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Original Article

Antibiotic Resistance Pattern of E. Coli Isolated from UTI Patients at Mayo Hospital

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ABSTRACT

Background: Urinary tract infection is one of the most common bacterial infections encountered in clinical practice, and Escherichia coli remains the leading uropathogen. Increasing antimicrobial resistance among urinary E. coli isolates has reduced the effectiveness of commonly used empirical antibiotics and highlights the need for local susceptibility surveillance. **Objective:** To determine the antibiotic resistance pattern of Escherichia coli isolated from urinary tract infection patients at Mayo Hospital, Lahore. **Methods:** A descriptive cross-sectional study was conducted over six months in the Clinical Microbiology Laboratory of Mayo Hospital, Lahore. A total of 200 culture-positive urine samples from patients with urinary tract infection were processed using standard microbiological methods. Bacterial isolates were identified by colony morphology, Gram staining, biochemical testing, and VITEK-2 Compact system. Antimicrobial susceptibility testing of confirmed E. coli isolates was performed using the Kirby–Bauer disk diffusion method according to Clinical and Laboratory Standards Institute guidelines. **Results:** E. coli was the predominant uropathogen, isolated from 142 of 200 samples (71.0%). Among E. coli cases, 96 (67.6%) were female and 46 (32.4%) were male. The highest sensitivity was observed for imipenem 140/142 (98.6%), fosfomycin 126/142 (88.7%), and nitrofurantoin 120/142 (84.5%). The highest resistance was observed against nalidixic acid 115/142 (81.0%), Septran 98/142 (69.0%), and cefoperazone 78/142 (54.9%). **Conclusion:** E. coli was the major uropathogen among urinary tract infection patients, with substantial resistance to commonly used antibiotics. Routine urine culture, antimicrobial susceptibility testing, rational antibiotic prescribing, and continuous local resistance surveillance are essential to guide effective treatment. **Keywords:** Urinary tract infection, Escherichia coli, antimicrobial resistance, antibiotic susceptibility, fosfomycin, nitrofurantoin.

INTRODUCTION

Urinary tract infection is one of the most frequent bacterial infections encountered in both community and hospital settings and remains an important cause of patient morbidity, repeated healthcare visits, antimicrobial use, and treatment cost. It may involve any part of the urinary tract, including the urethra, bladder, ureters, or kidneys, although lower urinary tract involvement is most commonly reported in routine clinical practice (1). Patients usually present with dysuria, urinary frequency, urgency, suprapubic discomfort, pyuria, bacteriuria, cloudy urine, or flank pain, while some individuals may have bacteriuria with minimal or no symptoms. Because clinical features alone may not reliably distinguish bacterial UTI from other urinary or genital conditions, laboratory confirmation through urine culture and antimicrobial susceptibility testing is essential for accurate diagnosis and appropriate treatment selection (2,3).

Among bacterial uropathogens, Escherichia coli remains the leading causative organism of urinary tract infections worldwide, particularly in community-acquired cases. Its predominance is largely related to its intestinal origin, ability to colonize the periurethral region, adherence to uroepithelial cells through fimbrial adhesins, biofilm-forming capacity, toxin production, and mechanisms that allow persistence within the urinary tract (4). These virulence characteristics enable E. coli to ascend from the urethra to the bladder and, in complicated cases, to the upper urinary tract. In Pakistan and other low- and middle-income settings, E. coli has consistently been reported as the major uropathogen in both uncomplicated and complicated UTIs, although its relative frequency varies across hospitals, patient groups, and laboratory practices (5,6).

The burden of UTI is not evenly distributed across populations. Females are affected more frequently than males because of anatomical and physiological factors, including a shorter urethra and closer proximity of the urethral opening to the anal region, which facilitate ascending bacterial colonization. Pregnancy, sexual activity, previous UTI, diabetes mellitus, urinary obstruction, catheterization, older age, and immunocompromised status further increase susceptibility to infection and recurrence. In males, the risk rises particularly in older age groups due to prostatic enlargement, urinary retention, neurogenic bladder, and instrumentation. These host-related factors influence the occurrence and severity of UTI, but the success of treatment is increasingly determined by the antimicrobial susceptibility profile of the infecting organism (7,8).

Antimicrobial resistance has become a major challenge in the management of urinary tract infections. Empirical treatment is often initiated before culture results are available; however, increasing resistance among uropathogenic E. coli has reduced the effectiveness of commonly used antibiotics such as fluoroquinolones, cephalosporins, and trimethoprim-sulfamethoxazole. Resistance may arise through chromosomal mutations, plasmid-mediated resistance genes, beta-lactamase production, altered membrane permeability, efflux pumps, and biofilm-associated protection (9). Inappropriate antibiotic prescribing, incomplete treatment courses, self-medication, over-the-counter antibiotic availability, and inadequate antimicrobial stewardship further accelerate the emergence and spread of resistant strains. As a result, treatment failure, recurrent infection, prolonged illness, and increased healthcare expenditure have become increasingly common clinical concerns (10).

Local surveillance of antimicrobial susceptibility patterns is therefore essential because resistance profiles vary by region, hospital, patient population, antibiotic-use practices, and infection-control standards. Findings from one institution cannot be safely generalized to another without periodic local assessment. For clinicians managing UTI at Mayo Hospital, updated information on the susceptibility profile of E. coli is necessary to guide empirical therapy, reduce unnecessary broad-spectrum antibiotic use, and support antimicrobial stewardship. In particular, identifying antibiotics that retain high activity against local E. coli isolates can help optimize treatment decisions while preserving reserve agents such as carbapenems for severe or resistant infections (11).

Despite the high clinical burden of UTI and the growing concern of antimicrobial resistance, locally generated data on the antibiotic resistance pattern of E. coli isolated from UTI patients at Mayo Hospital remain limited. This knowledge gap restricts evidence-based empirical prescribing and may contribute to inappropriate antibiotic selection. Therefore, the present study was conducted among patients with urinary tract infection at Mayo Hospital to determine the frequency of E. coli among bacterial isolates and to evaluate its antibiotic susceptibility and resistance pattern against commonly used antimicrobial agents. The primary objective was to determine the antibiotic resistance pattern of Escherichia coli isolated from UTI patients at Mayo Hospital.

MATERIALS AND METHODS

A descriptive cross-sectional observational study was conducted over a period of six months in the Clinical Microbiology Laboratory of Mayo Hospital, Lahore, to determine the antimicrobial resistance

pattern of Escherichia coli isolated from patients with urinary tract infection. The cross-sectional design was selected because it allowed assessment of the frequency of uropathogens and their antibiotic susceptibility profile at a defined point within the study period. Patients of any age and sex who presented with clinical features suggestive of urinary tract infection, including dysuria, urinary frequency, urgency, pyuria, bacteriuria, suprapubic discomfort, or positive urine culture, were included. Pregnant or lactating women, patients with recent antibiotic use, immunocompromised status, kidney transplantation, known urinary tract abnormalities, or other conditions that could alter the usual microbiological profile of urinary tract infection were excluded (6).

A total of 200 urine samples were collected from eligible patients using a conventional sampling technique. Midstream clean-catch urine specimens were obtained from non-catheterized patients after appropriate instructions regarding perineal cleaning and avoidance of contamination, while catheterized urine samples were collected aseptically from the catheter sampling port where applicable. Each sample was placed in a sterile, leak-proof, properly labeled urine container and transported promptly to the microbiology laboratory for processing. Demographic and clinical information, including age, sex, clinical presentation, sample type, and relevant laboratory findings, was recorded on a structured data collection form to ensure uniformity of data capture.

Urine samples were processed using standard microbiological procedures. Each specimen was inoculated on MacConkey agar, blood agar, and cysteine lactose electrolyte-deficient agar, followed by aerobic incubation at 37°C for 24–48 hours. After incubation, culture plates were examined for bacterial growth, colony morphology, lactose fermentation, hemolysis pattern, and purity of growth. Isolates suspected to be Escherichia coli were further identified using Gram staining and biochemical testing, and confirmation was performed using the VITEK-2 Compact system. Other bacterial isolates recovered from urine cultures were recorded to determine the overall distribution of uropathogens; however, antimicrobial resistance analysis was focused on confirmed E. coli isolates.

Antimicrobial susceptibility testing of confirmed E. coli isolates was performed by the Kirby–Bauer disk diffusion method on Mueller–Hinton agar according to Clinical and Laboratory Standards Institute guidelines. A standardized bacterial suspension was prepared from fresh pure colonies and adjusted to match the turbidity of a 0.5 McFarland standard before inoculation onto Mueller–Hinton agar plates. Antibiotic disks were applied aseptically with adequate spacing, and plates were incubated aerobically at 37°C for 18–24 hours. After incubation, zones of inhibition were measured in millimeters and interpreted as sensitive or resistant according to standard breakpoint criteria. The antibiotics tested included fosfomycin, nitrofurantoin, cefoperazone, gentamicin, imipenem, nalidixic acid, and Septran. For consistency in reporting, antimicrobial susceptibility results were entered as categorical variables for each antibiotic.

The primary study variable was antibiotic resistance among E. coli isolates recovered from urine samples of patients with urinary tract infection. The main outcome was the proportion of E. coli isolates resistant or sensitive to each tested antibiotic. Additional variables included sex distribution, frequency of bacterial isolates among urine cultures, and the association between gender and antibiotic resistance pattern. Operationally, urinary tract infection was defined by compatible clinical features supported by laboratory evidence of bacteriuria or positive urine culture. Confirmed E. coli UTI was defined as isolation and identification of E. coli from a urine culture processed through standard microbiological methods. Antibiotic resistance was defined as absence of susceptibility to a tested antimicrobial agent based on disk diffusion interpretation criteria.

Measures were taken to reduce bias and improve reliability of results. Samples were collected using aseptic procedures to minimize contamination, and culture processing was performed using standardized laboratory protocols. Identification of isolates was based on a combination of colony characteristics, Gram staining, biochemical reactions, and automated confirmation. Antimicrobial susceptibility testing was conducted under uniform incubation conditions using Mueller–Hinton agar

and standardized inoculum density. Data were recorded on structured forms and checked for completeness before entry into the statistical software. Laboratory findings and demographic variables were coded consistently to minimize data entry errors and maintain reproducibility.

The sample size consisted of 200 urine samples collected during the defined study period from eligible patients meeting the inclusion criteria. Statistical analysis was performed using SPSS version 28.0. Descriptive statistics were used to summarize demographic characteristics, frequency of bacterial isolates, and antibiotic susceptibility patterns. Categorical variables were presented as frequencies and percentages. The Chi-square test was applied to assess associations between gender and antibiotic resistance patterns among E. coli isolates. A p-value of less than 0.05 was considered statistically significant. Missing or incomplete entries were excluded from the relevant analysis, and available-case analysis was applied for variables with complete recorded data.

The study was conducted after approval of the research synopsis and in accordance with ethical principles for human-subject research. Patient confidentiality was maintained throughout the study by using coded data without personal identifiers during analysis. Urine specimens were collected and processed only for diagnostic and research purposes related to urinary tract infection and antimicrobial susceptibility assessment. All laboratory records were handled securely, and access to collected data was limited to the research team. Data integrity was maintained through standardized collection procedures, consistent laboratory processing, double-checking of entered values, and preservation of analyzed records for reproducibility.

RESULTS

A total of 200 culture-positive urine samples from patients with urinary tract infection were analyzed. Escherichia coli was the most frequently isolated uropathogen, accounting for 142 cases, representing 71.0% of all bacterial isolates. Klebsiella pneumoniae was the second most common isolate, identified in 24 cases, corresponding to 12.0% of the total. Pseudomonas aeruginosa was isolated in 16 cases, representing 8.0%, followed by Staphylococcus species in 10 cases, representing 5.0%, and Proteus mirabilis in 8 cases, representing 4.0%. These findings demonstrate that E. coli was the dominant bacterial pathogen among patients with urinary tract infection, with a frequency nearly six times higher than that of Klebsiella pneumoniae, the next most frequent isolate.

Table 1. Frequency Distribution of Bacterial Isolates Among Patients with Urinary Tract Infection

Bacterial Isolate	Frequency (n)	Percentage (%)
Escherichia coli	142	71.0
Klebsiella pneumoniae	24	12.0
Pseudomonas aeruginosa	16	8.0
Staphylococcus species	10	5.0
Proteus mirabilis	8	4.0
Total	200	100.0

Among the 142 patients with confirmed E. coli-associated urinary tract infection, females constituted the majority of cases. A total of 96 female patients were culture-positive for E. coli, representing 67.6% of all E. coli isolates, whereas 46 male patients were affected, representing 32.4%. The female-to-male ratio was approximately 2.1:1, indicating that E. coli urinary tract infection was more frequently observed among females than males in the study population.

Table 2. Gender Distribution of Patients with E. coli Urinary Tract Infection

Gender	Frequency (n)	Percentage (%)
Female	96	67.6
Male	46	32.4
Total	142	100.0

Antimicrobial susceptibility testing was performed on 142 confirmed E. coli isolates. Imipenem demonstrated the highest antimicrobial activity, with 140 isolates sensitive, corresponding to 98.6%, and only 2 isolates resistant, corresponding to 1.4%. Fosfomycin also showed strong activity, with 126

sensitive isolates, representing 88.7%, and 16 resistant isolates, representing 11.3%. Nitrofurantoin showed a similar favorable susceptibility profile, with 120 sensitive isolates, representing 84.5%, and 22 resistant isolates, representing 15.5%. Gentamicin demonstrated moderate effectiveness, with 98 sensitive isolates, representing 69.0%, and 44 resistant isolates, representing 31.0%.

In contrast, higher resistance was observed against cefoperazone, Septran, and nalidixic acid. Cefoperazone showed sensitivity in 64 isolates, corresponding to 45.1%, while 78 isolates, corresponding to 54.9%, were resistant. Septran showed sensitivity in 44 isolates, corresponding to 31.0%, while 98 isolates, corresponding to 69.0%, were resistant. Nalidixic acid showed the lowest susceptibility, with only 27 isolates sensitive, corresponding to 19.0%, and 115 isolates resistant, corresponding to 81.0%. Overall, the lowest resistance was observed against imipenem, followed by fosfomycin and nitrofurantoin, whereas the highest resistance was observed against nalidixic acid, Septran, and cefoperazone.

Table 3. Antibiotic Susceptibility and Resistance Profile of E. coli Isolates

Antibiotic	Sensitive, n (%)	Resistant, n (%)	Total Isolates (n)
Imipenem	140 (98.6)	2 (1.4)	142
Fosfomycin	126 (88.7)	16 (11.3)	142
Nitrofurantoin	120 (84.5)	22 (15.5)	142
Gentamicin	98 (69.0)	44 (31.0)	142
Cefoperazone	64 (45.1)	78 (54.9)	142
Septran	44 (31.0)	98 (69.0)	142
Nalidixic acid	27 (19.0)	115 (81.0)	142

The antibiotics were further categorized according to resistance burden to support clinical interpretation of the susceptibility pattern. Imipenem, fosfomycin, and nitrofurantoin were placed in the low-resistance category, with resistance rates below 20%. Gentamicin was categorized as moderate resistance, with a resistance rate of 31.0%. Cefoperazone, Septran, and nalidixic acid were categorized as high-resistance antibiotics, with resistance rates exceeding 50%. Nalidixic acid showed the greatest resistance burden, with more than four-fifths of E. coli isolates resistant, while Septran showed resistance in more than two-thirds of isolates.

Table 4. Resistance Burden Classification of Tested Antibiotics Against E. coli

Resistance Category	Antibiotic	Resistant Isolates, n/N	Resistance Rate (%)
Low resistance	Imipenem	2/142	1.4
	Fosfomycin	16/142	11.3
	Nitrofurantoin	22/142	15.5
Moderate resistance	Gentamicin	44/142	31.0
High resistance	Cefoperazone	78/142	54.9
	Septran	98/142	69.0
	Nalidixic acid	115/142	81.0

Overall, the antimicrobial susceptibility profile showed a marked contrast between preserved activity of imipenem, fosfomycin, and nitrofurantoin and reduced activity of nalidixic acid, Septran, and cefoperazone. Imipenem had the greatest sensitivity-to-resistance separation, with 98.6% sensitivity compared with 1.4% resistance. Fosfomycin and nitrofurantoin also demonstrated favorable profiles, with sensitivity rates above 80%. By comparison, nalidixic acid showed the most unfavorable pattern, with resistance exceeding sensitivity by 62 percentage points, followed by Septran, where resistance exceeded sensitivity by 38 percentage points. These findings indicate substantial variability in antibiotic activity against urinary E. coli isolates in the study population.

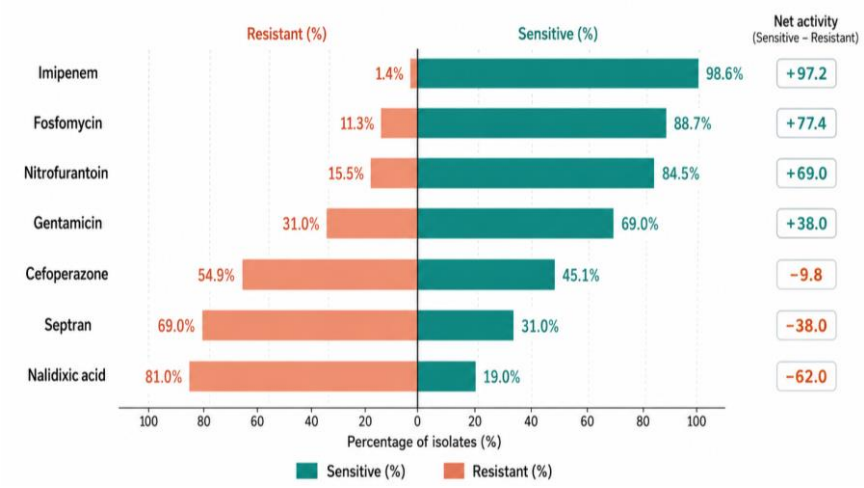

Figure 1. Comparative Resistance–Susceptibility Spectrum of Antibiotics Against Urinary E. Coli Isolates

The figure presents a diverging resistance–susceptibility profile of seven antibiotics tested against 142 urinary E. coli isolates. Imipenem demonstrated the highest net antimicrobial activity, with 98.6% sensitivity and only 1.4% resistance, followed by fosfomycin with 88.7% sensitivity and nitrofurantoin with 84.5% sensitivity. Gentamicin showed moderate effectiveness, with 69.0% sensitivity and 31.0% resistance. In contrast, cefoperazone showed reduced activity, with resistance exceeding sensitivity by 9.8 percentage points. The poorest susceptibility profiles were observed for Septran and nalidixic acid, with resistance rates of 69.0% and 81.0%, respectively. Overall, the figure highlights preserved activity of imipenem, fosfomycin, and nitrofurantoin, while demonstrating substantial resistance to nalidixic acid and Septran among urinary E. coli isolates.

DISCUSSION

Urinary tract infections remain among the most frequent bacterial infections encountered in clinical practice, and the present study reinforces the continued predominance of Escherichia coli as the leading uropathogen. Among 200 culture-positive urine samples, E. coli accounted for 142 isolates, representing 71.0% of all bacterial isolates. This finding is consistent with previous reports identifying E. coli as the principal causative organism in both community-acquired and hospital-associated urinary tract infections, largely because of its intestinal reservoir, ability to colonize the periurethral region, adhesion to uroepithelial cells, and capacity to persist within the urinary tract through virulence-associated mechanisms (12). The high proportion of E. coli observed in this study confirms that empirical treatment policies for urinary tract infection in this setting should remain strongly informed by the local susceptibility pattern of this organism.

The gender distribution showed that females constituted the majority of patients with E. coli-associated urinary tract infection, with 96 of 142 cases occurring in females, corresponding to 67.6%, compared with 46 cases in males, corresponding to 32.4%. This female predominance is comparable with earlier studies in which women represented a larger proportion of UTI cases than men. The higher frequency among females can be explained by anatomical and physiological factors, including a shorter urethra, closer proximity of the urethral opening to the anal region, and greater likelihood of ascending bacterial colonization (13,14). Although gender differences were evident in the frequency of infection, antimicrobial resistance is more likely to be influenced by antibiotic exposure, prescribing practices, prior treatment history, healthcare contact, and bacterial resistance mechanisms than by sex alone.

The antimicrobial susceptibility profile demonstrated marked variation in the activity of tested antibiotics against urinary E. coli isolates. Imipenem showed the highest sensitivity rate, with 140 of 142 isolates sensitive, corresponding to 98.6%, and only 1.4% resistant. This finding indicates that imipenem retained strong in vitro activity against E. coli isolates in the study population. However, carbapenems

should be interpreted as reserve agents rather than routine empirical options, because unnecessary carbapenem use may accelerate the emergence of carbapenem-resistant Enterobacterales and limit future treatment options. Therefore, while imipenem remains highly active microbiologically, its clinical use should be guided by severity of infection, culture results, resistance profile, and antimicrobial stewardship principles (15,16).

Fosfomycin and nitrofurantoin also demonstrated favorable susceptibility profiles, with sensitivity rates of 88.7% and 84.5%, respectively. These findings are clinically important because both agents are commonly considered useful options for lower urinary tract infection, particularly when resistance to older empirical antibiotics is high. Nitrofurantoin has retained activity against many uropathogenic E. coli isolates because it achieves high urinary concentrations and has multiple bacterial targets, reducing the likelihood of rapid resistance development. Fosfomycin also remains valuable because of its broad activity against urinary pathogens and convenient dosing for uncomplicated lower UTI. The relatively low resistance rates observed for these two antibiotics suggest that they may remain suitable therapeutic options for uncomplicated E. coli urinary tract infection when supported by clinical assessment and susceptibility findings (17).

In contrast, high resistance was observed against nalidixic acid, Septran, and cefoperazone. Nalidixic acid showed the poorest activity, with resistance in 115 of 142 isolates, corresponding to 81.0%, while Septran showed resistance in 98 isolates, corresponding to 69.0%. Cefoperazone also showed considerable resistance, with 78 isolates resistant, corresponding to 54.9%. These findings indicate reduced clinical utility of these agents for empirical management of E. coli urinary tract infection in the study setting. High resistance to quinolone-related agents and trimethoprim-sulfamethoxazole has been reported in several regions and is often associated with widespread empirical use, incomplete treatment courses, over-the-counter access, and selection pressure from repeated antibiotic exposure (18). The high resistance burden observed in this study supports the need to avoid blind empirical use of antibiotics with poor local susceptibility profiles.

Gentamicin showed intermediate activity, with 69.0% sensitivity and 31.0% resistance among E. coli isolates. This pattern suggests that gentamicin may still have a role in selected cases, particularly complicated infections requiring parenteral therapy, but its use should be guided by susceptibility testing and patient-specific safety considerations. Aminoglycosides are associated with nephrotoxicity and ototoxicity, particularly in vulnerable patients, and therefore require careful clinical monitoring. The moderate resistance rate also indicates that gentamicin should not be assumed to be uniformly effective in all E. coli UTIs without laboratory confirmation (19).

The pattern of resistance observed in this study reflects the broader challenge of antimicrobial resistance among uropathogens. The high resistance to nalidixic acid and Septran, together with substantial resistance to cefoperazone, suggests that commonly used antibiotics may no longer provide reliable empirical coverage against urinary E. coli isolates in this setting (20). This has direct implications for clinical practice, as inappropriate empirical therapy may result in persistent symptoms, recurrent infection, progression to complicated UTI, increased healthcare visits, and higher treatment costs. Culture-based diagnosis and antimicrobial susceptibility testing are therefore essential, particularly in recurrent, complicated, hospital-associated, or treatment-failure cases.

The findings also emphasize the importance of institutional antimicrobial stewardship. Antibiotics with high retained activity, such as imipenem, should be protected from unnecessary use, while agents with acceptable urinary activity, such as nitrofurantoin and fosfomycin, may be considered where clinically appropriate. Empirical therapy should be periodically updated according to local antibiograms rather than relying on generalized national or international resistance patterns. In settings where self-medication and non-prescription antibiotic use are common, stewardship efforts should extend beyond hospital prescribing and include patient education, regulation of antibiotic dispensing, and routine surveillance of resistance trends.

Several limitations should be considered when interpreting the findings. The study was conducted at a single center, which may limit generalizability to other hospitals or community settings. The sample size was modest, and the antibiotic panel was restricted to selected agents used for urinary tract infection management. Molecular testing for specific resistance mechanisms was not performed, and clinical risk factors such as previous antibiotic exposure, catheterization, diabetes mellitus, hospitalization status, recurrent UTI, and prior healthcare contact were not analyzed in detail. These factors may influence resistance patterns and could provide deeper insight into predictors of resistant E. coli infection. Despite these limitations, the study provides useful local evidence showing that E. coli remains the dominant uropathogen and that resistance to several commonly used antibiotics is substantial.

Overall, the present findings demonstrate a clinically meaningful resistance burden among urinary E. coli isolates, with preserved susceptibility to imipenem, fosfomycin, and nitrofurantoin and high resistance to nalidixic acid, Septran, and cefoperazone. These results support the routine use of urine culture and antimicrobial susceptibility testing for treatment guidance and reinforce the need for rational antibiotic prescribing. Continuous local surveillance, periodic antibiogram development, and stewardship-based prescribing policies are essential to reduce treatment failure, preserve effective antibiotics, and improve outcomes among patients with urinary tract infection.

CONCLUSION

The present study concluded that Escherichia coli was the predominant bacterial pathogen isolated from urine samples of patients with urinary tract infection at Mayo Hospital, accounting for 71.0% of all culture-positive cases, with a higher frequency among female patients. The antimicrobial susceptibility profile demonstrated marked variation across tested antibiotics, with imipenem, fosfomycin, and nitrofurantoin showing the highest effectiveness against urinary E. coli isolates, while nalidixic acid, Septran, and cefoperazone exhibited substantial resistance. These findings indicate that commonly used empirical antibiotics may have limited clinical utility in this setting and emphasize the need for routine urine culture, antimicrobial susceptibility testing, rational antibiotic prescribing, and continuous local resistance surveillance. Strengthening antimicrobial stewardship practices is essential to preserve effective treatment options, reduce inappropriate antibiotic use, limit the spread of resistant uropathogens, and improve therapeutic outcomes among patients with urinary tract infection.

REFERENCES

1. Al-Naqshbandi AA, Chawsheen MA, Abdulqader HH. Prevalence and antimicrobial susceptibility of bacterial pathogens isolated from urine specimens received in Rizgary Hospital—Erbil. J Infect Public Health. 2019;12(3):330-6.
2. Ronald A, Pattullo A. The natural history of urinary infection in adults. Med Clin North Am. 1991;75(2):299-312.
3. McLoughlin TG, Joseph MM. Antibiotic resistance patterns of uropathogens in pediatric emergency department patients. Acad Emerg Med. 2003;10(4):347-51.
4. Heffner VA, Gorelick MH. Pediatric urinary tract infection. Clin Pediatr Emerg Med. 2008;9(4):233-7.
5. Lipsky BA. Urinary tract infections in men: epidemiology, pathophysiology, diagnosis, and treatment. Ann Intern Med. 1989;110(2):138-50.
6. Pastore LM, Savitz DA, Thorp JM, Koch GG, Hertz-Picciotto I, Irwin DE. Predictors of symptomatic urinary tract infection after 20 weeks' gestation. J Perinatol. 1999;19(7):488-93.
7. Behrman RE, Kliegman RM, Jenson HB. Nelson Textbook of Pediatrics. 17th ed. Philadelphia: Saunders; 2004.

8. Belete MA. Bacterial profile and ESBL screening of urinary tract infection among asymptomatic and symptomatic pregnant women attending antenatal care of northeastern Ethiopia region. Infect Drug Resist. 2020;13:2579-92.

9. Gupta K, Hooton TM, Stamm WE. Increasing antimicrobial resistance and the management of uncomplicated community-acquired urinary tract infections. Ann Intern Med. 2001;135(1):41-50.

10. Weekes LM. Antibiotic resistance changing management of urinary tract infections in aged care. Med J Aust. 2015;203(9):352.

11. Negut AC, Duca AE, Dinca O, Streinu-Cercel A, Stoica MA, Haineala B, et al. Osteodiscita si abcese retroperitoneale la un pacient imunodeprimat: prezentare de caz/Osteodiscitis and retroperitoneal abscesses in an immunosuppressed patient: case report. Infectio.ro. 2015;(41):44.

12. Medina-Bombardó D, Jover-Palmer A. Does clinical examination aid in the diagnosis of urinary tract infections in women? A systematic review and meta-analysis. BMC Fam Pract. 2011;12:111.

13. Schmiemann G, Kniehl E, Gebhardt K, Matejczyk MM, Hummers-Pradier E. The diagnosis of urinary tract infection: a systematic review. Dtsch Arztebl Int. 2010;107(21):361-7.

14. Abbo LM, Hooton TM. Antimicrobial stewardship and urinary tract infections. Antibiotics. 2014;3(2):174-92.

15. Mohammed MA, Alnour TM, Shakurfo OM, Aburass MM. Prevalence and antimicrobial resistance pattern of bacterial strains isolated from patients with urinary tract infection in Messalata Central Hospital, Libya. Asian Pac J Trop Med. 2016;9(8):771-6.

16. Zavala-Cerna MG, Segura-Cobos M, Gonzalez R, Zavala-Trujillo IG, Navarro-Perez SF, Rueda-Cruz JA, et al. The clinical significance of high antimicrobial resistance in community-acquired urinary tract infections. Can J Infect Dis Med Microbiol. 2020;2020:2967260.

17. Islam MA, Islam MR, Khan R, Amin MB, Rahman M, Hossain MI, et al. Prevalence, etiology and antibiotic resistance patterns of community-acquired urinary tract infections in Dhaka, Bangladesh. PLoS One. 2022;17(9):e0274423.

18. Ndukwu CL, Ndu IF. Antimicrobial resistance in uropathogens associated with community acquired urinary tract infections in Port Harcourt, Nigeria.

19. Fourie J, Claassen F, Myburgh J. Causative pathogens and antibiotic resistance in community-acquired urinary tract infections in central South Africa. S Afr Med J. 2021;111(2):124-8.

20. Shkalim Zemer V, Ashkenazi S, Levinsky Y, Richenberg Y, Jacobson E, Nathanson S, et al. Pathogens causing pediatric community acquired urinary tract infections and their increasing antimicrobial resistance: a nationwide study. Pathogens. 2024;13(3):201.