance, the general Cypriot population's knowledge and awareness of antibiotic use and resistance were evaluated. The objective was to offer local data that might be included into upcoming awareness initiatives about antibiotics. The cross-sectional study included 614 respondents in total and used the same methodology as the World Health Organization's "Antibiotic Resistance: Multi-Country Public Awareness Survey." The findings revealed that, despite the majority of participants having sought medical professionals' assistance on how to use antibiotics properly, there was still a lack of understanding on specific indications. For instance, 33.0% of the participants thought that viral diseases could be cured by antibiotics, and

70.7% had no idea how antibiotic resistance arises. Graduates with more schooling displayed noticeably greater knowledge rates. With 72.3% of participants getting their information from these sources, the survey indicated that social media and healthcare practitioners were the main sources of information concerning antibiotic-resistant microorganisms. Despite the majority of respondents agreeing that the suggested measures to address antibiotic resistance are important, up to 47% of respondents were unable to say how those measures will help reduce antibiotic resistance.(Michaelidou, Karageorgos, & Tsioutis, 2020).

Community pharmacists in Northern Cyprus are essential to the delivery of healthcare services, including the dispensing of prescriptions and patient counseling. But nothing is known about the precise function of neighborhood pharmacists in the treatment of UTIs.(Gokcekus, Toklu, Demirdamar, & Gumusel, 2012).

The majority of the research points to community pharmacists as having a significant impact on UTI care through patient education, the promotion of non-antibiotic treatment choices, and assuring proper antibiotic usage. To better understand the specific role of community pharmacists in Northern Cyprus's UTI care and to assess the success of interventions led by pharmacists in the area, more study is nonetheless required.

CHAPTER-3- METHODOLOGY

3.1 Study design

This study was conducted as a cross-sectional study aimed at evaluating the practices of community pharmacists in North Cyprus concerning antibiotic use for UTIs and their awareness of antibiotic resistance over a three-month period between November 1, 2022, and January 31, 2023. The questionnaire was created by making minor modifications to the previous studies, and it was translated into the Turkish language by a forward and backward method. A pilot study was conducted with 20 community pharmacists to check the validity of the questionnaire.

3.2 Study setting

The study was conducted in Northern Cyprus. Northern Cyprus has six districts: Nicosia, Famagusta, Girne, Güzelyurt, İskele, and Lefke. Nicosia is the capital and largest district with 131 community pharmacies, followed by Famagusta with 97, Girne with 74, Güzelyurt with 20, İskele with 17, and Lefke with 11 community pharmacies.

3.3 Study population

The study population includes all community pharmacists working in the selected pharmacies within these districts during the study period. A minimum sample size of 184 participants will be recruited using a sampling procedure that involves selecting participants through a convenience sampling technique from each district proportional to the number of community pharmacies. All community pharmacists who meet the inclusion criteria will be eligible to participate in the study.

3.4 Sampling procedure and sample size calculation

The sample size for this study is 184 community pharmacists, calculated using Raosoft[®] software. The study will use a convenience sampling method, where community pharmacists from six districts of Northern Cyprus will be recruited to participate.

The Raosoft[®] sample size calculator was used to determine the sample size for this study. Based on a population size of 350 community pharmacists, a margin of error of 5%, and a 95% confidence level, a minimum sample size of 184 was chosen. These settings were chosen to

reduce the possibility of sampling error while ensuring that the sample size was sufficient to produce accurate and trustworthy findings.

3.5 Inclusion and exclusion criteria

Community pharmacists who work in Northern Cyprus and are willing to participate in the study meet the inclusion criteria for this study. There are no particular requirements for exclusion.

3.6 Data collection instrument

The study's questionnaire has four sections. The first section included five questions related to participants' demographic information, such as age, gender, educational level, and work experience. The second section included eight questions related to the community pharmacists' practice of antibiotic use for urinary tract infections, such as frequency of antibiotic dispensing, type of antibiotics dispensed, duration of treatment, and reasons for dispensing antibiotics without a prescription. The third section included five questions related to the reasons for dispensing antibiotics without a prescription for UTI treatment, such as patient demand, lack of time, and inadequate knowledge. The fourth section included four questions related to the community pharmacists' awareness of antibiotic resistance, such as the definition of antibiotic resistance, causes of antibiotic resistance, and ways to prevent antibiotic resistance. The last part consists of 3-Likert scale (Agree-3 points, neither 2-points and disagree 1 point), and the summation of the subscale ranged from 12-4 points and categorized to less than 8 points for poor awareness and 8 points or more for good awareness.

The questionnaire was self-administered and provided in Turkish, translated by a forward and backward method. The questionnaire took approximately 10 minutes to complete and was conducted face-to-face with the community pharmacist. The consent form was received from the participants.

3.7 Ethical considerations

The Institutional Review Board (IRB) of Near East University approved all parts of the study protocol. The information was confidential and was not used for any purpose other than this study and all data will be kept safe and used only for research purposes.

3.8 Statistical analysis

The Statistical Package for Social Sciences program (SPSS) version 21 was used to enter and analyze the data. Continuous data were presented as means and standard deviations (SD), whereas categorical variables were presented as frequencies and percentages. The chi-square test was used to examine the association between the demographic characteristics and awareness of community pharmacists. The threshold for significance was set at a p-value of less than 0.05.

CHAPTER-4-

RESULTS

4.1 Overview

The following chapter presents the results of a cross-sectional study that aimed to evaluate community pharmacists' practices of antibiotic use for urinary tract infections and their awareness of antibiotic resistance in North Cyprus.

248 questionnaires were distributed; 207(83%) accepted responses were obtained, and 41 refused to fill out the questionnaire. The chapter is structured in accordance with the study questions, which were created to investigate the community pharmacists' practices on the use of antibiotics for UTIs, their awareness of antibiotic resistance, and the reasons for dispensing antibiotics without a prescription.

4.2 Socio-demographic characteristics

Table 1 shows the demographic characteristics of the participants. Of the 207 community pharmacists, 66.2% were female, and 46.9% were younger than 30. Most of the participants were from the Turkish Republic of Northern Cyprus (92.3%). The majority of the participants had a master's degree in pharmacy (50.2%) and less than five years of experience (43.5%).

Table 1: The Demographic Information of Participants

Item	N	%
1. Gender		
Male	70	33.8%
Female	137	66.2%
2. Age		
<30 years old	97	46.9%
30-39 years old	72	34.8%
40-50 years old	21	10.1%
>50 years old	17	8.2%
3.Nationality		

Turkish Republic of Northern Cyprus	191	92.3%
Republic of Turkey	2	1.0%
Others	14	6.8%
4. Education Status		
Bachelor of Pharmacy	75	36.2%
Master of Pharmacy	104	50.2%
PhD	21	10.1%
Others	7	3.4%
5. 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%

4.3 Practices of community pharmacists

Table 2 shows the community pharmacists' practices in dispensing antibiotics for UTI treatment. The results indicate that 41.1% of the community pharmacists dispense antibiotics without a prescription as a common practice for UTI treatment, and the same percentage dispense antibiotics without a prescription at the patient's request for UTI treatment. 44% of the community pharmacists recommend and dispense antibiotics without a prescription based on the patient's situation. The majority of the participants (83.1%) refer their patients to a physician when they present with symptoms of UTI. 73.9% of the participants recommend over-the-counter treatment for patients with symptoms of UTI. The majority of the participants ask patients about a history of drug allergy before dispensing antibiotics used for UTI (93.7%), provide information to their patients regarding the potential and management of side effects of antibiotics used for UTI (92.3%), and advise their patients to complete the dose of antibiotics dispensed according to their UTI treatment (96.6%).

Table 2: Community Pharmacists' Practice of Antibiotics Dispensed for Urinary Tract Infection Treatment

	Yes (%)	No (%)	Don't want to answer (%)	Score (Mean ± SD)
1. Do you dispense antibiotics without a prescription as a common practice for UTI treatment in your pharmacies?	85(41.1%)	120(58%)	2(1.0%)	1.83± 0.98
2. Do you dispense antibiotics without a prescription at the patient's request for UTI treatment?	85(41.1%)	120(58%)	2(1.0%)	1.83± 0.98
3. Based on the patient's situation, do you recommend and dispense antibiotics without a prescription?	91(44.0%)	112(54.1%)	4(1.9%)	1.9±0.99
4. Do you refer your patients to a physician when they present with symptoms of urinary tract infections?	172(83.1%)	27(13.0%)	8(3.9%)	2.70±0.69
5. Do you recommend over-the-counter treatment for patients with symptoms of UTI?	153(73.9%)	50(24.2%)	4(1.9%)	2.50±0.86
6. Do you ask patients about a history of drug allergy before dispensing antibiotics used for UTI?	194(93.7%)	12(5.8%)	1(0.5%)	2.88±0.47
7. Do you provide information to your patients regarding the potential and management of side effects of antibiotics used for Urinary Tract Infections?	191(92.3%)	9(4.3%)	7(3.4%)	2.88±0.44
8. Do you advise your patients to	200(96.6%)	1(0.5%)	6(2.9%)	2.96±0.22

complete the dose of antibiotics dispensed according to their UTI treatment?				
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Cronbach's alpha (0.64) was calculated as questionable internal consistency for community pharmacists' practice of antibiotics dispensed for the urinary tract infection treatment questionnaire.

Table 3 shows the reasons for dispensing antibiotics without a prescription for UTI treatment. The results indicate that the community pharmacists' confidence in their knowledge of antibiotics usage for UTI treatment (90.3%) is the primary reason for dispensing antibiotics without a prescription. Patients with UTIs trying to obtain antibiotics from another pharmacy (75.4%), patients with UTIs not applying to the hospital due to a lack of time (76.8%), patients with UTIs not visiting the hospital due to a lack of finances (91.3%), and the fear of losing patients with UTIs (41.1%) are other

Table 3: Reasons for Dispensing Antibiotics without Prescription for Urinary Tract Infection Treatment

	Yes (%)	No (%)	Don't Know (%)	Score (Mean ± SD)
1. Community pharmacists have confidence in their knowledge of antibiotics usage for UTI treatment.	187(90.3%)	14(6.8%)	6(2.9%)	2.84±0.52
2. Patients with Urinary tract Infections may try to obtain antibiotics from another pharmacy.	156(75.4%)	35(16.9%)	16(7.7%)	2.58±0.76
3. Patients with Urinary tract Infections may not apply to the hospital due to lack of time	159(76.8%)	32(15.5%)	16(7.7%)	2.61±0.74
4. Patients with Urinary tract Infections may not apply to the hospital due to a lack of finances	189(91.3%)	13(6.3%)	5(2.4%)	2.85±0.5

5. Community pharmacists may be afraid of losing their patients with Urinary Tract Infections	85(41.1%)	110(53.1%)	12(5.8%)	1.88±0.97
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Cronbach's alpha (0.61) was calculated as questionable internal consistency for community pharmacists' reasons for dispensing antibiotics without prescription for urinary tract infection treatment questionnaire.

4.4 Awareness of community pharmacists

Table 4 presents the results of a study on community pharmacists' awareness of antibiotic resistance in North Cyprus. The table shows the percentage of pharmacists who agree, disagree, or are neutral on four statements related to antibiotic resistance, along with the mean score and standard deviation for each statement. The Cronbach's alpha value of 0.74 indicates acceptable internal consistency of the awareness questionnaire.

Table 4: Community Pharmacists' Awareness of Antibiotic Resistance

	Agree (%)	Disagree (%)	Neither Agree nor Disagree (%)	Score (Mean ± SD)
1. Antibiotic resistance is a public health issue in North Cyprus.	136(65.7%)	38(18.4%)	33(15.9%)	2.47±0.79
2. Dispensing antibiotics without a prescription may contribute to antibiotic resistance.	163(78.7%)	27(13.0%)	17(8.2%)	2.66±0.7
3. Patients who decide to take an antibiotic themselves increase the risk of developing antibiotic resistance.	181(87.4%)	16(7.7%)	10(4.8%)	2.8±0.56
4. Discontinuing antibiotics before or after patients' treatments may increase antibiotic resistance.	164(79.2%)	27(13.0%)	16(7.7%)	2.66±0.7

Cronbach's alpha (0.74) was calculated as acceptable internal consistency for community pharmacists' awareness of antibiotic resistance questionnaire.

Table 5 shows the association between demographic factors and community pharmacists' awareness of antibiotic resistance. The table displays the number of pharmacists with good and poor awareness for each demographic factor, including gender, age, nationality, education status, and experience. The table also reports the p-value for each demographic factor using the Pearson Chi-square test, indicating whether there is a statistically significant association between the factor and pharmacists' awareness of antibiotic resistance. A p-value of less than 0.05 was considered statistically significant.

Table 5: Association Between Demographic Factors and Community Pharmacists' Awareness of Antibiotic Resistance

	Good Awareness	Poor Awareness	P-value
1. Gender			
Male	69 (98.6%)	1 (1.4%)	0.006
Female	119(86.9%)	18 (13.1%)	
2. Age			
<30 years old	93 (95.9%)	4 (4.1%)	0.020
30-39 years old	65 (90.3%)	7 (9.7%)	
40-50 years old	16 (79.2%)	5 (23.8)	
>50 years old	14 (82.4%)	3 (17.6)	
3. Nationality			
Turkish Republic of Northern Cyprus	173(90.6%)	18 (9.4%)	0.867
Republic of Turkey	2 (100%)	0	
Others	13 (92.9%)	1 (7.1%)	
4. Education Status			
Bachelor of Pharmacy	65 (86.7%)	10 (13.3%)	0.0001
Master of Pharmacy	100(96.2%)	4 (3.8%)	
PhD	20 (95.2%)	1 (4.8%)	
Others	3 (42.9%)	4 (57.1%)	

5.Experience			
<5 years	85 (94.4%)	5 (5.6%)	0.0001
6-10 years	64 (100%)	0	
11-15 years	11 (64.7%)	6 (35.3%)	
16-20 years	7 (87.5%)	1 (12.5%)	
>20 years	21 (75%)	7 (25%)	
* p < 0.05 was considered the statistically significant association between demographic factors and community pharmacists' awareness of antibiotic resistance by using the Pearson Chi-square test.			

There was found to be an association between gender and community pharmacists' awareness of antibiotic resistance (p=0.006*). There was found to be an association between age and community pharmacists' awareness of antibiotic resistance (p=0.020*). There was not found to be an association between nationality and community pharmacists' awareness of antibiotic resistance. There was found to be an association between education status and community pharmacists' awareness of antibiotic resistance (p=0.0001*). There was found to be an association between experience and community pharmacists' awareness of antibiotic resistance (p=0.0001*).

CHAPTER-5-

DISCUSSION

5.1 Overview

This study aimed to evaluate the community pharmacists' practice of antibiotic use for urinary tract infections (UTI) and their awareness of antibiotic resistance in North Cyprus. The findings revealed that 41% of pharmacists prescribed antibiotics for UTI therapy without a prescription, despite the fact that the majority of participants directed patients with UTI symptoms to physicians. Additionally, a comparable number of pharmacists prescribed and dispersed antibiotics at the patient's request, indicating a lack of adherence to appropriate antibiotic use guidelines.

5.2 Need for interventions to improve community pharmacists' practice

The finding that a sizable percentage of pharmacists gave out antibiotics for the treatment of UTIs without a prescription is alarming since it contributes to antibiotic misuse, which can result in antibiotic resistance. The misuse of antibiotics has been identified as a significant factor in the development and spread of antibiotic resistance (Fletcher, 2015). Interventions to enhance community pharmacists' practices in administering antibiotics are thus urgently needed.

One of the potential reasons for the inappropriate use of antibiotics found in this study is lack knowledge of antibiotic resistance and its causes. Although the majority of the pharmacists were aware of antibiotic resistance, the study identified gaps in their knowledge regarding its causes. These results are consistent with previous studies that have reported a lack of knowledge among healthcare professionals regarding antibiotic resistance (Lalithabai, Hababeh, Wani, & Aboshaiqah, 2022; Sahoo, Tamhankar, Johansson, & Lundborg, 2010).

Several studies were conducted to assess the dispensing of antibiotic without prescription, our findings showed that 41% of the enrolled sample dispense antibiotic for UTI without prescription, these findings in contrast with other study conducted in different countries. This difference between our findings and the other studies may relate to the rules of dispensing antibiotic in each country. (Abubakar, U., & Tangiisuran, B., 2020), (Zawahir, S., et al., 2019) (Hadi, M. A., et al., 2016). In our study, 90% of the pharmacist dispenses antibiotic for UTI due their confidence in their knowledge, which is similar to a study conducted in Nigeria, and the

reason behind the similarity of these findings may due to similarity of the tasks of the pharmacist in both countries and similarity of the studied curriculum. (Abubakar, U., & Tangiisuran, B., 2020)

Even the majority of our sample dispense anti biotic without prescription for the treatment of UTI, around 78% of our pharmacist believed that dispensing antibiotics without a prescription may contribute to antibiotic resistance. These findings showed similarity with the global studies. (Abubakar, U., & Tangiisuran, B., 2020), (Al-Halawa, D. A., et al., 2023), (Alhomoud, F., et al., 2017)

Moreover, the results of this study suggest that the lack of appropriate antibiotic use by community pharmacists in North Cyprus may be due to several factors, including patients seeking antibiotics from other pharmacies, lack of time and finances to go to a hospital, and the pharmacists' fear of losing their patients. These factors highlight the need for a multifaceted approach to address inappropriate antibiotic use. Possible interventions could include educational programs for pharmacists and patients, guidelines for appropriate antibiotic use, and regulations that prohibit dispensing antibiotics without a prescription.

5.3 Role of community pharmacists in promoting rational antibiotic use

Gender appears to be a significant factor, with males having better awareness than females. Among the age groups, those below 30 years old and those between (30 - 39) years old have good awareness compared to other ages.

Another important aspect is education level, with pharmacists with master's and PhD degrees having better awareness than those with other degrees. Another important component is experience, with pharmacists with less than five years' experience and those with (6-10) years' experience having better awareness than those with more than 11 years' experience.

Patients' behavior and attitudes regarding antibiotics can be strongly influenced by the pharmacists' knowledge of and attitudes concerning antibiotic usage and resistance. Therefore, interventions aimed at enhancing community pharmacists' knowledge and practice can have a favorable effect on both antibiotic usage and resistance.

The study reveals that community pharmacists have a good awareness of appropriate UTI treatment practices. However, there is still room for improvement in the non-prescription distribution of antibiotics. The fact that this behavior was mentioned by more than 41% of

respondents raises suspicions since it raises the risk of antibiotic resistance. This result is in line with other research, especially in developing countries, which indicates a high rate of antibiotic distribution without a prescription in community pharmacies. Potential factors driving this behavior include financial incentives or pressure from patients. (Abubakar, U., & Tangiisuran, B., 2020)

The fact that the majority of pharmacists (83.1%) refer patients to physicians when presented with UTI symptoms shows that they recognize the importance of medical evaluation and diagnosis in UTI treatment. This aligns with guidelines from organizations such as the CDC, which recommend appropriate diagnosis and treatment of UTIs (Ashraf et al., 2020).

The findings indicate that community pharmacists are generally providing appropriate advice to patients. However, there is still room for improvement, particularly in recommending over-the-counter treatments for UTIs. This is because over-the-counter drugs may not always be appropriate or effective for treating UTIs and may contribute to the development of antibiotic resistance.

5.4 Strength and limitations

This study is the first study to evaluate the community pharmacists' practice of antibiotic use for urinary tract infections and awareness of antibiotic resistance in North Cyprus, also this study included the major cities in North Cyprus and all community pharmacies who accepted filling the surveys. The response rate of our study (83%) and the power of the sample size both were good compared to other studies which can be enough to generalize the study to the whole pharmacists in North Cyprus.

The study is a cross sectional that collected self-reported surveys, hence, this study is prone to limitations such as limited generalizability, and the findings may not apply to other regions as the study was conducted in Northern Cyprus. Also, the data was collected through self-reported questionnaires which may influenced by response bias and recall bias. In addition, the sample and findings may not reflect the whole pharmacist in North Cyprus.

CHAPTER -6-

CONCLUSIONS AND RECOMMENDATION

This study highlights the need for interventions to improve the practice of community pharmacists regarding antibiotic use for UTI treatment and their awareness of antibiotic resistance in North Cyprus. The results suggest that interventions should focus on increasing knowledge and awareness of antibiotic resistance, promoting adherence to appropriate antibiotic use guidelines, and addressing the potential factors contributing to inappropriate antibiotic use by community pharmacists. Such interventions could positively impact rational antibiotic use and combating antibiotic resistance in North Cyprus and other regions.

Regarding the result obtained, we recommend improving the workshops for pharmacist in North Cyprus related to antibiotic, this is will be adequate to decrease inappropriate and excessive use of antibiotics, optimize therapy and clinical outcomes for the infected patient. In addition, it is imperative to provide education programs regarding the rational applications of antibiotics to all pharmacy students and pharmacists since resistance is a global issue.

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Appendix I

Survey

Section 1-Bölüm 1: Demographic Information of Participants-Katılımcıların Demografik Bilgileri

Gender-Cinsiyetiniz?

- Male-Erkek
- Female-Kadın

2. Age-Yaşınız?

- <30 years old-yaş
- 30-39 years old-yaş
- 40-50 years old-yaş
- >50 years old-yaş

3. Nationality-Uyruğunuz?

- Kuzey Kıbrıs Türk Cumhuriyeti
- Türkiye Cumhuriyeti
- Diğerleri (Belirtiniz.....)

4. Education Status-Eğitim Durumunuz?

- Lisans (BPharm)- Bachelor of Pharmacy
- Yüksek Lisans (MSc veya Mpharm)-Master of Pharmacy
- Doktora-PhD
- Diğer – Others

5. Experience-Deneyiminiz?

- <5 years-yıl.
- 6-10 years-yıl
- 11-15 years-yıl
- 16-20 years-yıl
- >20 years-yıl

Table 1. Community Pharmacists' Practice of Antibiotics dispensed for Urinary Tract Infection treatment- Serbest Eczacıların İdrar Yolu Enfeksiyonu tedavisi için dağıtılan Antibiyotik Uygulaması

	Yes Evet	No Hayır	Don't want to answer
1. Do you dispense antibiotics without a prescription as a common practice for UTI treatment in your pharmacies? (Eczanenizde İdrar Yolları Enfeksiyonu tedavisi için reçetesiz antibiyotik dağıtıyor musunuz?)			
2. Do you dispense antibiotics without a prescription at the patient's request for UTI treatment? (İdrar Yolları Enfeksiyonu tedavisi için hastanın talebi üzerine reçetesiz antibiyotik veriyor musunuz?)			
3. Based on the patient's situation, do you recommend and dispense antibiotics without a prescription? (Hastanın durumuna göre reçetesiz antibiyotik öneriyor ve dağıtıyor musunuz?)			
4. Do you refer your patients to a physician when they present with symptoms of urinary tract infections? (Hastalarınızı İdrar Yolları Enfeksiyonu semptomları ile geldiklerinde doktora sevk ediyor musunuz?)			
5. Do you recommend over-the-counter treatment for patients with symptoms of UTI? (İdrar Yolları Enfeksiyonu semptomları olan hastalara reçetesiz ilaçlar ile tedavi önerir misiniz?)			
6. Do you ask patients about a history of drug allergy before dispensing antibiotics used for UTI? (İdrar Yolları Enfeksiyonu için kullanılan antibiyotikleri vermeden önce hastalara ilaç alerjisi geçmişi hakkında soru soruyor musunuz?)			

7. Do you provide information to your patients regarding the potential and management of side effects of antibiotics used for Urinary Tract Infections? (İdrar Yolu Enfeksiyonlarında kullanılan antibiyotiklerin potansiyel yan etkileri ve yönetimi konusunda hastalarınıza bilgi veriyor musunuz?)			
8. Do you advise your patients to complete the dose of antibiotics dispensed according to their UTI treatment? (Hastalarınıza İdrar Yolları Enfeksiyonu tedavisine göre verilen antibiyotik dozunu tamamlamalarını tavsiye ediyor musunuz?)			

Table 2. Reasons for dispensing antibiotics without prescription for Urinary Tract Infection treatment- İdrar Yolu Enfeksiyonu tedavisi için reçetesiz antibiyotik verilmesinin nedenleri			
	Yes	No	Don't Know
1. Community pharmacists have confidence in their knowledge of antibiotics usage for UTI treatment. (Serbest eczacılar, İYE tedavisi için antibiyotik kullanımı konusundaki bilgilerine güvenirler.)			
2. Patients with Urinary tract Infections may try to obtain antibiotics from another pharmacy (İdrar yolu enfeksiyonu olan hastalar başka bir eczaneden antibiyotik almaya çalışabilirler.)			
3. Patients with Urinary tract Infections may not apply to the hospital due to lack of time. (İdrar Yolu Enfeksiyonu olan hastalar vakit yetersizliğinden hastaneye başvuramayabilirler.)			
4. Patients with Urinary tract Infections may not apply to the hospital due to a lack of finances.(İdrar yolu enfeksiyonu olan hastalar maddi yetersizlik nedeniyle hastaneye			

başvuramayabilirler.)			
5. Community pharmacists may have fear of losing their patients with Urinary Tract Infections.			

Table 3. Community Pharmacists' Awareness of Antibiotic Resistance- Serbest Eczacıların Antibiyotik Direnci Farkındalıkları

	Agree Katılıyorum	Disagree Katılmıyorum	Neither Agree nor Disagree Kararsızım
1. Antibiotic resistance is a public health issue in North Cyprus. (Antibiyotik direnci, Kuzey Kıbrıs'ta bir halk sağlığı sorunudur.)			
2. Dispensing antibiotics without a prescription may contribute to antibiotic resistance. (Reçetesiz antibiyotik verilmesi antibiyotik direncine katkıda bulunabilir.)			
3. Patients who decide to take an antibiotic themselves increase the risk of developing antibiotic resistance.(Kendi kendine antibiyotik almaya karar veren hastalarda antibiyotik direnci gelişme riski artar.)			
4. Discontinuing antibiotics before or after patients' treatments may increase antibiotic resistance (Hastaların tedavilerinden önce veya sonra antibiyotiklerin kesilmesi antibiyotik direncini artırabilir.)			

Appendix II
TURNITIN SIMILARY REPORT

THESIS

ORJİNALLİK RAPORU

% 12	% 8	% 7	% 2
BENZERLİK ENDEKSİ	İNTERNET KAYNAKLARI	YAYINLAR	ÖĞRENCİ ÖDEVLERİ

BİRİNCİL KAYNAKLAR

1	hdl.handle.net İnternet Kaynağı	% 2
2	Usman Abubakar, Balamurugan Tangiisuran. "Knowledge and practices of community pharmacists towards non-prescription dispensing of antibiotics in Northern Nigeria", International Journal of Clinical Pharmacy, 2020 Yayın	% 1
3	Diala Abu Al-Halawa, Rania Abu Seir, Radwan Qasrawi. "Antibiotic Resistance Knowledge, Attitudes, and Practices among Pharmacists: A Cross-Sectional Study in West Bank, Palestine", Journal of Environmental and Public Health, 2023 Yayın	% 1
4	Sumaya Jairoun, Doaa Kamal Alkhalidi, Ammar Abdulrahman Jairoun, Hanan S Anbar. "Over-the-counter antibiotic dispensing: knowledge and practice of community pharmacists in the United Arab Emirates",	% 1