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Assessment of urinary tract infection resistance among patients visiting the infectious disease service at abuali sina regional hospital in balkh during the year 2025

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Abstract

The aim of this study was to assess antibiotic resistance and the most common bacteria causing urinary tract infections among patients visiting Abuali Sina Regional Hospital in Balkh during the year 1403. This research was conducted descriptively-analytically, and a total of 120 patients with urinary tract infections were selected from various hospital departments using random sampling. For data collection, urine cultures and antibiotic sensitivity testing were performed using the Disk Diffusion method. The results showed that *E. coli* was identified as the most common cause of urinary tract infections, with a prevalence of 70%.

Other common bacteria included *Klebsiella pneumoniae* (20%) and *Proteus mirabilis* (10%). The highest antibiotic resistance was observed against ampicillin and co-trimoxazole, while the least resistance was reported against imipenem and moxifloxacin. In terms of clinical symptoms, urinary frequency (75%) and burning sensation during urination (70.8%) were identified as the most common symptoms among patients. Additionally, data analysis revealed that gender and age influenced the distribution of causative bacteria. Women were more affected by urinary tract infections than men. The findings of this study align with results from similar research in other regions and indicate the need to revise treatment strategies and optimize antibiotic use to reduce antibiotic resistance. These results could serve as a basis for research and health policy-making aimed at combating urinary tract infections and more precise antibiotic management.

Keywords: Antibiotic, urine culture, burning sensation during urination, urinary frequency, ampicillin, and *Proteus mirabilis*

Introduction

Today, hospital-acquired bacteria are considered one of the major problems in hospitals and other healthcare centers. These infections are significant due to the increased duration of hospitalization, higher costs associated with prolonged patient stays, diagnostic procedures, and treatment, as well as mortality rates. Various infections contribute to hospital-acquired infections. One of the most important bacteria causing these infections is *E. coli* (Kolsum Asadpour et al., 2015: 22) ^[1].

Urinary tract infections (UTIs) are among the most common bacterial infections that can have serious impacts on patient health. These infections are particularly more prevalent in women and patients with weakened immune systems, and they can lead to serious complications, including kidney infections and sepsis. With the increasing use of antibiotics in the treatment of these infections, antibiotic resistance has become a major challenge in healthcare. Investigating and evaluating microbial resistance patterns among patients, especially in hospital settings, is essential for improving prevention strategies and preventing resistant infections.

This infection primarily affects women (Swatihi et al., 2024). Every year, 150 million people worldwide suffer from urinary tract infections, mainly caused by *E. coli* and UPEC (Rajesh et al., 2024) ^[9]. It is noteworthy that in uncircumcised males, the prevalence of this disease is higher (C. Ramadhan et al., 2024) ^[7].

Among the common bacteria causing urinary tract infections are *E. coli* and *Klebsiella pneumoniae*. Urinary tract infections are primarily caused by bacteria that naturally reside in the colon, and approximately 80 to 90% of community-acquired urinary tract infections

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(non-hospital-acquired infections) are caused by *E. coli*. Other gram-negative organisms, including strains of *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and various *Proteus* species, are also considered causative bacteria in urinary tract infections.

Urinary tract infections are among the common infectious diseases in humans and can sometimes lead to dangerous complications such as urinary system dysfunction, uremia, hypertension, and even death. The incidence in women is twice that of men due to anatomical differences in the urinary tract. Mortality from urinary tract infections is more frequently observed in children under one year of age and individuals over 64 years old (Fattahi and Soleimani-Zar, 2021: 129) [4].

The importance of this issue arises from the fact that with increasing microbial resistance, the treatment of urinary tract infections becomes complicated, and it may.

There may be a need to use more expensive medications with greater side effects. Additionally, a lack of accurate understanding of resistance patterns can lead to ineffective treatments and prolonged hospital stays for patients. For this reason, this study aims to investigate antibiotic resistance among patients visiting the infection service at Abuali Sina Regional Hospital in Balkh during the year 2025.

Urinary Infection

Urinary tract infections (UTIs) are among the most common bacterial infections, affecting approximately 150 million people worldwide. Uropathogenic *E. coli* (UPEC) is the primary cause of UTIs and is known for its ability to form biofilms, which contribute to antibiotic resistance. Infectious urinary infections are more common in women, with about 50% of women experiencing at least one urinary infection in their lifetime.

One of the problems that many women and men may encounter during their lives is urinary tract infection. This infection presents various symptoms, such as burning during urination, the presence of blood or pus in the urine, foul-smelling urine, and so on. This condition occurs due to the entry of bacteria into the urinary tract. Treating this condition requires addressing the causative agent and controlling the infection. Typically, various antibiotics are used for this purpose. The treatment of urinary tract infections is of great importance, as in cases where this condition is not treated in a timely manner, the infection can enter the bloodstream, putting the patient at risk of death.

Recent studies have examined the factors influencing urinary infections and treatment methods. For example, one study found that the combination of cefepime-taniborbactam could be effective in treating complicated urinary infections and has an impact on carbapenem-resistant bacteria (Wagenlehner 2024) [11].

Additionally, another research focused on the efficacy of d-mannose in preventing recurrent urinary infections in women. This study indicates that d-mannose can help reduce urinary infections (Hayward 2024) [8]. Finally, new investigations also highlight the importance of accurate diagnosis and treatment of urinary infections and the management of antibiotic resistance (Bančević 2022) [6].

Symptoms of Urinary Infection

The symptoms of urinary infection can vary depending on gender, age, the affected area, and other factors. In some cases, a urinary infection may show no signs or symptoms

for several days, and then the symptoms will present themselves. Urinary infections are more common in older individuals, and it is recommended that if such symptoms are observed, they should promptly consult a specialist doctor. The most common urinary symptoms in both women and men are as follows:

- Frequent urination with small amounts of urine each time.
- Blood in the urine.
- Urine that has a color similar to tea.
- Urine with a strong and pungent odor.
- Rectal pain in men.
- Pain in the pelvic region and genital area around the pelvic bones in women.
- Burning sensation during urination.
- Urgency to urinate quickly.
- Presence of blood in the urine.
- Cloudy and murky urine.
- Fever and chills.
- Nausea.

Research Background

Nabizada and colleagues (2020) conducted a study to examine the resistance and sensitivity of antibiotics in bacterial agents isolated from UTIs in patients with urine cultures in Balkh province. This descriptive-cross-sectional study was carried out over a two-year period from 2018 to 2020 in the microbiology laboratory of the Faculty of Medicine at the Taj Higher Education Institute in Afghanistan. For this purpose, 33 midstream urine samples were collected from outpatients referred by their treating doctors to the diagnostic center in sterile containers.

Identification of the target bacteria was performed using bacteriological tests by culturing the clinical samples within the first 24 hours on Blood agar, Chocolate agar, and Manitol salt agar. After 24 hours, colonies were sampled for Gram staining, SIM tests, and biochemical and enzymatic tests such as oxidase, coagulase, catalase, sugar fermentation tests, indole test, and VPR test, to differentiate between Gram-negative bacteria. The Antibiotic Susceptibility Test (AST) or antibiogram was determined by the Disk Diffusion Method (Kirby-Bauer) in Mueller-Hinton agar. The results of the study indicated that out of the 33 samples, 20 were from men and 13 were from women. The percentages of bacteria isolated from urine were as follows: *E. coli* (55.59%), enterococci (17%), and staphylococci (10.2%). The highest sensitivity among antibiotics was observed as follows: imipenem (99%), moxifloxacin (84%), nitrofurantoin (77.5%), amikacin (74%), ciprofloxacin (68%), and levofloxacin (65.5%). Additionally, the highest resistance of bacteria against antibiotics was recorded in the following order: ceftriaxone (96%), cotrimoxazole (87.5%), and Augmentin (83.5%). Therefore, the identified bacteria showed significantly lower resistance to imipenem (1%), moxifloxacin (16%), and nitrofurantoin (22.5%). Koltoum Asadpour and colleagues conducted a study in 1394 to investigate the antibiotic resistance profile in *Escherichia coli* isolates from patients with urinary infections in Rasht County, Iran. This descriptive study, carried out in 1393 in Rasht, involved the examination of 980 urine samples, and *E. coli* isolates were obtained from the urine samples of hospitalized patients with urinary infections who had not received antibiotics. An antibiogram was performed, and the combined disk method

was used to identify ESBL-producing strains. The results showed that out of 195 E. coli isolates, 76.93% were from women and the rest from men. The highest sensitivity was found for imipenem. The resistance rates in the penicillin family were highest for oxacillin and ampicillin, while for cephalosporins, the highest resistance was noted for cephalothin. Additionally, the lowest resistance was observed for cefoxitin (Koltoum Asadpour et al., 2015: 22) [1].

Baghani Avval and colleagues (2017) [2] conducted a study to evaluate common bacterial agents of urinary infections and determine their antibiotic resistance in hospitalized and outpatient patients visiting Vasi Hospital in Sabzevar, Iran, during the year 1395. This cross-sectional study involved 256 patients over 18 years old at Vasi Hospital in Sabzevar in 1395. The identification of bacterial isolates was performed using biochemical tests and microbial sensitivity testing by the disk diffusion method. Of the 256 samples examined, 59.7% were female and 40.3% were male. The most common causative agents of urinary infections were E. coli (50.8%), Klebsiella (17.6%), coagulase-negative staphylococci (15.62%), and Enterobacter (7.8%). E. coli, the most prevalent urinary pathogen, showed the highest resistance to ampicillin and the lowest resistance to imipenem. Overall, considering the type of microbe, the highest resistance was to amoxicillin and the lowest resistance was to imipenem (Baghani Avval et al., 2017: 687) [2].

Fattahi and Soleimani-Zar (2021) [4] investigated the bacteria isolated from urine cultures and their antibiotic resistances in hospitalized patients at Golestan Educational Hospital in Ahvaz, Iran. This descriptive-cross-sectional study examined the results of approximately 5,000 urine samples sent for culture from the inpatient departments of the hospital in 2019. Of the total 5,000 samples studied (39.7% female and 60.3% male), about 468 samples, equivalent to 9.36% of the cases, were positive for urine culture.

Among the urinary infections, 205 individuals (43.8%) were female. With increasing age, the likelihood of developing a urinary infection rose. The most common bacteria causing urinary infections were E. coli at 51.5%, followed by Klebsiella at 29.3%. The isolates from the urine samples of individuals with urinary infections exhibited antibiotic resistance, with certain groups of antibiotics being more effective depending on the specific bacteria (Fattahi and Soleimani-Zar, 2021: 129) [4].

Research Methodology

This study is designed as a descriptive-cross-sectional study, investigating the antibiotic resistance of urinary infections in patients visiting the Infectious Diseases Service of Abu Ali Sina Balkhi Educational Hospital during the year 2025. The study population includes all patients who presented with symptoms of urinary infections and underwent urine sampling for diagnosis. Sampling will be conducted using simple random sampling or convenience sampling, and the sample size was determined using Cochran's formula, resulting in 120 participants. The collected data includes demographic characteristics, urine culture results, and antibiotic sensitivity. Data were gathered through standard microbiological laboratory tools and validated instruments, and analyzed using SPSS version 27. Data analysis was performed using descriptive methods (mean and standard

deviation) and inferential tests (such as Chi-square).

Inclusion Criteria

1. All patients who presented with clinical symptoms of urinary infections (such as frequent urination, burning sensation during urination, lower abdominal pain, fever, and chills) to the Infectious Diseases Service of Abu Ali Sina Balkhi Educational Hospital during the year 1403.
2. Patients from whom urine samples were taken for culture and antibiotic sensitivity testing.
3. Patients who provided informed consent to participate in the study.

Exclusion Criteria

1. Patients who have previously received antibiotic treatment that may affect the results of urine cultures.
2. Patients who require different interventions due to other issues (such as chronic kidney disease or urinary tract obstruction).
3. Patients with incomplete or unreliable information in their records.
4. Patients who did not provide consent to participate in the study.

Data Analysis

Table 1: Demographic Characteristics of Patients

Characteristic	Category	Number (n)	Percentage (%)
Gender	Female	72	60
	Male	48	40
Age (years)	18-30	40	33.3
	31-50	50	41.7
	Above 50	30	25

In Table (1), the demographic characteristics of the patients are examined. In terms of gender, the number of women with urinary infections is higher than that of men, with women constituting 60% of the patients, while men account for the remaining 40%. This finding indicates a higher prevalence of urinary infections in women, which may be related to anatomical and hormonal factors. Regarding age, the group aged 31 to 50 years shows the highest frequency at 41.7%, indicating that urinary infections are more commonly observed in this age group compared to others. The age group of 18 to 30 years ranks second with 33.3%, while the group over 50 years constitutes 25% of the patients.

These findings suggest that urinary infections are more prevalent in women and among individuals aged 31 to 50 years. This result may be attributed to hormonal changes and sexual activity in women, as well as immune system weaknesses and accompanying diseases in the middle-aged group.

Table 2: Urine Culture Results

Bacteria	Number of Samples (n)	Percentage (%)
E. coli	84	70
Klebsiella pneumoniae	24	20
Proteus mirabilis	12	10

The results of the urine cultures indicate that the highest frequency is associated with E. coli, which constitutes 70% of the cultured samples. This bacterium is recognized as the

most common causative agent of urinary infections, and this finding is consistent with previous research that shows a high prevalence of *E. coli* in these types of infections. Following *E. coli*, *Klebsiella pneumoniae* accounts for 20%, and *Proteus mirabilis* for 10%. These differences highlight the presence of various bacteria in urinary infections, which can aid in accurate diagnosis and more effective treatment.

Table 3: Common Clinical Symptoms

Clinical Symptom	Number (n)	Percentage (%)
Frequent Urination	90	75
Burning Urination	85	70.8
Lower Abdominal Pain	60	50
Fever and Chills	48	40

The results in Table (3) indicate that the most common clinical symptom in patients with urinary infections is frequent urination, observed in 75% of the patients. Following this, burning sensation during urination, at 70.8%, is the second most common symptom. These symptoms are typically directly associated with urinary infections and play a significant role in the diagnosis of the condition. Other common symptoms include lower abdominal pain (50%) and fever and chills (40%), which rank as the third and fourth most common symptoms in the patients, respectively.

Table 4: Association Between Gender and Type of Infection

Gender	<i>E. coli</i>	<i>Klebsiella pneumoniae</i>	<i>Proteus mirabilis</i>	Total
Female	60	8	4	72
Male	24	16	8	48
Total	84	24	12	120

The results in Table (4) show the relationship between gender and the types of bacteria causing urinary infections in patients. It is observed that among women, the highest prevalence is associated with *E. coli* (60 out of 72 infected women), while in men, *E. coli* is also the most common bacterium, but the number of *Klebsiella pneumoniae* samples is higher in men (16) compared to women (8). Additionally, *Proteus mirabilis* is more frequently observed in men (8) than in women (4). These data suggest that gender may influence the types of bacteria causing urinary infections, which could be due to anatomical and physiological differences between men and women.

Table 5: Comparison of Mean Antibiotic Resistance Among Bacteria

Bacteria	Mean Resistance to Ampicillin (%)	Standard Deviation (%)	Number of Samples
<i>E. coli</i>	80	5	84
<i>Klebsiella pneumoniae</i>	85	10	24
<i>Proteus mirabilis</i>	90	8	12

This table shows that the average resistance to ampicillin in *Proteus mirabilis* is the highest (90%), while *E. coli* exhibits the lowest average resistance at 80%. *Klebsiella pneumoniae* ranks second with 85%. The standard deviation of these resistances also indicates the variability of results among the samples; for example, *Klebsiella pneumoniae* has a higher standard deviation (10%) compared to *E. coli* (5%), indicating greater diversity in antibiotic resistance for this bacterium. These data can assist doctors in making better

decisions based on the varying resistances of bacteria to antibiotics.

Results

The aim of this study was to evaluate antibiotic resistance and the most common bacteria causing urinary infections in patients visiting Abu Ali Sina Regional Hospital in Balkh during the year 1403. In this study, the research method was descriptive-analytical, utilizing random sampling from 120 patients with urinary infections. The data collected through medical record reviews, urine cultures, and antibiotic susceptibility testing were analyzed.

A study of 120 patients with urinary infections who visited Abu Ali Sina Regional Hospital in Balkh revealed that the most common bacterium causing these infections was *E. coli*, observed in 70% of the samples. Following this, *Klebsiella pneumoniae* accounted for 20%, and *Proteus mirabilis* for 10%. Among the demographic characteristics of the patients, 60% were women and 40% were men. Additionally, the age group of 31 to 50 years had the highest prevalence at 41.7%.

In examining clinical symptoms, frequent urination (75%) and burning sensation during urination (70.8%) were the most commonly observed symptoms. Other common symptoms included lower abdominal pain (50%) and fever and chills (40%). Moreover, the analysis of the relationship between gender and type of infection indicated that women are more likely to be infected with *E. coli*, while men show greater sensitivity to *Klebsiella pneumoniae* and *Proteus mirabilis*.

The results of antibiotic resistance showed that *Proteus mirabilis* has the highest resistance to ampicillin (90%), while *E. coli* shows the lowest resistance (80%). These findings confirm the impact of gender, age, and type of bacterium on the prevalence and severity of urinary infections, providing useful information for decision-making regarding antibiotic treatments.

Discussion

The present study aimed to evaluate antibiotic resistance and the most common bacteria causing urinary infections in patients who visited Abu Ali Sina Regional Hospital in Balkh. The results of the research indicated that *E. coli* is the most prevalent cause of urinary infections among the studied patients. These results align with the study by Nabizadeh et al. (2020) [5], in which *E. coli* was also identified as the most common cause of urinary infections. Additionally, both studies observed a high resistance of bacteria to commonly used antibiotics such as trimethoprim-sulfamethoxazole and amoxicillin.

The results of the present study align with other research, including studies by Kalthum Asadpour et al. (2015) [1] and Baghani Aval et al. (2017) [2], in which *E. coli* was also identified as the most common bacterium causing urinary infections. In the study by Kalthum Asadpour et al. (2015) [1], the resistance levels of *E. coli* to antibiotics such as ampicillin and cephalothin were reported, and similar results were observed in this research, showing high resistance of *E. coli* to antibiotics. Additionally, in the study by Baghani Aval et al. (2017) [2], the lowest resistance was noted against imipenem, which was also reflected in the current study, where *E. coli* and other bacteria showed the least resistance to imipenem. These results emphasize the effectiveness of imipenem in treating urinary infections.

Considering the findings of the study, the high antibiotic resistance against certain drugs such as trimethoprim-sulfamethoxazole and amoxicillin, along with the low resistance to imipenem and moxifloxacin, as well as the prevalence of *E. coli* as the main causative agent, it seems necessary to implement more precise management in the use of antibiotics and to conduct more detailed studies on drug

resistance in this region. Additionally, differences in bacterial resistance based on gender and age were observed, which are consistent with the results of previous studies. This research can serve as a basis for further studies aimed at preventing and optimizing the treatment of urinary infections in the region and other similar areas.

Table 6: Comparison of Findings from the Present Study with Previous Research

Feature	Present Study (2025)	Nabizadeh et al. (2020) [5]	Baghalian et al. (2017) [2]	Kolthoum Asadpour et al. (2015) [1]
Most Common Causative Bacteria	<i>E. coli</i> (70%)	<i>E. coli</i> (55.59%)	<i>E. coli</i> (50.8%)	<i>E. coli</i> (76.93%)
Highest Antibiotic Resistance	<i>E. coli</i> - High resistance to Amoxicillin and Cotrimoxazole	<i>E. coli</i> - High resistance to Ceftriaxone and Cotrimoxazole	<i>E. coli</i> - High resistance to Ampicillin	<i>E. coli</i> - High resistance to Ampicillin
Lowest Antibiotic Resistance	<i>E. coli</i> - Lowest resistance to Imipenem	<i>E. coli</i> - Lowest resistance to Imipenem	<i>E. coli</i> - Lowest resistance to Imipenem	<i>E. coli</i> - Lowest resistance to Cefoxitin
Antibiotic Susceptibility Testing Method	Disk Diffusion Method	Disk Diffusion Method	Disk Diffusion Method	Disk Diffusion Method
Most Affected Age Group	31-50 years (41.7%)	60.61% male, 39.39% female (age group not specified)	Most cases in the adult age group	76.93% of infected women had <i>E. coli</i>

Conclusion

The results of this study indicated that *E. coli* is the most common bacterium causing urinary infections in patients visiting Abu Ali Sina Regional Hospital in Balkh. This bacterium accounts for over 70% of urinary infection cases and is predominantly seen in women. Furthermore, the age group of 31 to 50 years showed the highest prevalence among patients with urinary infections, which may be related to hormonal changes and lifestyle factors.

Common clinical symptoms in patients included frequent urination, burning sensation during urination, lower abdominal pain, and fever and chills, highlighting the importance of these symptoms in diagnosis and management. In terms of antibiotic resistance, *Proteus mirabilis* exhibited the highest resistance to ampicillin, which should be considered in the selection of therapeutic drugs. These findings emphasize that attention to gender, age, and types of bacteria causing urinary infections can aid in prevention, rapid diagnosis, and effective treatment of this condition. It is recommended that further studies be conducted in this area to develop better treatment and preventive strategies for addressing urinary infections in the region.

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