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Research Article

Clinical and Bacteriological Profile of Catheter-Associated Urinary Tract Infections in Hospitalized Patients

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ABSTRACT

Background: Urinary tract infections (UTIs) are one of the most common nosocomial infections, particularly in catheterized patients. This study aims to assess the clinical presentation, bacteriological profile, and antibiotic sensitivity of pathogens in patients with catheter-associated urinary tract infections (CAUTIs).

Objective: To evaluate the clinico-bacteriological aspects of urinary tract infections in catheterized patients.

Material and Methods: A prospective study was conducted in the Department of Medicine at a tertiary care hospital, including 120 catheterized patients diagnosed with UTIs. Clinical data were collected, and urine samples were analyzed microbiologically.

Results: The study identified Escherichia coli as the predominant organism, followed by Klebsiella pneumoniae and Proteus mirabilis. Resistance rates to commonly prescribed antibiotics were notable.

Conclusion: This study highlights the prevalence of antibiotic-resistant strains in CAUTIs, necessitating regular surveillance and appropriate antibiotic stewardship.

Keywords: Urinary tract infections, catheter-associated, Escherichia coli, antibiotic resistance

Introduction:

Urinary tract infections (UTIs) are prevalent worldwide and represent a significant burden on healthcare systems. They are particularly common in hospitalized patients, especially those with indwelling urinary catheters, which are associated with increased risk of infection. The catheterization process can introduce pathogens into the urinary tract, leading to catheter-associated urinary tract infections (CAUTIs). Studies have shown that the incidence of UTIs in catheterized patients can be as high as 25-50% (1).

The clinical presentation of CAUTIs can vary widely, with symptoms ranging from mild dysuria to severe systemic illness. In many cases, the symptoms may be atypical, especially in elderly or immunocompromised patients, leading to challenges in diagnosis and management (2). Furthermore, the presence of an indwelling catheter often complicates the clinical picture, as classic signs of infection may be masked.

Microbiologically, Escherichia coli is the most frequently isolated organism in UTIs, accounting for approximately 70-90% of cases (3). Other notable pathogens include Klebsiella pneumoniae, Proteus mirabilis, and Enterococcus species. The rise of multidrug-resistant organisms (MDROs) has become a significant concern, especially in hospital settings, where antibiotic use is frequent (4).

Antibiotic resistance patterns in CAUTIs have evolved, necessitating local surveillance to inform empirical treatment guidelines. Studies indicate that resistance to first-line antibiotics, such as trimethoprim-sulfamethoxazole and fluoroquinolones, is on the rise, emphasizing the need for susceptibility testing (5).

This study aims to evaluate the clinico-bacteriological profile of UTIs in catheterized patients, focusing on the identification of pathogens and their antibiotic sensitivity patterns.

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Aim and Objectives

Aim: To assess the clinico-bacteriological profile of urinary tract infections in catheterized patients.

Objectives:

1. To identify the common pathogens responsible for CAUTIs.
2. To evaluate the antibiotic susceptibility patterns of these pathogens.

Material and Methods

This prospective study was conducted in the Department of Medicine at a tertiary care hospital. A total of 120 catheterized patients diagnosed with UTIs were included in the study. The inclusion criteria encompassed adult patients with clinical signs of UTI, such as dysuria, frequency, urgency, fever, and flank pain. Patients with non-catheter-associated UTIs or those who received antibiotics within the preceding week were excluded.

Data Collection

Clinical data were obtained through structured interviews and physical examinations. Urine samples were collected using a sterile technique for culture and sensitivity testing. The samples were inoculated onto blood agar and MacConkey agar plates and incubated at 37°C for 24 hours. Bacterial colonies were identified based on standard microbiological techniques.

Antibiotic Sensitivity Testing

Antibiotic susceptibility testing was performed using the disk diffusion method according to the Clinical and Laboratory Standards Institute (CLSI) guidelines. A panel of antibiotics, including ciprofloxacin, nitrofurantoin, and amoxicillin-clavulanate, was tested.

Statistical Analysis

Data were analyzed using statistical software. Descriptive statistics were used to summarize patient demographics and microbiological findings. Chi-square tests were employed to assess associations between categorical variables.

Results

Patient Demographics

The study cohort comprised 120 catheterized patients, with a mean age of 58.3 ± 12.4 years. Of the patients, 60 (50%) were male and 60 (50%) were female.

Table 1: Distribution of Pathogens Isolated from Urine Cultures

Pathogen	Frequency (n)	Percentage (%)
Escherichia coli	65	54.2
Klebsiella pneumoniae	30	25.0
Proteus mirabilis	15	12.5
Enterococcus faecalis	10	8.3

The results indicate that Escherichia coli is the most frequently isolated pathogen, constituting over half of the cases. Klebsiella pneumoniae follows as the second most common organism, highlighting the significance of these bacteria in CAUTIs.

Table 2: Antibiotic Sensitivity Patterns of Isolated Pathogens

Antibiotic	E. coli (n=65)	K. pneumoniae (n=30)	P. mirabilis (n=15)	E. faecalis (n=10)
Ciprofloxacin	52 (80%)	18 (60%)	12 (80%)	8 (80%)
Nitrofurantoin	58 (89%)	22 (73%)	10 (67%)	6 (60%)
Amoxicillin-clavulanate	45 (69%)	15 (50%)	8 (53%)	5 (50%)

The susceptibility results show that the majority of E. coli and P. mirabilis strains remain sensitive to nitrofurantoin, while resistance to amoxicillin-clavulanate is evident in K. pneumoniae and E. faecalis strains. These findings underline the necessity for susceptibility testing to guide appropriate antibiotic therapy.

Discussion

This study underscores the significant prevalence of CAUTIs in catheterized patients and highlights the importance of identifying the causative pathogens and their antibiotic resistance patterns. As noted in previous studies, Escherichia coli remains the predominant pathogen in UTIs, reaffirming its role as a major contributor to nosocomial infections (6). The high isolation rate of Klebsiella pneumoniae and Proteus mirabilis aligns with similar findings reported in the literature (7).

The antibiotic susceptibility patterns observed in this study reveal concerning resistance levels, particularly against commonly used antibiotics such as amoxicillin-clavulanate. This trend reflects the growing challenge of antibiotic resistance in hospital settings, necessitating continuous monitoring and adherence to local guidelines for empirical therapy (8). The resistance to ciprofloxacin in K. pneumoniae also raises alarms about the potential for treatment failure, emphasizing the need for individualized patient management based on susceptibility results.

In the context of the increasing prevalence of multidrug-resistant organisms, strategies such as appropriate catheter care and the judicious use of antibiotics are essential to mitigate the incidence of CAUTIs (9). Furthermore, education of healthcare providers regarding proper catheterization techniques and infection control practices can significantly reduce the risk of infections in catheterized patients (10).

While the study provides valuable insights, it is important to note its limitations. The study was conducted in a single center, and the results may not be generalizable to other settings. Future multi-center studies are warranted to establish broader trends and resistance patterns. Additionally, further research is needed to explore the impact of infection control measures on the incidence of CAUTIs and to develop effective strategies for antibiotic stewardship in hospitals.

Conclusion

This clinico-bacteriological study provides essential insights into the epidemiology of urinary tract infections in catheterized patients. The findings highlight the dominance of Escherichia coli and the concerning resistance patterns among isolated pathogens. Regular surveillance of antibiotic susceptibility is crucial for guiding empirical treatment and enhancing patient outcomes in CAUTIs.

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