

# Prevalence of Catheter Associated Urinary Tract Infections (CAUTI) and the Parameters Associated with the Presence of Uropathogens in a Tertiary Care Hospital in Telangana

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**Abstract:** ***Background:** Uropathogen - induced urinary tract infections (UTIs) pose a serious threat to global public health, particularly in developing nations where individuals lack knowledge about basic hygiene and appropriate medication usage. Many UTI patients who were previously treated at a hospital for an acquired disorder have been referred to as catheter - associated UTIs (CAUTI). Bacterial biofilm forms after catheter insertion, hindering the ability of antibiotics to combat the bacteria that cause urinary tract infections. Therefore, using cutting - edge therapeutic strategies is essential to get rid of the multidrug - resistant (MDR) bacteria that cause urinary tract infections. **Methodology:** Current Study is prospective observational single - centre, hospital - based investigation conducted from January 2023 to October 2023 which includes 150 catheterized patients. Those who met the study's eligibility requirements, were observed for a maximum of five days. The third and fifth days after the catheterization were used to collect the urine samples for the follow - up. **Results:** The prevalence of CAUTI varied significantly depending on how long the urinary catheter was used. Additionally, there were statistically significant differences in the incidence of CAUTI by age category, with patients over 50 experiencing more cases (n = 9) than patients under 50 (n = 4). **Conclusion:** It is crucial to prioritize CAUTI prevention strategies and apply culture and sensitivity testing methods prior to the administration of antibiotics. Implementing and rigorously adhering to IPC activities utilizing multimodal strategies is necessary to reduce the rate of CAUTI and other HAIs.*

**Keywords:** Catheter - associated urinary tract infections, uropathogens, antimicrobial susceptibility, risk factors.

## 1. Introduction

The catheter - associated urinary tract infection, also known as CAUTI, is the most common urinary tract infection that is acquired in hospitals around the world. Its incidence rate is approximately 35 percent (1). It is one of the primary causes of morbidity and mortality among patients who have been admitted to the hospital and have urinary catheters that are in place (2). Over one hundred and fifty million people are impacted annually, and the associated costs amount to more than six billion dollars in the United States (3). Infections of the urinary tract that are related with catheters have a very high incidence, approximately twenty percent once patients have been catheterized and with closed drainage (4).

The sheath of exudates surrounding the catheter may allow bacteria ( $\geq 10^5$  CFUs/ml) to enter the urethra during the catheter insertion procedure (5). It is possible to inject bacteria intraluminal using either the tube or the catheter collection bag. Patients who have been catheterized for a period of more than seven days are more likely to develop bacteriuria. However, bacteriuria also contributes to an increase in the length of hospital stay and the expenditures associated with treatment (6).

Urinary catheters are rarely colonized by pathogenic bacteria such as *Escherichia coli*, *Klebsiella*, *Enterococci*, *Pseudomonas*, *Enterobacter*, *Proteus*, and *Serratia*. The

production of biofilm, which shields the organism from the body's natural defences, is responsible for adding the toxicity of these bacteria (7). It is possible for the bacteria that cause CAUTI to originate from either an exogenous source, such as the hands of healthcare personnel or equipment that have been contaminated, or an endogenous source, such as the colonization of the rectal, meatal, or vaginal region. Furthermore, a significant number of these bacteria are the endogenous intestinal flora of the patient, but they can also be obtained from the hospital (8).

The repercussions of CAUTI are devastating in immune compromised patients who are admitted to the hospital. Mortality rate is roughly ten to fifteen percent of these patients who have indwelling catheters. The development of multi - drug resistant bacteria due to the selective pressure of antibiotics, the formation of strictures resulting from inflammation of the prostate gland's surrounding tissues in males, purulent urethritis, and prostate gland abscesses are additional side effects of CAUTI (9).

The risk of contracting a catheter - associated urinary tract infection (CAUTI) is contingent upon the host's susceptibility, the quality of catheter care, the procedure, and the duration of catheterization. Some of the characteristics that enhance the likelihood of a catheter - associated urinary tract infection (CAUTI) are the presence of a feminine gender, a severe underlying illness, extended catheterization,

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disconnection of the catheter and drainage tube, and the absence of systemic antibiotic prophylaxis (10).

The current study aims to determine the incidence and etiology of catheter - associated urinary tract infections (CAUTI) among patients with indwelling catheters as well as intends to ascertain the drug susceptibility pattern of these uropathogens.

## 2. Material and Methods

**Study Design:** Prospective observational study

**Sample size:** This study includes 150 catheterized patients from Yashoda Hospital Secunderabad

**Study site:** The current study is a single - centre, hospital - based investigation conducted from January 2023 to October 2023 in Obstetrics and Gynaecology, maternity, emergency, medical and surgical wards of Yashoda Hospital, Secunderabad.

**Inclusion criteria:** Patients who were admitted to the hospital with indwelling urinary catheters and who signed screening consent forms to allow their urine samples to be analysed for urinary tract infections within one hour of urethral catheterization, whose urine cultures were determined to be negative are included. Conscious adult patients, unconscious adults and children under the age of 18 years who have signed informed consent forms, surrogate consent forms and minor assent forms are also included in the study.

**Exclusion criteria:** Patients with a positive baseline urine culture and discharged before the 3<sup>rd</sup> day or 48 hours of catheterisation, patients whose catheter have been removed before the 3<sup>rd</sup> day or 48 hours of catheterisation are excluded from the study. Participants qualified for the study were monitored for a period of five days. After catheterization, the urine samples were collected on the third and fifth d of urinary tract infections for analysis.

### Statistical analysis

Data was analysed using Statistical Package for the Social Sciences (SPSS) version 21.0. Pearson chi - square test is used for analysis of categorical variables where  $p < 0.05$  was considered statistically significant. CAUTI rate is calculated as follows

CAUTI Rate: No of CAUTI X 1000  
Device Days

## 3. Results

Table 1 shows the age, gender and the admitted ward of the individuals included for the present study. A total of 150 individuals were examined of which 111 (74%) were female and 39 (26%) were male. In the current study's age distribution maximum individuals 94 (62.7%) belong to 26 - 30 years, followed by 31 - 35 years with 16% and 18 - 25 years with 14.7%. Least 10 (6.7%) were observed in the age group of more than 36 years. On considering the age category majority 127 (84.7%) of individuals belongs to 50 years and below age whereas 23 (15.3%) belongs to above 50 years of age category. Out of 150 individual's majority of patients 77 (51.3%) were admitted in the maternity ward followed by emergency 32 (21.3%), medical ward 15 (10%), obstetrics and gynaecology ward 14 (9.3%) and in surgical ward 12 (8%)

**Table 1:** Distribution of catheterised patients according demographic variables (N=150)

Demographic Variables	Frequency (N)	Percentage (%)
<b>Gender</b>		
Male	39	26%
Female	111	74%
<b>Age (years)</b>		
18 - 25 years	22	14.7%
26 - 30 years	94	62.7%
31 - 35	24	16.0%
More than 36	10	6.7%
50 years and below	127	84.7%
Above 50 years	23	15.3%
<b>Ward</b>		
Emergency	32	21.3%
Surgical	12	8.0%
Medical	15	10.0%
Obstetrics and Gynaecology	14	9.3%
Maternity	77	51.3%

Present study findings show that the calculated CAUTI rate among 13 individuals over 10 months of surveillance period was observed as 0.57 which is within Healthcare Associated Infection (HAI) benchmark (Table 2)

**Table 2:** CAUTI rate for a period of 10 months

Number of individuals with CAUTI positive	Total urinary catheter days in 10 months	CAUTI rate /1000 urinary catheter days.
13	22, 773	0.57

**Table 3:** Prevalence of CAUTI according to the age group of participants and duration of urinary catheter

CAUTI incidence	Frequency	Percentage	Age 50 years and below	Above 50 years	Before 3 days	3 - 5 days
Positive	13	8.66%	4	9	2	11
Negative	137	91.33%	123	14	90	47
Chi square			28.40		13.71	
p value			0.001		0.001	

Table 3 depicts the prevalence of CAUTI in the present study. Results show that maximum individuals 137 (91.33%) are negative to CAUTI infection whereas only 13 individuals

(8.66%) had shown CAUTI infection The results also indicate that there was a statistically significant difference in the reported prevalence of CAUTI based on the length of urinary

catheter use ( $p = 0.001$ ). Additionally, it was demonstrated that individuals who had used a catheter for less than three days had higher negative attitudes (90) than those who had used for three to five days (47) which is statistically significant ( $p=0.001$ ). Current results show that, patients with urethral catheters in place for longer periods of time had significantly higher rates of CAUTI (84.6%) than patients with shorter (15.38%) catheterization durations ( $p = 0.001$ ). Results also show that CAUTI incidence was maximum ( $n = 9$ ) in individuals who were above 50 years of age compared to individuals who were below 50 years of age ( $n = 4$ ). This indicates the statistically significant difference in the CAUTI incidence based on age category ( $p = 0.001$ ).

#### 4. Discussion

CAUTIs can lead to more serious complications such as sepsis, endocarditis and it is estimated that over 13, 000 deaths each year are associated with healthcare - associated urinary tract infections (UTI's). There is a documented risk of urinary tract infection associated with the use of urinary catheters. Various studies show that CAUTI is the most prevalent hospital acquired infection among individuals who were admitted to the hospital and the risk is increased by almost five to ten - fold in those admitted to the ICU (11). One of the main strategies for lowering CAUTI rates is the implementation of appropriate care bundles and ongoing education for healthcare professionals.

A Study on healthcare - associated urinary tract infections in Australian Hospitals reported a CAUTI incidence of 0.9% (12). Present study reported CAUTI incidence of 8.66% which highlights the significance of maintaining appropriate cleanliness in the prevention of CAUTI. When nurse - driven hospital protocols are set in place to ensure an IUC is appropriately placed, maintained, and removed promptly when no longer needed, the number of CAUTI are dramatically decreased (13). Reduction in the number of IUC insertions and the number of days IUCs are in use removes the source of infection which reduces the CAUTI incidence.

Our study shows a significant increase in CAUTI rates in patients whose urethral catheters had been in place for a longer period of time compared to patients who had been catheterized for a shorter period of time. This is consistent with the findings of Catheter - associated urinary tract infections at a hospital in Zinvie, Benin (West Africa) in the past (14). When the catheter is left in place for a longer period of time, the risk of getting a catheter - associated urinary tract infection (CAUTI) increase. Age, female gender, diabetes, and extended catheterization duration are the major risk factors for CAUTI (15). When the urethral catheter is in place for four weeks, the chance of developing catheter - associated bacteriuria climbs to one hundred percent (16). The risk of developing this condition increases by five percent for each day that the catheter is in place beginning on day five (17). Reducing the number of needless indwelling catheters and early extubation remain the cornerstones of the current preventive and control strategies. However, given the disease characteristics of older patients, it may not always be relevant. Long hospital stays and indwelling urinary catheters are the two most important risk factors for CAUTI in older patients

(18). It is possible that the impaired immune system is the cause of the higher occurrence of the CAUTI (19).

Current study shows that, our hospital uses healthcare associated infection (HAI) surveillance facility and laboratory - based Ward liaison surveillance, which aid in directing outbreaks and guiding infection prevention and control (IPC) interventions. Regular monitoring of bundle care (Insertion and Maintenance), bedside training of healthcare workers (HCWs) by the guidelines of international council of nursing (ICN) and continuous training sessions by education department were the few key measures maintained the CAUTI rate within benchmark.

#### 5. Conclusion

CAUTI has grown to be a major global threat to patient safety, that it is still a problem, and that active infection control programs must be put in place in order to monitor infections. It is necessary to place a greater emphasis on CAUTI prevention techniques and to make use of culture and sensitivity tests prior to the administration of antibiotics. IPC activities using multi modal strategies must be implemented and must be followed stringently to reduce CAUTI and other Healthcare Associated Infection (HAIs).

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