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ORIGINAL RESEARCH

Analysis of Catheter Associated Urinary Tract Infections (CAUTI) and Antibiotic Susceptibility Pattern of Uropathogens Causing CAUTI at Tertiary Care Hospital

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ABSTRACT

Aim: A research with the goal of determining the antibiotic susceptibility pattern of uropathogens responsible for catheter-associated urinary tract infections (CAUTI) in a tertiary care hospital.

Materials and Methods: There were a total of 300 individuals that required catheterization. During her daily rounds, the infection control nurse gathered all of the pertinent information, such as the patient's name, age, sex, the date of their catheterization, and laboratory findings. The CAUTI diagnosis was carried out in accordance with the CDC criteria that were issued in 2009. Patients of both sexes who were more than 18 years old and who had been placed on a Foley's catheter for at least 48 hours were considered for inclusion in the research. This selection criteria were used to determine who would be included in the study.

Results: Out of 300 catheterized patients, 20 developed CAUTI. The overall incidence was 6.67%. Male patients were more than the female patients for catheterization. Catheterization days ranged from 2 days to 12 days. The most common uropathogens were E. coli (40%) and Klebsiella pneumoniae (40%) followed by Pseudomonas aeruginosa (10%) and Acinetobacter species (10%) 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 continued to be a significant risk to the health of patients and a difficult obstacle for the staff working in infection control. The implementation of appropriate care packages and the provision of ongoing education to health care staff each play a significant part in the reduction of CAUTI rates, which in turn leads to a reduction in the morbidity of patients and the length of their stays in hospitals.

Keywords: CAUTI, Infection, Uropathogens, Antibiotic.

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INTRODUCTION

The catheter-associated urinary tract infection (CAUTI) is the kind of device-associated infection that occurs in hospitals more often than any other type. Approximately 75% of urinary tract infections that are acquired in hospitals are linked to the use of urinary catheters. When care bundles are not used, anywhere between 15 and 25 percent of hospitalised patients will obtain urinary catheters at some point during their stay. This may result in catheter-associated urinary tract infections (CAUTI).[1] According to the Centers for Disease Control and Prevention (CDC), a catheter-associated urinary tract infection (CAUTI) is defined as a urinary tract infection (UTI) that occurs when an indwelling urinary catheter has been present for more than two calendar days on the date that the infection occurred (day 1 being the day of device placement).[2] The incidence of CAUTI might be influenced by a number of different risk factors. Among them are the quality of the aseptic technique, the length of time that the patient is catheterized, the maintenance of the catheter, and sufficient hand hygiene.[3,4] The urethral catheter is the most common source of nosocomial infections and gram-negative bacteremia that may be found in hospitals. The length of time a patient is required to have a catheter inserted has been linked to an increased risk of infection. It is simple for bacteria to enter the lower urinary tract via the exterior surface of the catheter or by an ascending path through the lumen of the catheter. Both of these entry points are located on the catheter. In males[5], CAUTI can lead to complications such as prostatitis, epididymitis, and orchitis. In females[5], CAUTI can lead to complications such as cystitis, pyelonephritis, gram-negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis. In males[5], CAUTI can lead to complications such as Complications connected with CAUTI result in the patient experiencing pain, a prolonged hospital stay, greater costs, and an increased risk of death. In addition, CAUTIs obtained in hospitals are often caused by strains that are resistant to several drugs, necessitating stronger antibiotics.[6] Assessing the prevalence of catheter-associated urinary tract infections (CAUTIs) in a tertiary care hospital was the primary objective of the current study. Other objectives included determining the uropathogens associated with CAUTIs and determining the antibiotic sensitivity pattern of the organisms that were isolated. This plays a significant role in initiating appropriate antibiotics, which in turn reduces complications and length of hospital stay. Additionally, this helps the infection control team implement proper care bundles, which in turn reduces the length of time patients spend in the hospital, thereby reducing morbidity and mortality.

MATERIALS AND METHODS

After receiving permission from the protocol review committee as well as the institutional ethics committee, the Department of Microbiology, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand (India) undertook the conduct of this prospective research during January 2018 to December 2018.

There was a total of 300 individuals that required catheterization. During her daily rounds, the infection control nurse gathered all of the pertinent information, such as the patient's name, age, sex, the date of their catheterization, and laboratory findings. The CAUTI diagnosis was carried out in accordance with the CDC criteria that were issued in 2009. Patients of both sexes who were more than 18 years old and who had been placed on a Foley's catheter for at least 48 hours were considered for inclusion in the research. This selection criteria were used to determine who would be included in the study. There was no record of the patient ever having any sexually transmitted illness in the past, nor was there any indication that they were immunocompromised.

Urine was collected following the recommendations given earlier for culture and sensitivity with aseptic precautions, and it was promptly transferred to the laboratory in a sterile

container. Urine was collected in this manner because it was necessary to determine culture and sensitivity.[7] The urine in its natural state was stained with gramme stain and examined under a wet mount to look for pus cells and microbes. Urine was grown on blood agar medium for quantitative analysis in order to determine the number of microbial counts. The calibrated loop was used for this. Additionally, MacConkey agar medium was plated. When determining whether or not the patient had CAUTI, a considerable bacteriuria level of 105 cfu/ml was taken into account. The disc diffusion test, which is approved by CLSI standards, was used in order to determine the identity of the organism and its susceptibility to antibiotics.[8-10]

RESULTS

Twenty catheterized patients out of a total of 300 developed CAUTI. The incidence rate was 6.67% across the board. Table 1 displays the demographics of catheterized patients in terms of age and gender distribution. The number of male patients requiring catheterization was much higher than that of female individuals. The number of days that patients were catheterized varied anywhere from 2 to 12. In the instances of CAUTI, the uropathogens that were found most often were E. coli (40%) and Klebsiella pneumoniae (40%) followed by Pseudomonas aeruginosa (10%) and Acinetobacter species (10%).

There was evidence of the existence of multidrug-resistant pathogens in the bacterial uropathogens that were isolated from individuals with CAUTI. [11] Imipenem was the single most effective antibiotic against all bacteria, with the exception of Pseudomonas aeruginosa, which was more susceptible to Amikacin. Additionally, the Acinetobacter species shown very high resistance to all antibiotics with the exception of imipenem (Table 2).

Table 1 Gender and age distribution of patients

Age (years)	Male	Female
Below 25	25	13
25-35	62	20
35-45	53	18
45-55	50	16
Above 55	30	13
Total	220	80

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	87.5	100	0	0	12.5	87.5	37.5	62.5	12.5	62.5	12.5	12.5	12.5	87.5
K. pneumoniae	100	100	0	12.5	37.5	100	62.5	87.5	75	100	37.5	62.5	37.5	100
P. aeruginosa	100	100	100	50	0	100	100	100	0	50	0	50	100	100
Acinetobacter species	100	100	0	100	100	100	100	100	100	100	100	100	100	100

AMP: Ampicillin; AM: Amoxicillin; IC: Imipenem; MRP: Meropenem; PIT: Piperacillin Tazobactum; CZ: Cefazolin; CAC: Ceftazidime Clavulanate; CAZ: Ceftazidime; GEN: Gentamicin; CIP: Ciprofloxacin; AK: Amikacin; TOB: Tobramycin; NET: Netilmicin; CXM: Cefuroxime

DISCUSSION

Patients have a tremendous burden due to CAUTIs, both in terms of increased morbidity and increased risk of death. Infections in the urinary tract caused by catheters, often known as CAUTIs, remain one of the most prevalent types of infections acquired in hospitals. In addition to a rise in morbidity and mortality, there is also a large increase in the amount of

time patients spend in the hospital, as well as an increase in the price that patients and health systems pay for hospital care. Catheter associated urinary tract infections (CAUTIs) are major health impacting disorders in hospitalised patient.[12] E. coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococcus faecalis, and Candida species are the bacteria that are responsible for the majority of CAUTIs in hospitalised patients.[13,14] The incidence of catheter-associated urinary tract infections (CAUTI) was lower than the benchmark established by the hospital infection control committee (HICC) in the current investigation, which was 5 cases per 1000 catheter days. When compared to the findings of previous investigations, the incidence is quite low.[15,16] It's possible that untrained staff members who lack enough knowledge and experience with infection control procedures are to blame for the fluctuations in the incidence rate that have occurred over the last several months. The use of a catheter for an extended period of time is also a significant contributor to the development of CAUTI, which is the second primary cause. At the current institution, training has been provided on a consistent basis for the use of preventative measures for the reduction of CAUTI, and constant monitoring of compliance with hand hygiene has also been implemented. The personnel attended monthly meetings where the attack rates were discussed and presented for everyone to see. On the other hand, there are some studies that have demonstrated a significantly elevated risk of CAUTI in individuals who are catheterized.[17-21]

The high incidence may be attributable to a number of factors, including the gender of the patient, infection control measures, which may include aseptic job, catheter care, length of catheterization, and tight drainage system, among other factors. This hospital has very strict infection prevention procedures, which has enabled the infection control staff to maintain a low incidence of catheter-associated urinary tract infections (CAUTI) among catheterized patients. This was accomplished by members of the infection control team making many visits throughout the day to catheterized patients at varying times in order to perform rigorous monitoring of the preventative bundles. The preventative bundles that were observed throughout the round include strict adherence to hand hygiene, the use of an aseptic method, a tight drainage system, placing the urobag below the waist, and catheter care, among other things.

It was discovered that the uropathogens that were isolated from CAUTI patients were resistant to many drugs. These results are consistent with the findings of a number of previous investigations which is where uropathogens that were resistant to many drugs were found. In the current investigation, the uropathogens with the highest level of resistance were Pseudomonas aeruginosa and Acinetobacter species, both of which shown a high level of resistance to various antibiotics, including imipenem and meropenem.[22-24]

The fact that antibiotic resistance is rising among uropathogens suggests that many infections are acquired in hospitals and are thus difficult to treat. If proper procedures for preventing infections are not followed when caring for catheterized patients, the situation might become much more hazardous. If healthcare personnel do not adhere to preventative methods with the utmost attention to detail, there is a significant risk that these infections may become resistant to several drugs. In the current research, the incidence was found to be much lower than expected as a result of ongoing staff training and monitoring.

CONCLUSION

CAUTI continued to be a significant risk to the health of patients and a difficult obstacle for the staff working in infection control. The implementation of appropriate care packages and the provision of ongoing education to health care staff each play a significant part in the

reduction of CAUTI rates, which in turn leads to a reduction in the morbidity of patients and the length of their stays in hospitals.

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