Section : Microbiology

Original Research Article

COMPARATIVE CROSS-SECTIONAL STUDY OF URINARY ISOLATES AND RESISTANCE PATTERNS IN CATHETER-ASSOCIATED URINARY TRACT INFECTIONS VERSUS NON-CATHETER-ASSOCIATED CASES IN HOSPITALIZED PATIENTS

Suchita Tekam[1], Madhumalati Madavi[1], Qazi MS[2]

[1]Assistant Professor, Department of Microbiology, Government Medical College Yavatmal, Maharashtra India.
[2]Professor and Head, Department of Microbiology, Government Medical College Yavatmal, Maharashtra India.

Received : 03/02/2025
Received in revised form : 21/03/2025
Accepted : 07/04/2025

Keywords:
Catheter-Associated Urinary Tract Infections, Antimicrobial Resistance, Multidrug-Resistant Organisms, Nosocomial Infections, Uropathogens.

Corresponding Author:
Dr. Suchita Tekam,
Email: Suchitatekam84@gmail.com

DOI: 10.47009/jamp.2025.7.2.197

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 980-985

Abstract

Background: Urinary tract infections (UTIs) are a major cause of healthcare-associated infections (HAIs), with catheter-associated UTIs (CAUTIs) accounting for majority of nosocomial urinary infections. Indwelling catheters promote biofilm formation increasing the risk of multidrug-resistant organisms (MDROs). Understanding the microbiological profiles and resistance patterns in catheterized and non-catheterized patients is essential to optimize empirical treatment and prevent resistance. **Materials and Methods:** A comparative cross-sectional study was conducted in a tertiary care hospital's microbiology department. Urine samples from 150 hospitalized patients with suspected UTIs were analysed. Group A (n=75, catheterized) and Group B (n=75, non-catheterized). Samples were collected aseptically and cultured using standard microbiological techniques. Significant isolates ($\geq 10^4$ CFU/mL) were identified using biochemical methods, and antibiotic susceptibility was determined via the Kirby-Bauer disc diffusion method in accordance with CLSI 2022 guidelines. Statistical comparisons between groups were performed. P value less than 0.05 was taken as statistically significant. **Result:** Escherichia coli was the most common organism in both groups (34.67% in CAUTIs and 40.00% in non-CAUTIs). CAUTI cases showed a broader range of pathogens, including higher rates of Pseudomonas aeruginosa (16.00%), Klebsiella pneumoniae (8.00%) and Acinetobacter baumannii (5.33%), compared to non-catheterized cases. Resistance patterns were more pronounced in the CAUTI group with E. coli showing higher resistance to TMP-SMX (92.31% vs. 86.67%) and Amoxicillin clavulanate (65.38% vs. 60.00%). Drug resistance was more prevalent among CAUTI isolates particularly in Pseudomonas and Klebsiella species, which showed high resistance to meropenem, gentamicin, and cefixime. **Conclusion:** CAUTIs were associated with a higher incidence of uropathogens resistant to common antibiotics as compared to non-catheterized UTIs. Judicious catheter use and appropriate infection control practices will curb the spread of resistant uropathogens in hospitalized patients.

INTRODUCTION

Urinary tract infections (UTIs) are among the most common healthcare-associated infections (HAIs) encountered in hospitalized patients. These infections pose a significant burden on patient morbidity, mortality and healthcare systems worldwide. Hospitalized patients, by virtue of their underlying illnesses and exposure to invasive interventions are inherently at increased risk of developing UTIs.[1] The immunosuppressed state of many hospitalized individuals further increase this susceptibility. Risk factors such as advanced age, diabetes mellitus, structural abnormalities of the genitourinary tract, urological interventions and antimicrobial exposure are commonly encountered in hospitalized populations and are strongly associated with increased UTI incidence.[2] These infections not only prolong hospital stays but are frequently associated with multidrug-resistant organisms (MDROs), complicating treatment and increasing the risk of systemic complications such as urosepsis.

Among the various risk factors use of invasive urological devices such as catheters is a major contributor to the development of UTIs in hospitalized settings. Catheter-associated urinary tract infections (CAUTIs) account for majority of hospital acquired infections related to the urinary tract. Catheters provide a direct entry of uropathogens into the bladder bypassing natural host defenses.[3] Prolonged catheterization leads to the formation of biofilms. These biofilms shield microorganisms from host defense responses. This also serve as reservoirs for antibiotic resistance genes. The risk of CAUTI increases cumulatively with the duration of catheterization. IN addition to this improper aseptic technique during insertion, poor maintenance of the closed drainage system and the use of catheters without appropriate clinical indications further contribute to the pathogenesis of CAUTIs. The microbiological profile of CAUTIs often includes a broader range of nosocomial pathogens compared to UTIs acquired without catheterization.[4]

Given the established role of catheterization in the pathogenesis of UTIs it is essential to analyse the microbiological and resistance patterns of catheter-associated versus non-catheter-associated UTIs in hospitalized patients. While Escherichia coli remains a predominant isolate in both groups, CAUTIs are often caused by more resistant and opportunistic pathogens such as Pseudomonas aeruginosa, Klebsiella pneumoniae, Enterococcus faecalis, and Acinetobacter baumannii.[5] The resistance patterns in these isolates may differ significantly due to biofilm-associated resistance mechanisms, horizontal gene transfer within the hospital environment and differing antibiotic exposures. Comparing microbiology between these two groups is important for optimizing empirical antibiotic therapy and preventing inappropriate use of antibiotics. Furthermore assessing the antimicrobial susceptibility across these two groups can help formulate infection control strategies in hospitalised patients.[6]

Despite increasing interest in study of hospital-acquired infections there remains a significant gap in the literature comparing urinary isolates and resistance profiles in catheterized and non-catheterized patients. Most available studies have either focused solely on CAUTIs or broadly described nosocomial UTIs without analysing and comparing the cases based on catheter use.[7] This study aims to address this gap by conducting a comparative cross-sectional analysis of urinary isolates and their antimicrobial susceptibility patterns in catheter-associated and non-catheter-associated UTI cases in hospitalized patients.

MATERIALS AND METHODS

This was a comparative cross-sectional study conducted in the Department of Microbiology of a tertiary care medical institute. Bacterial profile and antibiotic resistance patterns of urinary isolates obtained from hospitalized patients with catheter-associated urinary tract infections (CAUTIs) and non-catheter-associated urinary tract infections (non-CAUTIs) were compared. For this purpose, 150 confirmed cases of UTI were analysed. Out of these 150 cases 75 cases belonged to catheter-associated urinary tract infections (CAUTIs) and remaining 75 cases were from non-catheter-associated urinary tract infections (non-CAUTIs).

Group A: urinary sample from 75 catheterise patients were analysed for bacterial profile and antibiotic resistance pattern.

Group B: urinary sample from 75 non-catheterise patients were analysed for bacterial profile and antibiotic resistance pattern.

Patients from both groups were included based on clinical suspicion of UTI, and urine samples were collected prior to the initiation of antimicrobial therapy. The study aimed to identify variations in uropathogen distribution and susceptibility patterns between these 2 patient categories. Urine specimens were collected from both catheterized and non-catheterized patients admitted to the hospital. For non-catheterized patients, clean-catch midstream urine samples were obtained using standard aseptic precautions. In contrast, samples from catheterized individuals were collected aseptically following infection prevention protocols to minimize contamination.

A calibrated loop was used to inoculate 10 µL of each urine sample onto blood agar and MacConkey agar plates. The plates were incubated aerobically at 37°C for 18–24 hours. Bacterial growth was evaluated and colonies were identified on the basis of their morphology and standard biochemical characteristics. Only those samples that showed significant bacteriuria, defined as $\geq 10^4$ colony-forming units (CFU)/mm involving one or two bacterial species were processed further to identify causative uropathogens.

Isolated organisms were subjected to biochemical identification using conventional tests such as the oxidase test, citrate utilization, motility-indole-urease (MIU) reaction, catalase and coagulase tests, and growth analysis on Kligler's iron agar. These tests enabled precise identification of commonly implicated urinary pathogens.

Antibiotic susceptibility testing was conducted using the disc diffusion method. Bacterial suspensions were prepared in Trypticase Soy Broth and adjusted to the 0.5 McFarland turbidity standard. The suspension was uniformly spread on Mueller-Hinton agar plates and commercially available antibiotic discs were used for testing sensitivity. The antibiotics tested covered aminoglycosides, β-lactams, trimethoprim sulfamethoxazole, cephalosporins, carbapenems, fluoroquinolones and others commonly used in clinical practice for urinary tract infections. The plates were incubated at 35°C for 18–24 hours and zones of inhibition were measured and interpreted. Discs were stored at –20°C to maintain potency. In cases requiring differentiation of coagulase-negative staphylococci a novobiocin susceptibility test was performed. After preparing a standard 0.5 McFarland suspension and inoculating Mueller-Hinton agar a

ISSN (O): 2687-5365; ISSN (P): 2753-6556

novobiocin disc was placed at the center of the plate. Following 24-hour incubation at 37°C isolates were categorized as resistant if the inhibition zone was ≤16 mm and susceptible if ≥17 mm.

Statistical analysis of the collected data was conducted using an online statistical tool. A two-proportion z-test was applied to compare variables between the two patient groups, and a p-value less than 0.05 was considered statistically significant.

Inclusion Criteria

1. Hospitalized patients with clinical suspicion of urinary tract infection (UTI)
2. Patients aged ≥18 years
3. Patients with or without an indwelling urinary catheter
4. Patients who had not received antibiotics in the 48 hours prior to urine sample collection
5. Patients from whom a proper urine sample (midstream or catheter-derived) could be collected under aseptic conditions
6. Samples showing significant bacteriuria (≥10^4 CFU/mL of one or two organisms)

Exclusion Criteria

1. Patients on antibiotic therapy within 48 hours prior to urine sample collection
2. Urine samples showing mixed growth or contamination
3. Patients with known structural urinary tract abnormalities (e.g., vesicoureteral reflux, neurogenic bladder) unrelated to catheterization
4. Pediatric patients (<18 years of age)
5. Patients with fungal urinary tract infections.

RESULTS

The analysis of the gender distribution of the studied cases showed that among the catheterised group, males constituted the majority of cases (56.00%), while females accounted for 33 cases (44.00%). Similarly, in the non-catheterised group, males were slightly more common with 40 cases (53.33%) compared to 35 cases (46.67%) in females. Gender distribution in both the groups was found to be comparable with no statistically significant difference (P=0.869) [Table 1].

Table 1: Gender Distribution of catheterised Vs Non-Catheterised UTIs.

	Catheterised		**Non-Catheterised**	
	No of cases	**Percentage**	**No of cases**	**Percentage**
Males	42	56.00%	40	53.33%
Females	33	44.00%	35	46.67%
Total	75	100.00%	75	100.00%
P=0.869 (Not Significant)				

The analysis of the age distribution of the studied cases showed that among the catheterised group, the majority of cases were in the age group above 50 years (42.67%), followed by 41–50 years (30.67%), 31–40 years (16.00%), and 18–30 years (10.67%). In the non-catheterised group, the highest number of cases also fell in the age group above 50 years (37.33%), followed by 41–50 years (28.00%), 31–40 years (20.00%), and 18–30 years (14.67%). The mean age was slightly higher in the catheterised group (47.79 ± 12.32 years) compared to the non-catheterised group (45.76 ± 12.98 years). Age distribution in both groups was found to be comparable with no statistically significant difference (P = 0.3275) [Table 2].

Table 2: Age Distribution of UTI in Catheterised Vs Non-Catheterised cases.

Age in Years	**Catheterised**		**Non-Catheterised**	
	No of cases	**Percentage**	**No of cases**	**Percentage**
18-30	8	10.67%	11	14.67%
31-40	12	16.00%	15	20.00%
41-50	23	30.67%	21	28.00%
Above 50	32	42.67%	28	37.33%
Total	75	100.00%	75	100.00%
Mean Age	47.79 ± 12.32		45.76 ± 12.98 years	
P = 0.3275				

The analysis of the bacterial isolates among non-catheterised patients (total 75 cases) showed that Escherichia coli was the most frequently isolated organism, accounting for 30 cases (40.00%). This was followed by Staphylococcus epidermidis with 11 cases (14.67%), Enterococcus faecalis with 8 cases (10.67%), and both Staphylococcus saprophyticus and Pseudomonas aeruginosa with 7 cases each (9.33%). Other organisms identified included Klebsiella pneumoniae in 6 cases (8.00%), Acinetobacter baumannii in 3 cases (4.00%), Proteus mirabilis in 2 cases (2.67%), and Enterobacter species in 1 case (1.33%). E. coli emerged as the predominant pathogen in non-catheterised urinary tract infections, with a relatively lower distribution of other isolates [Figure 1].

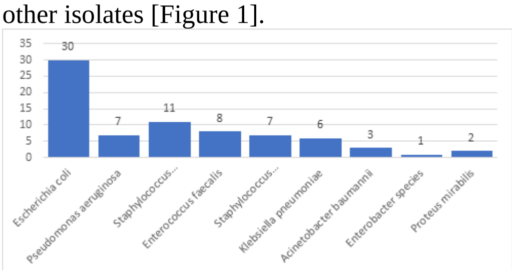

Figure 1: Type of Organisms isolated from UTI cases (Non Catheterised).

The analysis of the bacterial isolates in catheter-associated urinary tract infections (CAUTI) showed that Escherichia coli was the most commonly isolated organism, accounting for 26 cases (34.67%). This was followed by Pseudomonas aeruginosa with 12 cases (16.00%), Staphylococcus epidermidis with 10 cases (13.33%), Enterococcus faecalis with 7 cases (9.33%), and Staphylococcus saprophyticus with 6 cases (8.00%). Klebsiella pneumoniae also accounted for 6 cases (8.00%), while Acinetobacter baumannii was identified in 4 cases (5.33%). Less frequently isolated organisms included Enterobacter species and Proteus mirabilis, each with 2 cases (2.67%). Similar to non-catheterised patients, E. coli remained the predominant pathogen in CAUTI cases, followed by a diverse mix of other gram-negative and gram-positive organisms [Figure 2].

The analysis of the antibiotic resistance patterns of the studied organisms showed that Escherichia coli (n=30) exhibited the highest resistance to TMP-SMX (86.67%), followed by Amox/clavulanate (60.00%) and Azithromycin (53.33%), with comparatively lower resistance to Amikacin and Ciprofloxacin (both 33.33%). Pseudomonas aeruginosa (n=7) demonstrated resistance to Ceftazidime IN 28.58% CASES and high resistance to TMP-SMX (85.71%) and ciprofloxacin (42.86%). Staphylococcus aureus (n=5) showed no resistance to Amikacin, azithromycin, cefixime and Meropenem (0.00%). Overall relatively less resistance was seen against meropenem [Table 3].

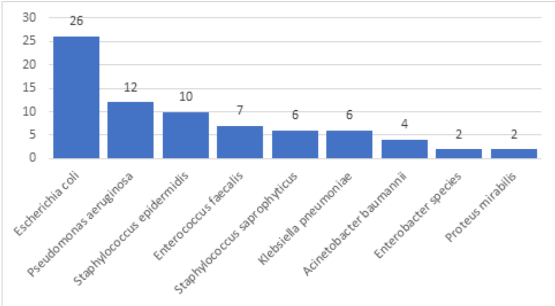

Figure 2: Type of Organisms isolated from UTI cases (Catheterised).

Table 3: Antibiotics Resistance Pattern in Non-catheter associated urinary tract infection.

Organism	Count	Amikacin	Amox/clavulanate	Azithromycin	Cefixime	Ceftazidime	Ceftriaxone	Ciprofloxacin	TMP-SMX	Doxycycline	Gentamicin	Meropenem
Escherichia coli	30	10/30 (33.33%)	18/30 (60.00%)	16/30 (53.33%)	7/30 (23.33%)	2/30 (6.67%)	2/30 (6.67%)	10/30 (33.33%)	26/30 (86.67%)	4/30 (13.33%)	9/30 (30.00%)	6/30 (20.00%)
Pseudomonas aeruginosa	7	1/7 (14.29%)	2/7 (28.58%)	3/7 (42.86%)	6/7 (85.71%)	2/7 (28.58%)	2/7 (28.58%)	3/7 (42.86%)	1/7 (14.29%)	1/7 (14.29%)	2/7 (28.58%)	1/7 (14.29%)
Staphylococcus aureus	5	3/5 (60.00%)	1/5 (20.00%)	2/5 (40.00%)	3/5 (60.00%)	2/5 (40.00%)	2/5 (40.00%)	2/5 (40.00%)	2/5 (40.00%)	2/5 (40.00%)	4/5 (80.00%)	1/5 (20.00%)
Enterococcus faecalis	8	2/8 (25.00%)	0/8 (0.00%)	4/8 (50.00%)	6/8 (75.00%)	6/8 (75.00%)	4/8 (50.00%)	2/8 (25.00%)	6/8 (75.00%)	2/8 (25.00%)	3/8 (37.50%)	2/8 (25.00%)
Staphylococcus epidermidis	4	3/4 (75.0%)	3/4 (75.00%)	2/4 (50.00%)	2/4 (50.00%)	1/4 (25.00%)	2/4 (50.00%)	2/4 (50.00%)	2/4 (50.00%)	3/4 (75.00%)	1/4 (25.00%)	1/4 (25.00%)
Staphylococcus saprophyticus	2	0/2 (0.00%)	1/2 (50.00%)	0/2 (0.00%)	0/2 (0.00%)	1/2 (50.00%)	1/2 (50.00%)	1/2 (50.00%)	2/2 (100.00%)	1/2 (50.00%)	2/2 (100.00%)	0/2 (0.00%)
Klebsiella pneumoniae	6	6/6 (100.00%)	5/6 (83.33%)	0/6 (0.00%)	0/6 (0.00%)	2/6 (33.33%)	3/6 (50.0%)	0/6 (0.00%)	3/6 (50.00%)	4/6 (66.67%)	0/6 (0.00%)	0/6 (0.00%)
Acinetobacter baumannii	3	2/3 (66.67%)	2/3 (66.67%)	1/3 (33.33%)	3/3 (100.00%)	2/3 (66.67%)	0/3 (0.00%)	1/3 (33.33%)	0/3 (0.00%)	0/3 (0.00%)	2/3 (66.67%)	1/3 (33.33%)
Enterobacter species	1	1/1 (100.00%)	1/1 (100.00%)	0/1 (0.00%)	0/1 (0.00%)	1/1 (100.00%)	1/1 (100.00%)	1/1 (100.00%)	1/1 (100.00%)	0/1 (0.00%)	1/1 (100.00%)	1/1 (100.00%)
Proteus mirabilis	2	1/2 (50.00%)	0/2 (0.00%)	1/2 (50.00%)	1/2 (50.00%)	2/2 (100.00%)	1/2 (50.00%)	2/2 (100.00%)	0/2 (0.00%)	0/2 (0.00%)	0/2 (0.00%)	0/2 (0.00%)

The analysis of the antibiotic resistance patterns of the studied organisms revealed notable variability across different species. Escherichia coli (n=26) showed highest resistance to TMP-SMX (92.31%), Amox/clavulanate (65.38%), and Azithromycin (57.69%), with lower resistance to Ceftazidime and Ceftriaxone (19.23% each). Pseudomonas aeruginosa (n=12) displayed complete resistance to Ceftriaxone and Gentamicin (100.00% each), along with high resistance to Cefixime and Meropenem (91.67%

ISSN (O): 2687-5365; ISSN (P): 2753-6556

each). Overall, resistance was markedly higher among Gram-negative organisms, particularly Klebsiella, Acinetobacter, and Pseudomonas. [Table 4].

Table 4: Antibiotics Resistance Pattern in catheter associated UTI.

Organism	Count	Amikacin	Amox/clavulanate	Azithromycin	Cefixime	Ceftazidime	Ceftriaxone	Ciprofloxacin	TMP-SMX	Doxycycline	Gentamicin	Meropenem
Escherichia coli	26	13/26 (50.00%)	17/26 (65.38%)	15/26 (57.69%)	9/26 (34.62%)	5/26 (19.23%)	5/26 (19.23%)	3/26 (11.54%)	24/26 (92.31%)	8/26 (30.77%)	11/26 (42.31%)	8/26 (30.77%)
Pseudomonas aeruginosa	12	4/12 (33.33%)	2/12 (16.67%)	7/12 (58.33%)	11/12 (91.67%)	3/12 (25.00%)	12/12 (100.00%)	7/12 (58.33%)	4/12 (33.33%)	3/12 (25.00%)	12/12 (100.00%)	11/12 (91.67%)
Staphylococcus epidermidis	10	9/10 (90.00%)	10/10 (100.00%)	6/10 (60.00%)	10/10 (100.00%)	8/10 (80.00%)	10/10 (100.00%)	6/10 (60.00%)	7/10 (70.00%)	8/10 (80.00%)	4/10 (40.00%)	4/10 (40.00%)
Enterococcus faecalis	7	3/7 (42.86%)	1/7 (14.29%)	5/7 (71.43%)	6/7 (85.71%)	6/7 (85.71%)	7/7 (100.00%)	3/7 (42.86%)	6/7 (85.71%)	2/7 (28.57%)	4/7 (57.14%)	4/7 (57.14%)
Staphylococcus saprophyticus	6	2/6 (33.33%)	4/6 (66.67%)	2/6 (33.33%)	2/6 (33.33%)	4/6 (66.67%)	4/6 (66.67%)	4/6 (66.67%)	6/6 (100.00%)	3/6 (50.00%)	5/6 (83.33%)	1/6 (16.67%)
Klebsiella pneumoniae	6	6/6 (100.00%)	5/6 (83.33%)	2/6 (33.33%)	1/6 (16.67%)	3/6 (50.00%)	6/6 (100.00%)	1/6 (16.67%)	4/6 (66.67%)	5/6 (83.33%)	2/6 (33.33%)	1/6 (16.67%)
Acinetobacter baumannii	4	3/4 (75.00%)	3/4 (75.00%)	2/4 (50.00%)	4/4 (100.00%)	3/4 (75.00%)	1/4 (25.00%)	2/4 (50.00%)	1/4 (25.00%)	1/4 (25.00%)	3/4 (75.00%)	2/4 (50.00%)
Enterobacter species	2	2/2 (100.00%)	2/2 (100.00%)	1/2 (50.00%)	1/2 (50.00%)	2/2 (100.00%)	2/2 (100.00%)	2/2 (100.00%)	2/2 (100.00%)	1/2 (50.00%)	2/2 (100.00%)	2/2 (100.00%)
Proteus mirabilis	2	2/2 (100.00%)	1/2 (50.00%)	2/2 (100.00%)	2/2 (100.00%)	2/2 (100.00%)	2/2 (100.00%)	2/2 (100.00%)	1/2 (50.00%)	1/2 (50.00%)	1/2 (50.00%)	1/2 (50.00%)

DISCUSSION

This study showed a significant difference in the distribution of uropathogens and their antimicrobial resistance patterns between catheter-associated urinary tract infections (CAUTIs) and non-catheter-associated UTIs (non-CAUTIs) in hospitalized cases. Escherichia coli was found to be the most prevalent pathogen in both groups. Resistance profile varied markedly with CAUTI isolates showing high resistance to several key antibiotics. This finding is consistent with the study by Nicolle et al who reported that long-term catheterization was associated with increased antimicrobial resistance particularly to fluoroquinolones and β-lactams.8 Similarly Saint et al found that the biofilm-forming capacity of uropathogens in catheterized patients results in greater resistance to conventional therapies due to altered pharmacodynamics within the biofilm environment.[9] Our data corroborate these conclusions, particularly in showing that E. coli from CAUTI patients was significantly less susceptible to Amikacin and Meropenem compared to its non-CAUTI counterparts.

Our findings also found that the increased presence of non-fermenting gram-negative bacilli like Pseudomonas aeruginosa and Acinetobacter baumannii in CAUTI cases. Both of these organisms also displayed higher levels of resistance. Similarly, Pseudomonas aeruginosa also showed greater resistance in catheterized possibly reflecting differing patterns of empirical antibiotic use. Our results were similar to the studies done by Gajdács et al who noted the increasing prevalence of MDR Pseudomonas spp. in nosocomial UTIs, particulalry among catheterized cases.[10] A similar trend was also observed by Magill et al. in their national survey on healthcare-associated infections in the U.S. In this study Pseudomonas and Acinetobacter were found more commonly in CAUTI cases often with extended drug resistance profiles.[11] These organisms' resilience and ability to form tenacious biofilms on catheter surfaces is thought to be a major contributory factor for their predominance and resistance in CAUTI scenarios.

The presence of gram-positive cocci such as Enterococcus faecalis and Staphylococcus epidermidis was also significant in both patient groups. There was higher antibiotic resistance among CAUTI-associated isolates particularly in Enterococcus faecalis toward Amikacin and in Staphylococcus epidermidis toward Cefixime. Similar findings were also reported by Flores-Mireles et al who documented that there was increasing

ISSN (O): 2687-5365; ISSN (P): 2753-6556

resistance of Enterococcus species in urinary isolates. The authors attributed this to intrinsic resistance mechanisms and enhanced horizontal gene transfer in catheterized patients.[12] Similarly work by Hall DE et al also supports this observation. This study demonstrated that Staphylococcus epidermidis strains from catheterized patients exhibit decreased susceptibility due to the presence of biofilm-related genes.[13]

Another essential observation in our study was the notable difference in drug resistance patterns which was markedly more prevalent in CAUTI isolates. This aligns with the findings by Mohamed AH et al who reported that catheterization significantly increases the likelihood of MDR pathogens due to prolonged hospital exposure and biofilm-mediated persistence.[14] Similarly, research by Koves B et al also highlighted the alarming trend of resistance to carbapenems and aminoglycosides among CAUTI isolates particularly Klebsiella pneumoniae and Acinetobacter baumannii.[15] These findings were similar to our own findings where CAUTI isolates showed higher resistance to antiobiotics as compared to non-CAUTI cases.

CONCLUSION

This study highlights the increased incidence of antimicrobial resistance in catheter-associated UTIs compared to non-catheterized cases. Resistance to commonly used antibiotics was seen in Pseudomonas aeruginosa, Acinetobacter baumannii, and Klebsiella pneumoniae in CAUTI cases. The findings emphasizes the need for catheter-use rationalization, targeted antibiotic therapy and appropriate infection control measures to reduce the spread of resistant uropathogens in hospitalized settings.

REFERENCES

1. Mancuso, G., Midiri, A., Gerace, E., Marra, M., Zummo, S., & Biondo, C. (2023). Urinary Tract Infections: The Current Scenario and Future Prospects. Pathogens, 12(4), 623. https://doi.org/10.3390/pathogens12040623
2. Peñaranda GE, Suasnabar DF, Foia E, Finello M, Ellena Leon MF, Panchuk A, Dominella F, Hernandez D, Cometto MA, Vázquez SM, Amuchástegui T, Albertini RA, Saad EJ. Urinary tract infections in hospitalized patients. Rev Fac Cien Med Univ Nac Cordoba. 2020 Dec 1;77(4):265-271. PMID: 33351394.
3. Jacobsen SM, Stickler DJ, Mobley HL, Shirtliff ME. Complicated catheter-associated urinary tract infections due to Escherichia coli and Proteus mirabilis. Clin Microbiol Rev. 2008 Jan;21(1):26-59. doi: 10.1128/CMR.00019-07. PMID: 18202436; PMCID: PMC2223845.
4. Werneburg GT. Catheter-Associated Urinary Tract Infections: Current Challenges and Future Prospects. Res Rep Urol. 2022 Apr 4;14:109-133. doi: 10.2147/RRU.S273663. PMID: 35402319; PMCID: PMC8992741.
5. Köves B, Magyar A, Tenke P. Spectrum and antibiotic resistance of catheter-associated urinary tract infections. GMS Infect Dis. 2017 Nov 22;5:Doc06. doi: 10.3205/id000032. PMID: 30671328; PMCID: PMC6301742.
6. Zhang HL, Nizamani MM, Wang Y, Cui X, Xiu H, Qayyum M, Sun Q. Analysis of antimicrobial resistance and genetic diversity of Acinetobacter baumannii in a tertiary care hospital in Haikou City. Sci Rep. 2024 Sep 27;14(1):22068. doi: 10.1038/s41598-024-73258-2. PMID: 39333332; PMCID: PMC11437051.
7. Rubi H, Mudey G, Kunjalwar R. Catheter-Associated Urinary Tract Infection (CAUTI). Cureus. 2022 Oct 17;14(10):e30385. doi: 10.7759/cureus.30385. PMID: 36407206; PMCID: PMC9668204.
8. Nicolle LE. Catheter-related urinary tract infection. Drugs Aging. 2005;22(8):627-39. doi: 10.2165/00002512-200522080-00001. PMID: 16060714.
9. Saint S, Trautner BW, Fowler KE, Colozzi J, Ratz D, Lescinskas E, Hollingsworth JM, Krein SL. A Multicenter Study of Patient-Reported Infectious and Noninfectious Complications Associated With Indwelling Urethral Catheters. JAMA Intern Med. 2018 Aug 1;178(8):1078-1085. doi: 10.1001/jamainternmed.2018.2417. PMID: 29971436; PMCID: PMC6143107.
10. Gajdács M, Ábrók M, Lázár A, Burián K. Comparative Epidemiology and Resistance Trends of Common Urinary Pathogens in a Tertiary-Care Hospital: A 10-Year Surveillance Study. Medicina (Kaunas). 2019 Jul 9;55(7):356. doi: 10.3390/medicina55070356. PMID: 31324035; PMCID: PMC6681214.
11. Magill SS, Edwards JR, Bamberg W, Beldavs ZG, Dumyati G, etal. Emerging Infections Program Healthcare-Associated Infections and Antimicrobial Use Prevalence Survey Team. Multistate point-prevalence survey of health care-associated infections. N Engl J Med. 2014 Mar 27;370(13):1198-208. doi: 10.1056/NEJMoa1306801. Erratum in: N Engl J Med. 2022 Jun 16;386(24):2348. doi: 10.1056/NEJMx210023. PMID: 24670166; PMCID: PMC4648343.
12. Flores-Mireles AL, Walker JN, Caparon M, Hultgren SJ. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. Nat Rev Microbiol. 2015 May;13(5):269-84. doi: 10.1038/nrmicro3432. Epub 2015 Apr 8. PMID: 25853778; PMCID: PMC4457377.
13. Hall DE, Snitzer JA 3rd. Staphylococcus epidermidis as a cause of urinary tract infections in children. J Pediatr. 1994 Mar;124(3):437-8. doi: 10.1016/s0022-3476(94)70370-1. PMID: 8120716.
14. Mohamed AH, Sheikh Omar NM, Osman MM, Mohamud HA, Eraslan A, et al. Antimicrobial Resistance and Predisposing Factors Associated with Catheter-Associated UTI Caused by Uropathogens Exhibiting Multidrug-Resistant Patterns: A 3-Year Retrospective Study at a Tertiary Hospital in Mogadishu, Somalia. Trop Med Infect Dis. 2022 Mar 4;7(3):42. doi: 10.3390/tropicalmed7030042. PMID: 35324589; PMCID: PMC8948891.
15. Koves B, Magyar A, Tenke P. Spectrum and antibiotic resistance of catheter-associated urinary tract infections. GMS Infect Dis. 2017 Nov 22;5:Doc06. doi: 10.3205/id000032. PMID: 30671328; PMCID: PMC6301742.