

# “To Study the Microbial Etiology of Catheter-Associated Urinary Tract Infection at a Tertiary Care Hospital in Kanpur”

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## Abstract:

Catheter-associated urinary tract infections, abbreviated as CA-UTIs are the most commonly faced hospital-acquired infections or nosocomial infections. CA-UTIs have been associated with increased morbidity, mortality, hospital cost, and length of stay.

**Aim:** To isolate and identify etiological agents responsible for CA-UTI.

**Materials and Methods:** This prospective study was conducted at Rama Hospital on 300 patients meeting the requirements of inclusion criteria during January 2018 to June 2018. Detailed history of the patients was recorded and symptoms pertaining to CA-UTI were recorded. Urine culture was done to identify the causative agent of CA-UTI. Symptomatic patients with urine culture showing growth after 48 hours of catheterization were taken as a case of CA-UTI. **Results:** A total of 300 patients were having indwelling urinary catheter with an aggregate of 1172 catheter days over a period of 6 months, in which 19 developed CA-UTI. The CA-UTI rate was 16.21 cases per 1000 catheter days. The mean age of study participants was 25 years and above. Most predominant etiological agents responsible for CA-UTI were Escherichia coli (36.8%), Candida species (31%), Klebsiella pneumonia (15%), Enterococcus faecalis(10%), Staphylococcus species(5%).

**Conclusion:** Implementation of infection control practices is necessary for prevention and control of CA-UTI. The most common practices include hand hygiene, close drainage system, aseptic method for insertion and catheter care along with daily need assessment with evidence based observations.

**Key words:** CA-UTI, etiology, E.coli.

## Introduction

Catheter associated urinary tract infections (CAUTI) are the most frequent nosocomial infections with the daily risk of developing CAUTI in the acute care settings [1]. Around 15–25% hospitalized patients receiving indwelling urinary catheter develops CAUTI with prolonged catheterization and in among 40% nosocomial UTI, 80% is due to CAUTI [2]. Patients continue to acquire new organisms at a rate of about 3–7%/day. In long term catheterization that is by the end of 30 days CAUTI develops in 100% patients usually with 2 or more symptoms or clinical sign of haematuria, fever, suprapubic or loin pain, visible biofilm in character or catheter tube and acute confusion all state[3].

## Material and Methods

This prospective study was performed in the Rama Hospital on 300 patients meeting the requirements of inclusion criteria during January 2018 to June 2018. All patients with indwelling urinary catheters hospitalized for longer than 48 hours were included in the study.

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Patients with symptoms of urinary tract infections prior to catheterization were excluded.

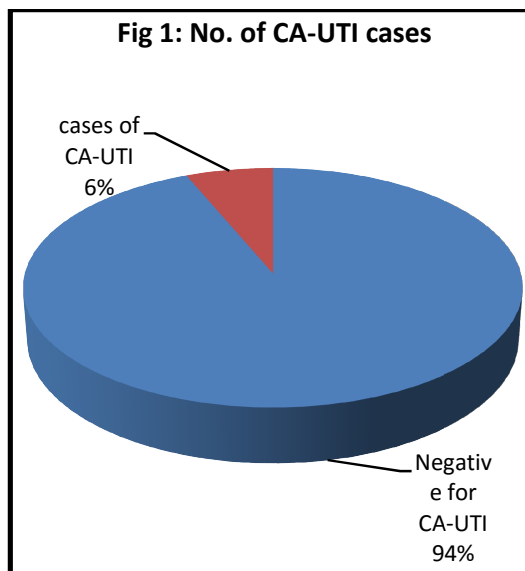
A CAUTI symptom include: cloudy urine, blood in the urine, strong urine odor, urine leakage around your catheter, pressure, pain, or discomfort in lower back or stomach, chills, fever, unexplained fatigue, vomiting. The diagnosis of CAUTI was done as per the CDC guidelines [4]. Urine sample was collected from the distal edge of the catheter tube (after cleaning with an antiseptic) using a sterile needle and syringe prior to catheter change or removal from each patient [5]. The sample was carefully dispensed into a sterile universal container and transported to the microbiology laboratory for analysis. Urine microscopy was performed on urine specimen to detect the presence of leukocytes, epithelial cells, erythrocytes and other cells. With the calibrated loop, urine was cultured on CLED agar media and incubated aerobically at 37°C for 24-48 hours for quantitative analysis to assess the microbial counts.

Urine culture was considered significant when colony count was more than >10<sup>5</sup> cfu/ml of urine. Or colony count was ≈10<sup>3</sup>- 10<sup>4</sup> with pyuria and patients was in ICU. Microorganism was identified according to conventional biochemical techniques [6]. All data were tabulated and analysed using Microsoft Excel 2010. Catheter utilization rate was calculated by dividing the total number of device days by the total number of patient days. Rate of CAUTI per 1000 device days were calculated by dividing the total number of CAUTIs by the total number of catheter days and multiplying the

result by 1000. A p-value <0.05 was considered as statistically significant.

### Results

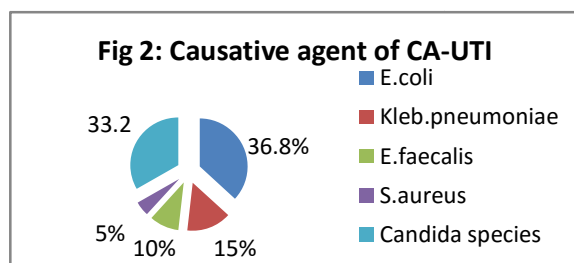
In this study total of 300 patients were included, those having indwelling urinary catheter over 6 months. Among 300 patients 19 were developed CA-UTI with significant colony count.



Here among 19 CA-UTI patients 14 (73.6%) and 6(31.5%) were female and male respectively. Maximum patients were between 41 to 60 years of age followed by more than 60 years age group in male and female both. (Table 1).

**Table 1: Age and Gender wise distribution of CAUTI patients.**

Age (Years)	Male	Female
<20	0	1
21-40	1	2
41-60	3	6
>60	2	5
Total	6	14



The CA-UTI rate was 16.21 cases per 1000 catheter days. Most predominant etiological agents responsible for CAUTI were *Escherichia coli* (36.8%), *Candida species* (33.2%), *Klebsiella pneumonia* (15%), *Enterococcusfaecalis* (10%), *Staphylococcus species* (5%)(fig 2).

### Discussion

Catheter-associated urinary tract infections (CAUTIs) represent the most common type of nosocomial infection and are a major health concern due to the complications and frequent recurrence. It is widely recognized as the most common HAI in the world, accounting for 40% of all HAIs [7]. Gram-negative bacteria species that cause CAUTIs express a number of virulence factors associated with adhesion, motility, biofilm formation, immunoavoidance, and nutrient acquisition as well as factors that cause damage to the host[8]. These infections can be reduced by strict use of care bundles.

The prognosis of catheter-associated infection is complicated due to the occurrence of chronic or recurrent UTIs, complicated UTI, and pyelonephritis. If left untreated, these infections can lead to abscess formation, renal obstruction, and scarring and eventually will lead to bacteremia and sepsis. These infections are difficult to treat due to the presence of biofilms and crystals that protect uropathogens from proper treatment [8].

In CAUTI the incidence of infection is *Escherichia coli* in 24%, *Candida* in 24%, *Enterococcus* in 14% *Pseudomonas* in 10%, *Klebsiella* in 10% and remaining part with other organisms [9].

Similar to most of the studies, *E. coli* is most common uropathogen. It is member of *Enterobacteriaceae* family. Normal commensal of *E.coli* strains as well as uropathogenic strains colonize the large intestine. Only UPEC strains are primarily selected for growth in the urinary tract. Virulence factors that differentiate these a virulent commensals from virulent strains of *E. coli* were acquired on mobile genetic elements by horizontal gene transfer; examples of such transfer can be found on the *E. coli* chromosome in the form of pathogen city islands [10]. In this study *K. pneumonia* was the second most bacterial uropathogen(15%). Gould C et al.find the contribution of *Klebsiella spp.* in CAUTI is near about 7.7%[11]. The source of *Klebsiella* causing CAUTI can be endogenous typically via meatal, rectal, or vaginal colonization or exogenous, such as via equipment or contaminated hands of healthcare personnel. They typically migrate along the outer surface of the indwelling urethral catheter, until they enter the urethra.

In the present study bacterial infections were accounted for 66.8% of catheter associated urinary infection and rest 32.8% were associated with *Candiuria*. Warren JW reported 70% of bacterial infection whereas fungal

infections were accounted for 16.6% and mixed fungal and bacterial infections accounted for 12.5%. *Candida* spp. was the commonest [12]. Diabetes mellitus has been reported as the most common risk factor for fungal infection [13, 14]. The duration of catheterization is also an important risk factor as the duration increases the incidence of fungal infection is increased [15].

In this study among gram positive cocci 10% and 5% of *Enterococcus* sprang *S.aureus* were associated with CAUTI. In these two, *Staphylococcus aureus* are the common gram positive bacteria usually responsible for skin and soft tissue infections but rarely cause CAUTI and bacteraemia [16]. In another study, *E. coli* was found the commonest (36%) followed by *Enterococcus* spp. (25%), *Klebsiella* species (20%) and *Pseudomonas* spp. (5%) [17]. Now the incidence of *Staphylococcal* UTI as well as CAUTI is increasing and the organisms carry wide variety of multidrug-resistant genes on plasmids.

Early detection of CAUTI is simple by examination of urine and catheter biofilm with microscopy as well as culture with antibiogram. It is easy and cost effective with early diagnosis and treatment for good clinical outcome.

## Conclusion

Regular continuous education and evaluation of bundle compliance by regular audits are the key elements to control CA-UTI. The most common practices include hand hygiene, close drainage system, aseptic method for insertion is important.

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