Assessment of Catheter Associated Urinary Tract Infection Rate and Antimicrobial Susceptibility Pattern of Isolated Organisms

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Abstract

Background and Aim: The most prevalent nosocomial infection and a major contributor to morbidity is catheter-associated urinary tract infections (CAUTIs). The goal of the current investigation was to determine the uropathogens linked to CAUTI, its prevalence in a tertiary care hospital, and the pattern of antibiotic sensitivity in the isolated organisms.

Material and Methods: This prospective investigation was carried out in the tertiary care facility. 80 catheterized patients in all were included for the six-month period. Urine samples were taken under aseptic conditions from clinically probable CAUTI cases, and the samples were processed in the department of Microbiology in accordance with established methods. We isolated, identified, and tested the antibiotic sensitivity of uropathogens. Results of the calculation of the CAUTI rate were recorded.

Results: 90 catheterized patients experienced 14 CAUTIs. Male patients required catheterization more frequently than female patients did. Escherichia coli (36.66%) and Klebsiella pneumoniae (33.33%) were the most prevalent uropathogens, followed by Pseudomonas aeruginosa (18.88%) and Acinetobacter spp. (10%) in cases of CAUTI. particularly the bacteria recovered from patients with CAUTI, which are multidrug resistant. The preferred medications included Imipenem, Fosfomycin, Nitrofurantoin, Cotrimoxazole, Tetracycline, and Doxycycline.

Conclusion: The results of our investigation and other studies show that CAUTI has grown to be a significant hazard to patient safety globally, that it is still a concern, and that it is crucial to adopt active infection control programmes for infection surveillance. For the prevention and management of CAUTI, infection control procedures must be put into practise.

Keywords: Catheter-associated urinary tract infections, Escherichia coli, Klebsiella Pneumonia, Uropathogens.

Introduction

The most typical device-associated infection contracted in a hospital setting is catheter-associated urinary tract infection (CAUTI). About 75% of UTIs acquired in hospitals are linked to urinary catheters. When care bundles are not used, between 15 and 25 percent of hospitalised patients who have urinary catheters develop Catheter Associated Urinary Tract Infections (CAUTI). [1]

Bacteria can get inside the bladder as the catheter is being inserted, through the catheter lumen, or through the area around the catheter. Escherichia coli, Klebsiella species, Proteus species, Enterococcus species, Pseudomonas species, Enterobacter species, and Serratia species are the most prevalent infecting organisms.[2] The problem of antimicrobial resistance among urinary pathogens has been worse over the past few decades; studies on the spread of resistance among

them and notable changes in the antibiogram of CAUTI-causing bacterial isolates.[3]

The centers for disease control and prevention (CDC) define catheter-associated urinary tract infections (CAUTI) as UTIs when an indwelling urinary catheter was in situ for more than two calendar days on the day of the incident.[4] The most typical type of infection related with healthcare is catheter-associated urinary tract infection. Hospital acquired catheter-associated urinary tract infections (CAUTIs). A urinary tract infection (UTI) is defined by the Centers for Disease Control and Prevention (CDC) as "an infection involving any part of the urinary system, including the urethra, bladder, ureters, and kidney." According to the National Healthcare Safety Network (NHSN), UTIs are the most prevalent type of healthcare-associated illness that has been

recorded, and of those that are hospital-acquired, over 75% are linked to urinary catheters. According to NHSN estimates, between 15 and 25 percent of all hospitalised patients use urinary catheters while they are there. Catheters should only be used for the right reasons, and they should be taken out as soon as they are no longer required.[5] The goal of the current investigation was to determine the uropathogens linked to CAUTI, its prevalence in a tertiary care hospital, and the pattern of antibiotic sensitivity in the isolated organisms.

Material and Methods

This prospective investigation was carried out in the tertiary care facility. From June 2022 to December 2022, a total of 80 catheterized patients were included.

The institutional ethical committee provided its ethical approval, and each subject provided signed informed permission.

Inclusion criteria

Patients on Foley's catheter for at least 48 hours will be included in the study

Exclusion criteria

1. Patients with history of sexually transmitted diseases.
2. Immunocompromised patients

By using a specifically designed case report form, the following information is gathered from patients in whom CAUTI is suspected and who meet the inclusion and exclusion criteria, including the following:

- Demographic data: Name, age, sex, occupation, address, phone number.
- History included, date of admission to the hospital, date of insertion of indwelling catheter, number of days with the catheter, disease data, treatment data and personal history.

Urine was grown on blood agar media using the calibrated loop for quantitative analysis to determine the bacteria counts. Additionally, MacConkey agar material was plated. While confirming the patient's diagnosis of CAUTI, the substantial bacteriuria of 105 cfu/ml was taken into account.

The disc diffusion test, as advised by CLSI standards, was used for identification and antimicrobial susceptibility testing.[6-8] Implementing the CAUTI care package, which includes pericare cleaning, explaining the technique, performing hand hygiene before and after catheterizing Foley, helps to lower the rates.

Strict aseptic measures, the use of a securement device, the positioning of the urinary system so that it can drain properly, the use of a special container for measuring and emptying urine, the maintenance of a collection bag, etc.

Statistical analysis

The collected data was organised, inputted, and exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA) after being combined and entered into a spreadsheet programme (Microsoft Excel 2007). The level of significance and confidence level for each test were set at 5% and 95%, respectively.

Results

90 catheterized patients experienced 14 CAUTIs. Male patients required catheterization more frequently than female patients did. The duration of catheterization ranged from 2 to 20 days. Escherichia coli (36.66%) and Klebsiella pneumoniae (33.33%) were the most prevalent uropathogens, followed by Pseudomonas aeruginosa (18.88%) and Acinetobacter spp. (10%) in cases of CAUTI. particularly the bacteria recovered from patients with CAUTI, which are multidrug resistant. The preferred medications included Imipenem, Fosfomycin, Nitrofurantoin, Cotrimoxazole, Tetracycline, and Doxycycline.

Table 1: Gender wise Distribution of study Population

Gender	Number	Percentage (%)
Male	48	53.33
Female	42	46.66
Total	90	100

Table 2: Age-wise Distribution of study participants

Age (Years)	Number	Percentage (%)
16-30	13	14.44
31-45	19	21.11
46-60	28	31.11
Above 60	30	33.33

Table 3: Distribution according to bacteria causing CAUTIs

Bacteria	Number	Percentage (%)
Escherichia coli	33	36.66
Klebsiella pneumoniae	30	33.33
Pseudomonas aeruginosa	18	18.88
Acinetobacter spp	9	10

Discussion

In terms of morbidity and mortality, CAUTIs place a heavy cost on patients. The most frequent hospital acquired infections are still catheter-associated urinary tract infections (CAUTI). In addition to greater rates of morbidity and mortality, hospital stays are lasting longer than they used to, and patients and healthcare systems are paying more for care. In hospitalised patients, E. coli, K. pneumoniae, P. aeruginosa, E. faecalis, and Candida species are the most prevalent bacteria that cause CAUTIs.[9,10] This is comparable to Nandini M.S. et al[11] and Bagachi et al[12]. Escherichia coli continues to be the most typical bacterial isolate for patients with UTI symptoms during a brief catheterization (3-5 days). By contaminating the urethra and ascending into the bladder after catheter placement, these bacteria that predominate in the stomach as normal flora may cause a urinary tract infection. Studies done in Italy[13], Thailand[14], and Sudan[15] revealed that the most typical bacterial isolates were P. aeruginosa or Enterococcus species. This variation in bacterial isolate dispersion may be brought about by variations in ambient factors, catheterization times, and the organisms' particularity to each facility.

17.50 CAUTIs were reported overall for every 1000 catheter days. When compared to previous research, incidence is high. The incidence rates are high, with the exception of a few months, but they decreased after the CAUTI care bundles were implemented, along with rigorous training and on-site monitoring. The unskilled staff's lack of knowledge and experience with infection prevention practises may be the cause of the rate's variation during the past few months. Long-term catheterization is another important factor that increases the likelihood of developing CAUTI. During rounds, meetings of the HICC team, and committee, the rates of the HAI, including the CAUTI, are discussed with all the pertinent employees. The CAUTI care bundles and hand hygiene compliance are both monitored by the infection control team. Numerous other investigations have demonstrated that catheterized individuals had a very high risk of CAUTI.[16-18] The patient's gender, a failure to follow infection prevention and control procedures, catheter care bundles, the length of the catheterization, etc., may all be contributing factors to the high prevalence of CAUTI. Strict infection control procedures and adherence to the CAUTI care bundles, such as explaining the rationale for catheterization, performing hand hygiene before and after Foley's catheterization, doing pericare cleaning, are required to maintain low incidence of CAUTI in catheterized patients. Strict aseptic precautions, the use of a securement device, the correct positioning of the urinary system to drain, the use of a dedicated container for measuring and emptying urine, the maintenance of collection bags, etc. can be accomplished by frequent visits by infection control team members to catheterized patients daily at various times to meticulously monitor the preventive bundles.[19] Multidrug Resistant Organisms, or MDROs, were discovered to be the uropathogens recovered from CAUTI cases. These results are consistent with those of numerous previous investigations in which multidrug resistant uropathogens were identified.[20] The uropathogens' increased antibiotic resistance is a sign that they are hospital-acquired and therefore challenging to cure. The preferred medications included Imipenem, Fosfomycin, Nitrofurantoin, Cotrimoxazole, Tetra, and Doxycycline. If infection control procedures are not followed when taking care of the catheterized patients, this will be concerning. If healthcare professionals do not strictly adhere to preventive practises, there is a substantial risk of transmission of these multidrug resistant infections. In this study, the reduced risk of CAUTI was attributable to the use of catheter care bundles, hand hygiene, and infection control procedures. This shows that careful intervention in the form of avoiding needless urinary catheters, maintaining aseptic precautions at the time of insertion and removal of the catheters, appropriate catheter maintenance practises, early catheter removal unless it is otherwise indicated, well defined antibiotic policy, and properly guided infection control programmes can reduce the extent of multidrug-resistant pathogen not only in CAUTI patients but also for the hospital.

Conclusion

The results of our investigation and other studies show that CAUTI has grown to be a significant hazard to patient safety globally, that it is still a concern, and that it is crucial to adopt active infection control programmes for infection surveillance. The use of infection control procedures is essential for the prevention and management of CAUTI. When short-term catheterization is used, about half of the patients

get a UTI within seven days. The bacteria' altered microbiological and drug sensitivity pattern has been discovered as a significant issue with this type of infection. Multidrug Resistant Organisms, or MDROs, are becoming more prevalent. Strict infection control procedures are required, as well as strict adherence to the CAUTI care packages and hand hygiene recommendations, to maintain low incidence of CAUTI in catheterized patients.

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