



## SEVERITY OF URINARY TRACT INFECTION SYMPTOMS AND THE ANTIBIOTIC RESISTANCE IN A TERTIARY CARE CENTRE IN PAKISTAN

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### Abstract:

**Introduction:** Urinary tract infections (UTIs) are common and can cause severe symptoms, such as frequent urination, burning feelings, and pelvic discomfort. The abuse of medicines for UTIs adds to the increasing problem of antibiotic resistance. The purpose of this study was to investigate the severity of UTI symptoms and frequency of antibiotic resistance in a tertiary care center in Pakistan.

**Methodology:** A cross-sectional study was conducted in 2023 over 12 months period at a tertiary healthcare hospital in Pakistan. A sample size of 700 adult patients who presented with UTI symptoms was chosen using power analysis. Demographic information, clinical symptoms, medical history, and history of antibiotic use were obtained from medical records. Urine samples were analyzed for uropathogens that cause UTIs, and antibiotic susceptibility testing was used to determine resistance rates.

**Results:** Of the 700 participants, 322 were female. The common symptoms include fatigue, pain, frequent urination, anxiety, and pelvic pain. The UTI severity was categorized as mild, moderate, or severe. In the "Mild" category, 377, 240, and 64 patients reported mild, moderate, and 64 reported severe fatigue, respectively. Most patients reported pain, high frequency of urination, and anxiety. Antibiotic resistance rates were as follows: Bactrim (trimethoprim/sulfamethoxazole), 1 in 3 uncomplicated UTIs, Ciprofloxacin, 1 in 5 uncomplicated UTIs, Other Common Antibiotics (combined), 1 in 5 uncomplicated UTIs.

**Conclusion:** Antibiotic resistance in UTIs is a growing concern, with multidrug resistance becoming more common. Urgent action is required to overcome antibiotic resistance and provide effective treatment for patients with UTIs.

**Keywords:** Urinary tract infection; Antibiotic resistance; Severity; Bactrim; Ciprofloxacin

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## Introduction

Infection of the kidneys, ureters, bladder, urethra, or any other area of the urinary tract, characterized by a strong, ongoing need to go to the toilet, a feeling of burning when urinating, frequently passing tiny amounts of pee, pee that smells strongly or is murky, pain in the pelvic region in women, men's rectal pain, urine containing blood and chills, and fever, point to a more serious infection (1). Urinary tract infections (UTIs) are recognized as potential markers of a global epidemic of antibiotic resistance. UTIs are among the most common types of infections; one in two women and one in ten men will suffer from a UTI at some point in their lives suffer from a UTI (2).

The primary cause of UTIs, as well as many other human diseases, is bacteria that naturally exist on or within our bodies. Therefore, antibiotic therapy is necessary. Nonetheless, the medical profession is becoming increasingly concerned about the increased challenge of treating UTIs with traditional antibiotics (3). In human medicine, antibiotics are regularly provided, often without need, for viral illnesses (such as the common cold, flu, or sinusitis), for which antibiotics are ineffective because they are meant to treat bacterial infections. When antibiotics are used unnecessarily, the body's bacterial balance is upset, leading to a notable change with no apparent reason. Although antibiotics can be lifesaving, when necessary, they selectively target both good and bad bacteria, putting enormous pressure on microorganisms to change and adapt. Adaptable organisms and bacteria exchange genetic material and develop defense mechanisms such as the capacity to reject, degrade, or avoid antibiotics. Without potent antibiotics, these harmful bacteria can easily spread and occasionally cause damage (4,5).

The misuse of antibiotics is a major factor that contributes to antibiotic resistance. Many people have been prescribed antibiotic courses, such as those that treat tract infections (UTIs) that include ciprofloxacin (Cipro) or trimethoprim/sulfamethoxazole (Bactrim). In recent years, the ability of these medicines to treat UTIs has rapidly declined (4). Remarkably, according to recent investigations, including one from the New York Times, one in three simple UTIs in young, healthy women is resistant to Bactrim, and one in five UTIs is resistant to five other conventional antibiotics. Administration of Bactrim as a dependable treatment for UTIs represents a worrisome change (5). Antibiotic administration to animals and overuse of

antibiotics by humans are the two main causes of bacterial resistance, while there are other contributing variables (4).

In the present study, the severity of UTI symptoms and antibiotic resistance were discussed.

## Methodology

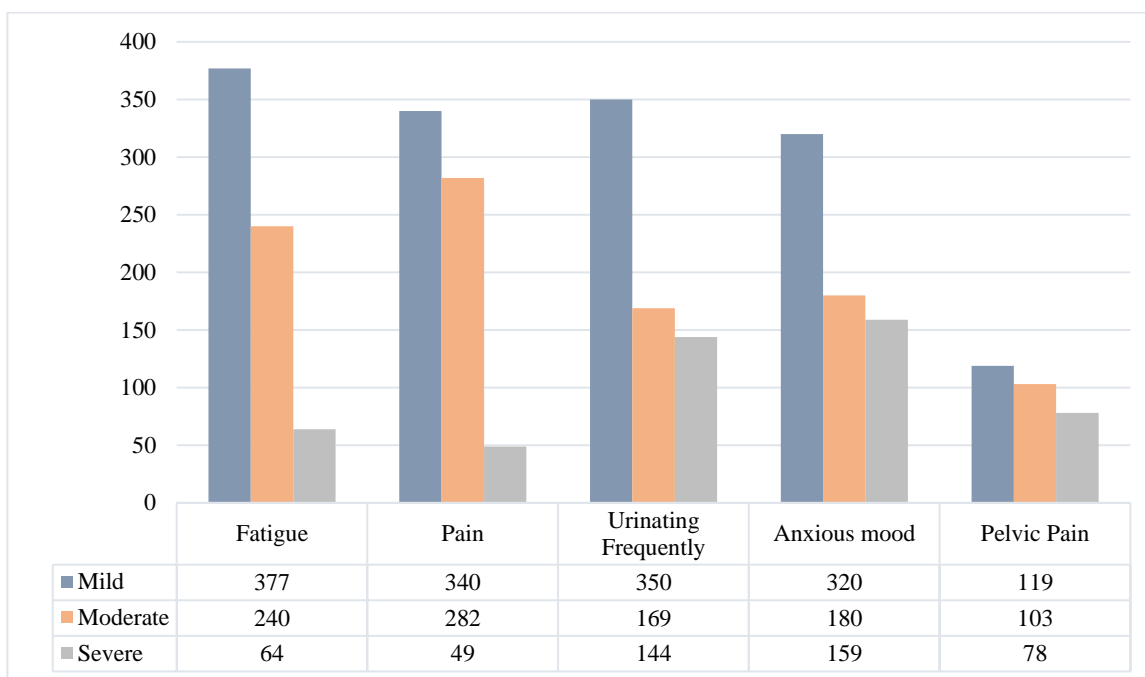
This study used a cross-sectional research methodology to determine the prevalence of antibiotic-resistant UTIs in the adult population. The study was conducted at a tertiary healthcare hospital in Pakistan over the course of 12 months, from January to December 2023. The study's target population consisted of adult patients (18 years of age and older) who visited the hospital for suspected tract infections during the study period. Power analysis was performed to ascertain the necessary sample size. Considering a desired degree of confidence (95%), margin of error (5%), and initial estimate of the expected prevalence of antibiotic-resistant UTIs (approximately 30%), a minimum sample size of 350 patients was determined.

Consecutive sampling was used to select participants from a pool of eligible patients. Patients with symptoms suggestive of UTIs who presented at a medical facility were identified as eligible. Data from 700 patients were recorded to conduct reliable data analysis. The medical records of the subjects were searched for pertinent information such as age, sex, clinical symptoms, and medical history. A history of antibiotic use, including the use of antibiotics for UTIs in the past, was recorded.

The participants provided urine samples for laboratory analysis. Uropathogens causing UTIs have been isolated from urine cultures. Antibiotic susceptibility testing was performed to determine how resistant the isolated uropathogens were to popular antibiotics used to treat UTIs. The frequency of antibiotic resistance in UTIs was the main dependent variable. Means and percentages were used to summarize the demographic characteristics of the study population. The number of antibiotic-resistant UTIs in the sample was used to calculate the prevalence of antibiotic resistance.

## Results

Of the female participants were 322 female, and the most common symptoms were fatigue, pain, frequent urination, anxious mood, and pelvic pain. UTI severity of urinary tract infections was categorized as Mild, Moderate, Severe.



**Figure 1:** Common Symptoms and their severity as reported by people on severity scale.

In the "Mild" category of UTI severity, 377 patients reported experiencing "Mild" fatigue, 240 "Moderate" and 64 patients reported "Severe" fatigue.

671 patients reported pain, 663 patients reported high frequency of urinating than normal, 659 patients reported anxiety and 300 women reported mild to severe pelvic pain.

**Table 1:** Antibiotic Resistance in Urinary tract infection (UTIs) by Antibiotic

Antibiotic Resistance in UTIs by Antibiotic	Frequency in Adult Population
Bactrim (Trimethoprim/Sulfamethoxazole)	1 in 3 uncomplicated UTIs
Ciprofloxacin	1 in 5 uncomplicated UTIs
Other Common Antibiotics (Combined)	1 in 5 uncomplicated UTIs

## Discussion

Simple or complex urinary tract infections (UTIs) impact the lower or upper urinary tract. Clinicians can easily diagnose uncomplicated cystitis and pyelonephritis based on clinical presentation; however, complex UTIs are difficult to diagnose. Pyelonephritis symptoms include fever and costovertebral angle pain/tenderness, whereas simple cystitis symptoms include dysuria, frequency, and urgency. However, pyuria usually presents with UTI regardless of location, and its absence suggests another condition (6). It is simple to treat acute cystitis or pyelonephritis in adult patients if they are not pregnant or elderly, have not recently received antibiotic medication or instrumentation, and do not have any known genitourinary tract anatomical or functional problems. Because *E. coli* is the primary cause of these infections, several oral antibiotics are effective against it; however, resistance is growing. Treatment for acute, simple pyelonephritis should last for 10–14 days. For pyelonephritis, we chose aminoglycosides, trimethoprim-sulfamethoxazole, and fluoroquinolones because they reach high

levels in the renal tissue. Although uncommon, the same uropathogens and antibiotic susceptibilities that cause pyelonephritis and acute uncomplicated cystitis in women also cause pyelonephritis in males in good health (7).

For outpatient treatment of mild to severe pyelonephritis, a 7–10-day oral fluoroquinolone regimen is appropriate if the causal pathogen is responsive and there is a quick clinical response to treatment. Currently, most women with acute simple pyelonephritis are safely and successfully treated as outpatients. Although extremely rare, acute, simple cystitis or pyelonephritis in healthy adult men is typically caused by a range of uropathogens, with a profile of antimicrobial susceptibility similar to that of women. The selection of antibiotics was comparable to that recommended for female cystitis, with the exception that nitrofurantoin is not considered a wise option. In general, a longer course of treatment is advised for women than what is advised for men (8). Patients and healthcare systems bear significant costs because of urinary tract infections, particularly those that occur

repeatedly. In the era of antibiotic resistance and stewardship, testing and treatment approaches have become increasingly crucial. Urine culture is usually the most economical approach and maximizes the number of days without symptoms when administered concurrently with empirical antibiotics. Empirical antibiotics should be considered only in situations in which very little antibiotic resistance is anticipated. The best course of action is to treat symptoms as soon as antibiotic resistance is suspected, as this reduces the need for antibiotics (9). Uropathogenic *E. Coli* (UPEC), the main source of UTIs, can grow as a biofilm that is linked to antibiotic resistance (AMR). High antibiotic resistance to widely used antibiotics is a problem in Tanzania and other low-income settings. Data on global AMR patterns in these settings are lacking. Biofilm-forming *E. coli* constitutes just over half of the isolated bacteria (10).

Most urinary tract infections (UTI) are gram-negative. Owing to their remarkable adaptability and selection of strains with virulence factors, uropathogens propose common processes by which bacterial cells acquire virulence and AMR factors. This is a complicated and context-dependent process in which resistance and virulence increase simultaneously. The abundance of distinct  $\beta$ -lactamases is among the recognized AMR pathways. The AMR risk in UTIs differs according to patient demographics. The history of antibiotic use and physiology of urine flow are two important factors that influence the occurrence of AMR. The microbiome of the genital tract and gut are closely intertwined with that of the urinary system. Furthermore, the development of AMR may be influenced by the pharmacokinetic characteristics and physiochemical makeup of urine compartments. There is a need for broader strategies to manage bacterial infections, as well as alternatives to antibiotic treatment. Antimicrobial peptides (AMPs) and bacteriophage therapies appear to be the most promising options (11).

As time passes, we are losing our treatment alternatives for treating uncomplicated bacterial illnesses, which is why it is concerning to observe that MDR is progressively increasing worldwide. Therefore, it is important to educate practitioners about the likelihood of multidrug resistance. Second, the prevalence of MDR in this study poses a major risk to the treatment of patients with UTIs. This emphasizes the need for a more rigorous, methodical strategy to reduce the rates of antibiotic resistance. Since antibiotic resistance is increasing at an alarming rate in this era, additional research is urgently needed to develop rapid diagnostic tests

(point-of-care testing) that will enable prompt targeted therapy. Additionally, the implementation of a drug monitoring system supports individualized treatment recommendations and enhances drug delivery. Additionally, educational initiatives should be carried out to improve the quality of life of patients residing in low- and middle-income areas and lower the prevalence of disease in the community.

**Limitations:** This study included a single-center emphasis, which may restrict the generalizability of the findings. The use of retrospective medical records raises questions regarding data accuracy and bias. This cross-sectional design precludes the identification of causal linkages and long-term trends. The omission of pediatric populations and certain patient groups may limit the application of the findings to larger demographics. Further research is required to overcome these issues.

#### **Conclusion:**

This study emphasizes the importance of treating the severity of urinary tract infection symptoms and the worrisome prevalence of antibiotic resistance in Pakistani tertiary care centers. Rising antibiotic resistance rates in routinely administered medications necessitate improved awareness among healthcare practitioners, as well as the deployment of effective antimicrobial abuse prevention methods. The value of establishing rapid diagnostic tests, drug monitoring systems, and investigating alternate treatment options, such as antimicrobial peptides and bacteriophage therapy, cannot be emphasized. Immediate action is required to maintain treatment efficacy, enhance patient outcomes, and address the risk of antibiotic resistance worldwide.

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