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Original Research Article

A Hospital-Based Study to Determine the Incidence of CAUTI and Etiology with Antibiotic Susceptibility

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Abstract

Aim: The aim of the present study was to determine the etiology with antibiotic susceptibility and also to calculate CAUTI rate.

Material & Methods: The study was conducted on 100 patients who admitted in intensive care unit (ICU) in Department of Microbiology for the period of 12 months. Patients who were on urinary catheter insertion for >48 hours were included in the study.

Results: There were 75 male and 25 females in the present study. Most of the patients belonged 25-45 years. The most common uropathogens were E. coli and Klebsiella pneumoniae followed by Pseudomonas aeruginosa and Acinetobacter species from the cases of CAUTI. Imipenem was the single best antibiotic for all pathogens except Pseudomonas aeruginosa where Amikacin was the drug of choice. The Acinetobacter species also showed very high resistance to all antibiotics except Imipenem.

Conclusion: CAUTI remained a great burden to patient safety and a challenge to the infection control team. Implementation of proper care bundles and continuous education to health care workers plays a key role in reducing the CAUTI rates, thereby decreasing the morbidity and hospital stay to the patients.

Keywords: CAUTI, Devise associated Hospital acquired UTI, CAUTI rate

Introduction

Urinary tract infections (UTIs) are the most common infections worldwide and are a major healthcare obstacle that impacts over 150 million people annually. [1] Catheter associated UTI (CA-UTI) is the most common hospital-acquired UTI, accounting for more than 80% of cases and affecting more than 1 million patients each year. [2] CAUTIs account for 40% of all hospital-acquired infections and 80% of all nosocomial urinary tract infections (UTIs). [3] If inadequately treated, CAUTIs may progress to complications such as cystitis, pyelonephritis, Gram-negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, and meningitis in all patients. [4] and these lead to discomfort for the patient, with an excess mortality rate of 23 deaths per 1000 inpatients and excess costs of $1000/case, i.e., additional costs per hospital acquired infection. [5] The risk of CA-UTI increases by 3–7% per day, as 20% of hospitalized patients are catheterized during admissions (45–79% of patients in intensive care units, as well as 17–23% of patients in medical and surgical wards). [6] The term catheter-acquired infection refers to asymptomatic bacteriuria (CA-ASB), whereas CA-UTI refers to symptomatic patients. [6] Multiple risk factors can affect the occurrence of CAUTI. These include quality of aseptic technique, duration of catheterization, appropriate hand hygiene and care of catheter. [7,8] CA-UTI is one of the most common nosocomial infections and leads to significant morbidity and increased healthcare expenditures, as it is associated with an increased number of multidrug-resistance (MDR) uropathogens with significant antimicrobial resistance. [9,10] More than 80% of isolated bacteria associated with CA-UTI are resistant to various classes of antimicrobials. This increased susceptibility in catheterized patients is due to the ability of the catheter to bypass several host defenses and thereby enable bacterial entry into the urinary tract. In intubated patients, bacteria can ascend from the urethral meatus into the bladder by migrating between the mucosal and catheter surfaces. The duration of catheterization is directly related to the development of infection. Bacteria can easily invade the lower urinary tract along the external surface of the catheter or by ascending route through the lumen of the catheter. [11] CAUTI can lead to complications such as prostatitis, epididymitis, and orchitis in males, and cystitis, pyelonephritis, gram-

negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis. Complications associated with CAUTI cause discomfort to the patient, prolonged hospital stay, and increased cost and mortality. Hence the aim of present study was done to assess the incidence of CAUTI in a tertiary care hospital, to identify the uropathogens associated with it and to detect the antibiotic sensitivity pattern in the isolated organisms. This plays a significant role in initiating appropriate antibiotics which decreases complications and hospital stay and also helps the infection control team to implement proper care bundles which reduces the hospital stay of patients there by reducing the morbidity and mortality

Material & Methods

The study was conducted on 100 patients who admitted in intensive care unit (ICU) in Department of Microbiology, Government Medical College, Bettiah, Bihar, India for the period of 12 months. Patients who were on urinary catheter insertion for >48 hours were included in the study. The patients were screened for inclusion and exclusion criteria. The criteria being considered are as follows:

Inclusion Criteria

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

Exclusion Criteria

- Patients with history of sexually transmitted diseases.
- Immunocompromised patients.

Methodology

Institutional Ethical Committee (IEC) clearance was obtained before beginning of the study. Patients on Foley's catheter in the hospital, who accepted to be a part of the study, were approached, IEC clearance certificate was shown to the patients and their consent was obtained. 3 The following data is collected from the patients in whom CAUTI is suspected, and satisfying the inclusion and exclusion criteria by means of the specially constructed case report form, including the following: Demographic data of 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.

Sample Collection

100 Urine samples were collected from clinically suspected cases of CAUTI in a sterile wide mouthed universal container taking aseptic precautions with a sterile disposable syringe after cleaning and clamping the catheter tube. The samples were immediately sent to the microbiology department for culture and sensitivity testing.

Processing the Sample

The urine samples were subjected to wet mount for evaluating the presence of pus cells, epithelial cells, RBCs and microorganisms. Semi-quantitative culture of urine samples was done by calibrated loop method on 5% sheep blood agar and CLED agar (cystine–lactose–electrolyte deficient agar and incubated in aerobic conditions at 37◦C for24-48 hours. The urine cultures of colony count >105 colony forming units (CFU)/Ml with no more than two species of microorganisms were considered as positive for CAUTI and cultures showing growth of more than two types of bacteria were considered contaminated. Positive cultures were identified by various biochemical reactions like nitrate test, catalase test, oxidase test, Methyl red test, voges – Proskauer test indole test, citrate test, triple sugar iron test, urease test, sugar (glucose, lactose, sucrose, mannitol, fructose) fermentation tests, arginine dehydroxylation, decarboxylation of lycine and ornithine. [12] Antibiotic susceptibility testing was performed by Kirby-Bauer s disk diffusion method on Mueller-Hinton agar as per the CLSI guidelines. [13] The antibiotics tested were ampicillin, amikacin, nitrofurantoin, cotrimoxazole, imipenem, ceftraxazone, cefotaxime, cefaxitine, ceftazidime, cefuroxime, ciprofloxacin, gentamycin, netlimycin, and norfloxacin. The CAUTI rate per 1000 urinary catheter days is calculated by dividing the number of CAUTIs by the number of catheter days and multiplying the result by 1000.

Statistical Analysis

Descriptive statistics expressed as percentages were used to evaluate the incidence of CAUTI in tertiary care hospital wards and adult ICUs and to define the resistance pattern of isolated organisms.

Results

Table 1: Gender and age distribution of patients

Age (years)	Male	Female
Below 25	9	4
25-35	20	6
35-45	19	5
45-55	12	5
Above 55	10	5
Total	75	25

There were 75 male and 25 females in the present study. Most of the patients belonged 25-45 years.

Table 2: Antibiotic resistance pattern of uropathogens isolated from catheter associated urinary tract infections (CAUTI) patients

Name of uropathogen	Resistance pattern (%)													
	AMP	AM	IC	MRP	PIT	CZ	CAC	CAZ	GEN	CIP	AK	TOB	NET	CXM
E. coli	83.33	100	0	0	16.67	83.33	33.33	66.67	16.67	50	16.67	16.67	16.67	83.33
K. pneumonia	100	100	0	16.67	33.33	100	50	83.33	66.67	100	33.33	50	33.33	100
P. aeruginosa	100	100	83.33	66.67	16.67	100	100	100	16.67	50	0	66.67	100	100
Acinetobacter species	100	100	0	100	100	100	100	100	100	100	100	100	100	100

The most common uropathogens were E. coli and Klebsiella pneumoniae followed by Pseudomonas aeruginosa and Acinetobacter species from the cases of CAUTI. Imipenem was the single best antibiotic for all pathogens except Pseudomonas aeruginosa where Amikacin was the drug of choice. The Acinetobacter species also showed very high resistance to all antibiotics except Imipenem.

Discussion

Catheter associated Urinary tract infection (CAUTI) is the most common among the device associated infections acquired from the hospital settings. Among hospital acquired UTIs, approximately 75% are associated with a urinary catheter. Between 15-25% of hospitalized patients receive urinary catheters during their hospital stay leading to Catheter Associated Urinary Tract Infections (CAUTI) where care bundles are not practiced. [14] Catheter- associated urinary tract infections (CAUTI) according to the centers of disease control and prevention(CDC) is defined as UTI where an indwelling urinary catheter was in place for more than two calendar days on the date of event (day 1 being the day of device placement). [15] Multiple risk factors can affect the occurrence of CAUTI. These include quality of aseptic technique, duration of catheterization, appropriate hand hygiene and care of catheter. [16,17]

There were 75 male and 25 females in the present study. Most of the patients belonged 25-45 years. The most common uropathogens were E. coli and Klebsiella pneumoniae followed by Pseudomonas aeruginosa and Acinetobacter species from the cases of CAUTI. Imipenem was the single best antibiotic for all pathogens except Pseudomonas aeruginosa where Amikacin was the drug of choice. The Acinetobacter species also showed very high resistance to all antibiotics except Imipenem. Catheter associated urinary tract infections (CAUTIs) are serious health affecting problems in hospitalized patient. [18] The most common bacteria causing CAUTIs in hospitalized patients includes E.coli, K. pneumoniae, P. aeruginosa, E. faecalis, and Candida species. [19,20] The overall incidence of CAUTI was 5 per 1000 catheter days which were below the benchmark set by this hospital infection control committee (HICC) in the present study. Incidence is very low as compared to other studies. [21,22] The reason of the fluctuation in the rate of incidence in few months might be due to the untrained staff without the proper knowledge and practice about the infection prevention practices. The other major reason includes prolonged catheterization as a major risk factor for the development of CAUTI. In the present institute training has been imparted regularly for practicing preventive protocols for reducing the CAUTI and continuous monitoring of compliance about hand hygiene. The attack rates were displayed and shared with the staff in the monthly meetings. However, there are other studies which had shown very high incidence of CAUTI in catheterized patients. [23,24]

The uropathogens isolated from CAUTI cases were found to be multidrug resistant. These findings correlate with various other studies. [25,26] where multidrug resistant uropathogens were isolated. In the present study the most resistant uropathogens were Pseudomonas aeruginosa and Acinetobacter species. which showed the high resistance to multiple antibiotics including imipenem and Meropenem. Increase in the antibiotic resistance amongst the uropathogens indicates that they are hospital acquired and thus difficult to treat. This will be more dangerous if infection prevention practices are not followed during care of the catheterized patients. The chances of transmission of these multi drug resistant are high if health care workers do not follow preventive practices meticulously. In the present study the incidence is much lower because of continuous monitoring and training of the staff.

Conclusion

CAUTI remained a great burden to patient safety and a challenge to the infection control team. Implementation of proper care bundles and continuous education to health care workers plays a key role in reducing the CAUTI rates, thereby decreasing the morbidity and hospital stay to the patients.

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