

Catheter Associated Urinary Tract Infection In Patients Suffering With Urological And Nephrological Problems At Adults Intensive Care Unit At Tertiary Care Hospital, Indore Mp-India

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ABSTRACT

Background: Urinary Tract Infections (UTI) associated with urinary catheters is the leading cause of secondary nosocomial bacteremia. Approximately 20 percent of hospital-acquired bacteremias are acquired due to catheter-associated urinary tract infection and the mortality associated with this condition is about 10%.

Aim and Objective: the present study was planned to assess the prevalence of catheter-associated urinary tract infection among patients suffering with urological / nephrological problems at adults intensive care unit at tertiary care hospital, Indore MP-India.

Material and method: The present study comprises 100 subjects of both ages and sexes whom clinically confirmed cases of CAUTI, with an age group ranging from 18 to 70 years. The present study provides CAUTI incidence rates in a tertiary care hospital in Index Medical College Hospital and Research Centre, Indore (M.P.) Furthermore, information on the risk factors of common associated CAUTI causative organisms and their antibiogram patterns are also presented.

Result and Observation: The prevalence of CAUTI in hospitals is about (72) and CA-ASB is (28). Males constituted 57% and females contributed 43% of study subjects. The odds of symptomatic CAUTI were 6.00 times more in diabetic people (P value <0.0005, 95 CI 2.024 to 17.82). People suffering from neurological and respiratory diseases had 4.445 (p value 0.004, 95 CI 1.529 to 12.914) times and , 5.667 (P value 0.003, 95% CI 1.510 to 21.262) times more risk of symptomatic CAUTI. People with urological/nephrological condition had the highest risk of suffering from symptomatic CAUTI, with an odds ratio of 11.833 (P value 0.007, 95% CI 1.26 to 111.12). The persons with other uncompromising conditions had no statistically significant increased risk of CAUTI. The common pathogens found in this study are *Escherichia coli* (14%), *Klebsiella* (19.3%), *Enterobacter* (33%), *Pseudomonas* (6%), *Staph. aureus* (5.8%), *Enterococcus* (3.8%), *Candida* spp. (16%) and *proteus* (2.1%). There was a statistically significant association found between indications of catheterization, days of catheter used, and co-morbid illness.

Conclusion: In the present study the prevalence of CAUTI is much higher which needs to be rectified by continuous monitoring and training of the staff in the implementation of infection control practices in a proactive manner. The patients present mainly as asymptomatic bacterial colonization and the risk of CAUTI increases with a longer duration of catheterization. All patients who had a catheter for more than 6 days, aged 60 and above, should be checked for UTI symptoms. And their urine should be cultured regularly to diagnose and prevent CAUTI and its complications which are very dangerous and difficult to treat.

KEY WORDS: catheter-associated urinary tract infection (CAUTI), nosocomial urinary tract infection (NUTI), urinary tract infection (UTI)

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I. Introduction

Catheter-associated urinary tract infection is an important cause of morbidity and mortality in Indian subjects, affecting all age groups [1]. CAUTI is the most frequent nosocomial infection with the daily risk of developing CAUTI being 3%-7% in the acute care settings [2]. Apart from increasing hospital stay and cost, CAUTI is associated with increased morbidity and mortality [3]. More importantly, these patients become a reservoir of multi drug-resistant organisms that can result in more serious HAI [4]. An indwelling catheter offers a conduit to bacterial entry along its external and internal surface and provides a surface on which bacteria can multiply at least partially shielded from the humeral and cellular mechanisms [5,6]. The catheterized patients are

at risk of catheter-related Urinary Tract Infection (UTI). Various risk factors for infection include longer duration of catheterization; colonization of drainage bag, diarrhea, diabetes, absence of antibiotics, female gender, renal insufficiency, error in catheter care, and immune-compromised states of the patients. Around 80% of urinary tract infection is because of the use of indwelling urinary catheters [7]. Significant association of the role of duration of catheterization and length of hospital stay on the rate of catheter related hospital-acquired urinary tract infection has been documented. In one of the studies, three patients had UTIs out of 37 catheterized patients (8%) at 10 days length of stay, and 42 patients had UTI out of 49 patients catheterized (85.5%) at 18 days length of stay [8]. Nurses are generally responsible initially for catheterizing the patients and then providing care to the catheterized patients to prevent catheter-associated UTI. They need to follow appropriate and safe practices while performing procedures related to a urinary catheter. With this background, authors undertook this study to provide an insight regarding the prevalence of CAUTI and its etiologic agents in ICU, CCU, surgery, orthopedic and gynecological, and obstetrical wards patients in a tertiary care hospital. It will also provide a scope for determining any non-compliance with the preventive recommendations and also improvising the infection control policy of the hospital.

II. MATERIALS AND METHOD

The study was conducted in Index Medical College Hospital and Research Centre, Indore (M.P.) , Department of ICU. Ethical clearances were obtained from the Institutional Ethical Committee and written informed consent was taken from all the cases and controls, before carrying out the study.

Subject Selection

The present study comprises 100 subjects of both ages and sexes whom clinically confirmed cases of CAUTI, with an age group ranging from 18 to 70 years. The present study provides CAUTI incidence rates in a tertiary care hospital in Index Medical College Hospital and Research Centre, Indore (M.P.) The patients under treatment were also included as cases. Patients with renal failure, Pregnant and other malignancies have been excluded from this study.

Sample Collection

For quantitative microbiological culture, 10 mL of midstream urine sample was collected from the catheter tube using a sterile disposable syringe in a sterile universal container from each patient.

Sample Analysis

Patient information, including demographics (age, sex), clinical data, type and cause of admission, risk factors, comorbidity, causes of urinary catheterization, antibiogram, and outcome of CAUTI management, was collected from the medical record files. No personally identifiable information was retrieved.

Statistics Analysis

Occurrence of symptomatic CAUTI was taken as primary outcome. Various personal (age, gender, etc) and clinical parameters (type of disease, steroid use, etc) of the patients were considered as explanatory factors. Descriptive analysis of all the explanatory and outcome parameters was presented as frequencies and percentages. The association between explanatory and outcome variables was analyzed by calculating odds ratios and their 95% confidence intervals. Statistical significance of this association was analyzed using chi square test. Microsoft excel and IBM SPSS version 21 were used for analysis.

III. RESULTS:

In this study, total of 100 patients were enrolled and included in the final analysis.

Table : Descriptive analysis of gender distribution in study group (N=100)

| Gender | Frequency | Percent |
|---------------|------------------|----------------|
| Male | 57 | 57.0 |
| Female | 43 | 43.0 |

Males constituted 57% and females contributed 43% of study subjects.

Table: Descriptive analysis of Risk factors in study group (N=100)

| Parameter | Frequency | Percent |
|---|-----------|---------|
| I. Age 50yrs and above | | |
| Yes | 24 | 24.0 |
| No | 76 | 76.0 |
| III. Duration of catheterisation ≥10days | | |
| Yes | 45 | 45.0 |
| No | 55 | 55.0 |
| IV. Diabetes mellitus | | |
| Yes | 18 | 18.0 |
| No | 82 | 82.0 |
| V. Neurological causes | | |
| Yes | 18 | 18.0 |
| No | 82 | 82.0 |
| VI. Respiratory causes | | |
| Yes | 10 | 10.0 |
| No | 90 | 80.0 |
| VII. Urological Nephrological causes | | |
| Yes | 5 | 5.0 |
| No | 95 | 95.0 |
| VIII. Steroid | | |
| Yes | 4 | 4.0 |
| No | 96 | 96.0 |
| IX. Other immunocompromised conditions | | |
| Yes | 5 | 5.0 |
| No | 95 | 95.0 |
| X. Faulty catheter care | | |
| Yes | 3 | 3.0 |
| No | 97 | 97.0 |

The descriptive analysis of all the potential risk factors for development of symptomatic CAUTI is presented in table 7. A total of 24(24%) of participants were aged above 50 years. The proportion of subjects who had catheterization for more than 10 days was 45(45%) .18(18%) of subjects had Diabetes mellitus. The proportion of subjects, who were suffering from neurological, respiratory conditions, was 18(18%) and 10(10%) respectively. Only 5(5%) of subjects were suffering from urological/nephrological conditions and 4 (4%) patients each had steroid use and 5 (5%) other uncompromising conditions. 3 patients each had faulty catheter care.

Fig : Bar chart of Risk factors distribution in study group.

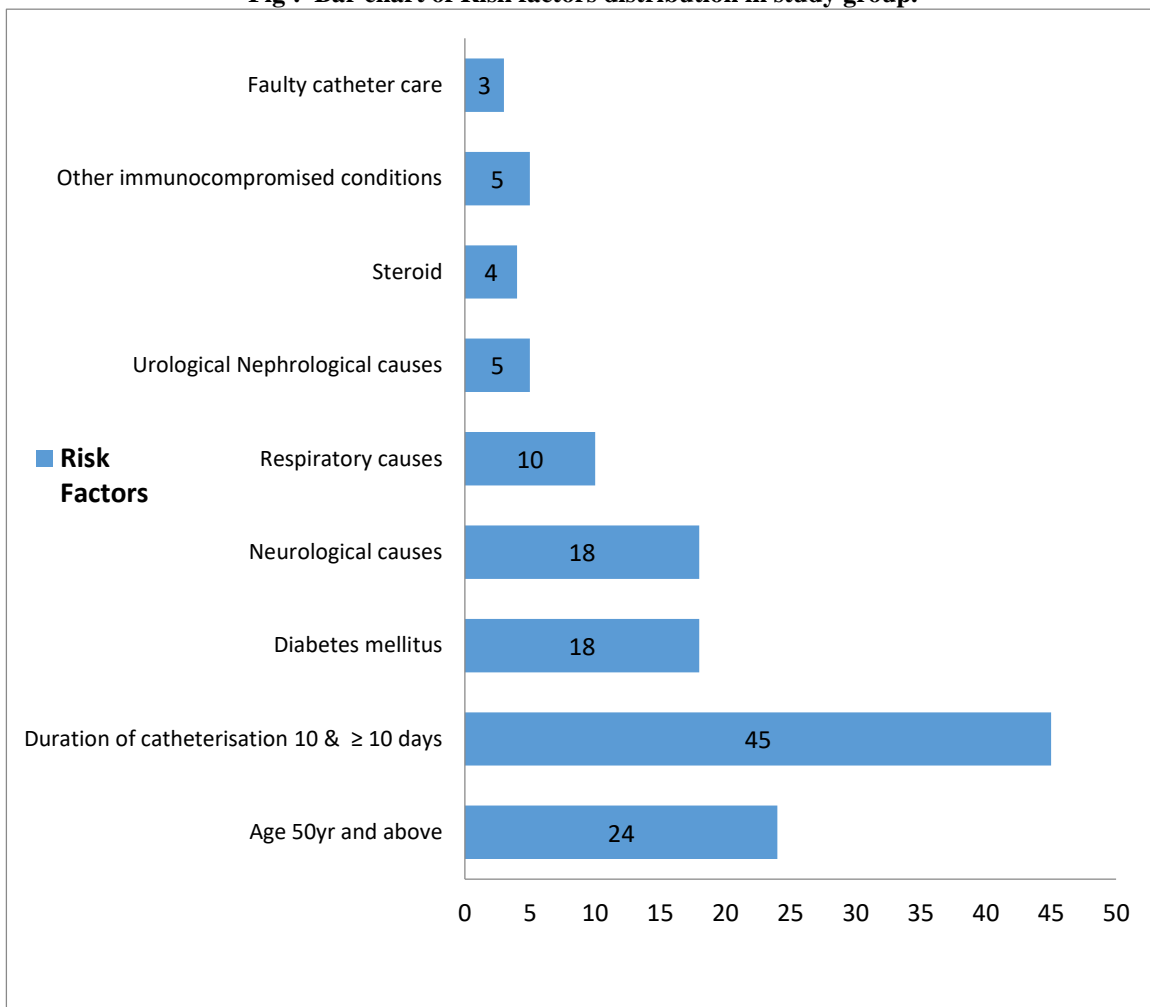


Table : Descriptive analysis of Organism isolated in study group (N=42)

| Organism Isolated | Frequency | Percent |
|--------------------------------|-----------|---------|
| Candida Species | 6 | 14.28 |
| Gram negative bacilli | | |
| Enterobacteriaceae | 14 | 33.34 |
| Non-fermenters | 13 | 30.95 |
| Gram positive organisms | 9 | 21.43 |
| Total | 42 | 100.0 |

Majority of the organisms isolated belonged to Enterobacteriaceae (33.34%) and non-fermenters (30.95%). Candida species (14.28%) and Gram positive organisms (21.43%) contributed to the remaining portion of the organisms.

Table : Descriptive analysis of Organism isolated in study group (N=42)

| Organism Isolated | Frequency | Percent |
|--------------------------------|-----------|--------------|
| Candida species | 6 | 14.28 |
| Enterobacteriaceae | | |
| <i>Escherichia coli</i> | 6 | 14.2 |
| <i>Klebsiella oxytoca</i> | 1 | 2.38 |
| <i>Klebsiella pneumoniae</i> | 7 | 16.67 |
| Non-fermenters | | |
| <i>Pseudomonas aeruginosa</i> | 10 | 23.80 |
| <i>Pseudomonas stutzeri</i> | 2 | 4.76 |
| <i>Pseudomonas fluorescens</i> | 1 | 2.38 |
| Gram Positive organisms | | |
| <i>Staphylococcus aureus</i> | 3 | 7.14 |
| <i>Enterococcus faecalis</i> | 6 | 14.28 |
| Total | 42 | 100.0 |

Pseudomonas aeruginosa was the most common isolate (30.95%) followed by *Klebsiella pneumoniae* (16.67%), *Enterococcus faecalis* (14.28%), *Escherichia coli* (14.2%) and *Candida spp.* (14.28%). Other isolates were *Pseudomonas stutzeri* (4.76%), *Klebsiella oxytoca* (2.38%), *Pseudomonas fluorescence* (2.38%). and *Staphylococcus aureus* (7.14%).

Table 26: Descriptive analysis of Candida spp. isolated in study group (N=6)

| Organism Isolated | Frequency | Percent |
|-------------------------|------------------|-------------------|
| <i>Candida albicans</i> | 1 | 16.7 |
| Non-albicans Candida | 5 | 83.3 |
| Total | 6 | 100.0 |
| Candida species | Frequency | Percentage |
| <i>Candida albicans</i> | 1 | 16.67 |
| <i>C.tropicalis</i> | 2 | 33.33 |
| <i>C.krusei</i> | 1 | 16.67 |
| <i>C.parapsilosis</i> | 1 | 16.67 |
| <i>C.glabrata</i> | 1 | 16.67 |

Among non-albicans *Candida*, 2 patients had *Candida tropicalis* and one patient each had *Candida krusei*, *Candida parapsilosis* and *Candida glabrata* isolate.

IV. DISCUSSION

Catheter-associated Urinary Tract Infections (CAUTIs) remain the most common nosocomial infection, accounting for more than 15% of infections reported by acute care hospitals [9]. *the present study was planned to assess the prevalence of catheter-associated urinary tract infection among patients suffering with urological / nephrological problems at adults intensive care unit at tertiary care hospital*

In the present study, out of a total of 57 male patients, 27 (24.3%) have developed CAUTI while out of a total of 43 female patients, 25 (28.0%) have developed CAUTI. The number of CAUTI cases was recorded in both sexes in the present study. Such results are also documented by the studies conducted by Leelakrishna P, et al. and Gordon, et al. [10,11]. Increased risk in women is likely to be due to easier access of the perineal flora to the bladder along the outside of the catheter as it traverses the shorter female urethra. In addition to this women's urethra is closer to the anus in comparison to men's urethra [12].

Studies such as Stacy Podkovic, et al. evaluated 146 patients that had urine cultures obtained in the presence of an indwelling urinary catheter found two out of 42 febrile patients that had a positive urine culture, which may have attributed to a UTI these results are not consistent with present study [13]. Another study conducted by Dr. Jagadish B. Hedawoo, et al. where Out of 400 patients with a male to female ratio of 1.23:1, 65 developed CAUTI (16.25%) and 22 patients had symptomatic bacteriuria (non-CAUTI-5.5 %). CAUTI rate was 23.06 per 1000 catheter days. The infection rate among males was 13.12% while that in females was

20.11%. 19 and 46 patients developed CAUTI after 48 hours and 120 hours of indwelling urinary catheters respectively. The most common organism was found to be *E. coli* [14]. These results consistent with our study where CAUTI was found in 26% of patients, and significantly associated with both gender at a p-value of 0.05. The presence of other associated diseases or comorbidity could be a risk factor for CAUTI where the p-value was 0.001.

The CAUTI rate in the present study was found to be 26%. It is high when compared to studies conducted by Kazi, et al. (4.59), Devendra, et al. and Hanumantha, et al. (3.65) [14-16]. Whereas it was which was more compared to the study done in Abant Izzet Baysal University Hospital in Turkey where the prevalence of CAUTI among 143 catheterized inpatients was 13% [17]. The prevalence of catheter-associated urinary tract infection in our hospital is about 20% and asymptomatic bacterial colonization is 50% which is near equal to Danchaiyijitr S, et al. study [18].

The common pathogens found in this study are *Escherichia coli* (46%), *Klebsiella* (19%), *Enterobacter* (11%), *Pseudomonas* (9%), *S. aureus* (5%), *Enterococcus* (3%), *Candida* (1%) and *Proteus* (1%). This finding is similar to the study conducted by NHSN which also shown *Escherichia coli* (21%) to be the common pathogen [19]. This data strongly proves that CAUTI is one of the important nosocomial infections. The NHSN data also shows *Escherichia coli* as the major culpable pathogen, accounting for 70% of the total isolates [20]. Laupland, et al. also demonstrated *Escherichia coli* as the most common etiological agent of CAUTI [21].

The finding in this study was also similar to the study done in India, by Sandhu, where they found that associated comorbid diseases increase the risk for CAUTI, but unlike in this study, they found that CAUTI was more among patients with a previous history of UTI and patients with the previous history of urinary catheter insertion [22]. A study conducted by Tambyah PA and Maki DG shows 90% of patients positive for culture were asymptomatic [23]. Inconsistently, in our study 16% of patients are asymptomatic. Males are affected more (55%) than females (44%) because many are affected by benign prostatic hypertrophy which contrary to other studies which show females are affected more may due to the lesser sample size in our study [24,25].

V. Conclusion

It is concluded that the old age, prolonged catheterization, presence of diabetes are the significant risk factors for CAUTI. Indwelling urethral catheters should be avoided whenever possible and should never be resorted to unless with absolute indications. Insertion of catheter should be done in strict asepsis by trained personnel. Before catheterization, perineal areas should always be cleaned using an antiseptic or germicidal preparation. Hand washing should be done immediately before and after manipulation of catheter site or apparatus. Closed catheter drainage system should be employed in all cases. The entire system should be replaced in an event where a break is present. The catheter should be inspected frequently to ensure that no obstruction in flow of urine. Emphasis should always be placed on good catheter management rather than the use of prophylaxis to reduce the incidence of CAUTI.

Conflicts of Interest

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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