



Original Research Article

## Profile of UTI in Indwelling Urinary Catheterized Patients in Tertiary Care Hospital, Jamnagar, Gujarat

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### ABSTRACT

**Introduction:** Catheter-Associated Urinary Tract Infection (CAUTI) remain the most common nosocomial infection, accounting for more than 15% of infections reported by acute care hospitals. Majority (80%) of the infections of urinary tract are associated with the use of indwelling urinary catheter. CAUTI has been a leading cause of morbidity and mortality in hospitalized patients.

**Material and Methods:** This cross sectional study was conducted at the Bacteriology laboratory, Microbiology Department, tertiary care hospital, Jamnagar from March 2012 to February 2013. Total 200 Adult patients having indwelling Foley's catheter inserted after admission at the Medical Intensive Care Unit, Gynecology Ward and Surgical Intensive Care Unit of the tertiary care Hospital were recruited for this study.

**Results:** In present study, 32% incidence of CAUTI was found. Out of 200 urine samples, 64 samples were found culture positive. This study identified two important risk factors associated with CAUTI, female gender and duration of catheterization. Higher incidence of CAUTI (42.23%) was found in female sex as compared to males (23.63%). Maximum number of patients have developed CAUTI in 2-7 days (53.12%), followed by 8-14 days (34.37%) and >14 days (12.50%). Most common isolated organism was E. coli (40.06%) and 2<sup>nd</sup> most common was Klebsiella (21.8%) species.

**Conclusion:** Unnecessary use of catheter as far as possible should be avoided. If necessary then it should be used for minimum period. While insertion strict aseptic precaution should be carried out.

**Keywords:** Catheter-Associated Urinary Tract Infection (CAUTI), Nosocomial, Bacteriuria, Indwelling urinary catheters, E. coli.

### INTRODUCTION

Indwelling urinary catheters are standard medical devices utilized in both hospital and nursing home settings to relieve urinary retention and urinary incontinence. Long-term indwelling catheter use is becoming more common. [1] Catheter-

Associated Urinary Tract Infection (CAUTI) remain the most common nosocomial infection, accounting for more than 15% of infections reported by acute care hospitals. [2] Majority (80%) of the infections of urinary tract are associated with the use of indwelling urinary catheter. [3]

Catheter associated urinary tract infection (CAUTI) refers to infection where an indwelling urinary catheter was in place for >2 calendar days on the date of events, with day of device placement being day 1, and an indwelling urinary catheter was in place on the date of event or the day before. [2] CAUTI has been a leading cause of morbidity and mortality in hospitalized patients. [4]

Duration of catheterization is the most important risk factor for the development of Catheter associated-bacteriuria. [5] Long-term care facility residents with chronic indwelling catheters have a much greater risk for bacteremia and other urinary complications than residents without catheters. [6] Risk factors associated with Catheter associated-bacteriuria include female sex, lack of antimicrobial therapy, microbial colonization of the drainage bag, catheter insertion outside the operating room, catheter care violations, rapidly fatal underlying illness, older age, diabetes mellitus. [5,7] Although usually benign, CAUTI causes bacteremia in 2-4% of patients and have been associated with a case fatality rate three times as high as non bacteriuric patients. [8]

For either short-or long-term catheters, the infection rate is about 3-10 % per day. [9] Escherichia coli remain the most common infecting organism. Other endogenous flora including Enterobacter, Klebsiella, Enterococci and Proteus are common pathogens of the urinary tract and potential colonizers of urinary catheters. Inadequately decontaminated equipment and hands of health care workers may introduce environmental and common skin bacteria during insertion and maintenance of urinary catheters. Therefore, Pseudomonas aeruginosa, Staphylococcus epidermidis, Staphylococcus aureus, Acinetobacter, and other non-intestinal or environmental

microbes can result in health care associated CAUTI. [7]

Catheter-Associated Urinary Tract Infection (CAUTI) can lead to such complications as cystitis, pyelonephritis, gram-negative bacteremia, prostatitis, epididymitis, and orchitis in males and, less commonly, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis in all patients. Complications associated with CAUTI cause discomfort to the patient, prolonged hospital stay, and increased cost and mortality.

The accepted means to prevent CAUTI are the maintenance of closed urinary drainage system and early removal of the catheter. Complications of infection may be prevented by giving antibacterial for bacteriuria immediately prior to any invasive urological procedure and by avoiding catheter blockage, twisting or trauma. [6]

The major focus of future advances in prevention of catheter-acquired UTI is the development of biomaterials resistant to biofilm formation. So this present study is aimed to determine the incidence, risk factors and impacts of CAUTI in tertiary care hospital and to find better preventive measures which when implemented can have effect on prevalence of CAUTI.

## **MATERIALS AND METHODS**

This study was conducted at the Bacteriology laboratory, Microbiology Department, tertiary care hospital, Jamnagar from March 2012 to February 2013. All Adult patients having indwelling Foley's catheter inserted after admission at the Medical Intensive Care Unit, Gynecology Ward and Surgical Intensive Care Unit of the tertiary care Hospital and who developed CAUTI after 48 hrs of catheterization between above mentioned time period were recruited for this study. Informed consent

was taken from all participants before including in study. Before collection of sample, brief history of patients about complains like frequency of micturition, burning micturition, suprapubic tenderness, fever and chills was noted. Reason for catheter insertion, date of catheter insertion is also taken.

Total of 200 adult patients in whom an indwelling Foley's catheter inserted for short to intermediate term purpose were taken in the study. Collection of urine sample was done at the time of development of any symptoms like fever, supra-pubic tenderness or costovertebral angle tenderness or any other related to UTI. Urine specimen was obtained by aspirating the required amount (5-10ml) from the clamped and disinfected catheter with a sterile needle and syringe under strict aseptic precautions. After collection of sample, it was transported to the laboratory within 2 hour & proceedings were done immediately.

Microscopic examination of the centrifuged urine sediment was done by wet preparation method. According to CDC guidelines of CAUTI, >5 pus cells/HPF in spun urine or  $\geq 10$  pus cells/mm<sup>3</sup> of unspun urine were considered as a positive test indicative of infection. [2] Gram stained smear of the urine from sediment is prepared and examined when bacteria or pus cells are seen in wet preparation.

Uncentrifuged urine was used for inoculation by using a standard calibrated

sterile chromium loop (2mm) delivered 0.002ml [10] on a nutrient agar, blood agar and MacConkey agar plates. These plates were incubated aerobically at 37°C for 18-24 hours. On the next day, colony count was done for organisms showing growth and colony count  $\geq 10$  [5]/CFU with no more than two species of microorganisms was taken significant. [2] Microorganisms isolated were identified according to colonial morphology, gram-stain reaction and standard microbiological procedures.

**Inclusion Criteria:** Urinary samples of those patients were taken in study that developed CAUTI after 48 hours of Catheterisation.

**Statistical Method:** Data was analysed in Microsoft Excel and displayed in percentages.

## RESULTS

Total 200 urine samples were received from adult patients from different wards like Medical Intensive care unit (140), Surgical Intensive care unit (34) and Gynecology ward (26). Out of 200 urine samples, 64 samples were found culture positive ( $\geq 10^5$ cfu/ml) for microorganisms and other samples were negative or normal flora. Highest urinary tract infections were found in Medical Intensive care unit (32.85%), followed by surgical Intensive care unit (30.55%) and gynecology ward(29.16%).

**Table.1; Age and sex wise distribution of positive urine samples.**

Age groups (Years)	Total Samples	Positive Male	Positive female	Total
16-30	73	7	10	17(26.56%)
31-50	68	11	15	26(40.62%)
51-70	59	8	13	21(32.81%)
Total	200	26(40.62%)	38(59.37%)	64

Table-1 shows, Out of 64 positive samples, 17 samples were from age group 16-30 years, 26 samples were from age group 31-50 years, 21 samples from age group 51-70

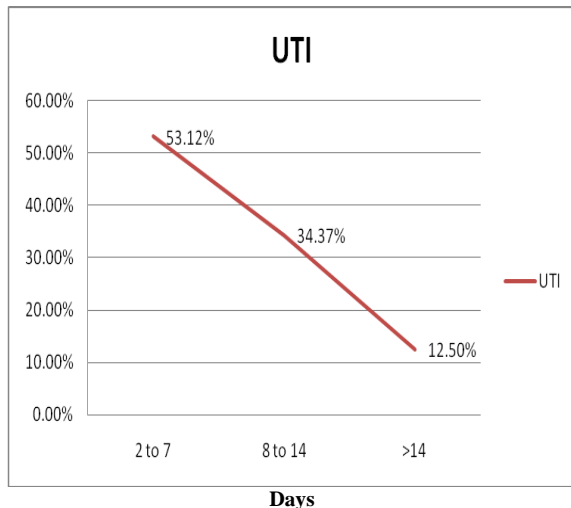
years. Among different age groups, highest number of samples found positive was in 31-50 years of age. Total 26(40.62%) out of 64 samples were found positive in 31-50

years of age. Out of total 64 positive samples, 26(40.62%) were male patients and 38(59.37%) were female patients.

**Table 2: Interval between catheter insertion and first Bacteriuria**

Days	UTI	
	Present	Absent
2 days	5(7.81%)	35(25.73%)
3-4 days	12(18.75%)	61(44.85%)
5-7 days	17(26.56%)	30(22.05%)
8-14 days	22(34.37%)	10(7.35%)
>14 days	8(12.5%)	0
Total	64	136

In table-2, Out of 64 positive isolates, 5(7.81%) patients have developed UTI after 2 days of catheterization. In case of 3-4 days duration incidence of bacteriuria increases up to 18.75% and further up to 26.56 % after 5-7 days of duration. Between 8-14 days of duration, incidence of UTI was 34.37 % and after 14 days was 12.5 %.



**Fig.1: Interval between catheterization and first bacteriuria**

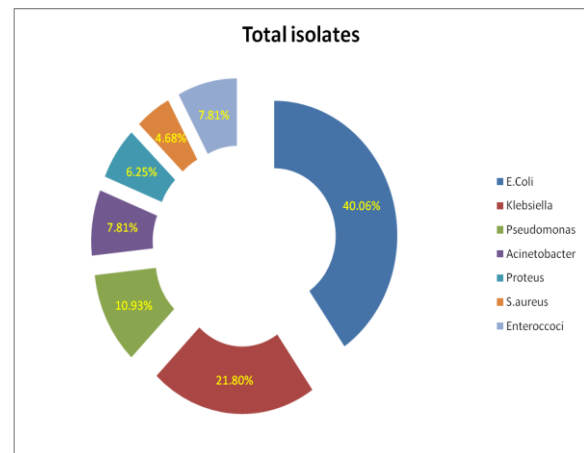
Figure-1 shows that maximum number of patients have developed bacteriuria in 2-7 days (53.12%), followed by 8-14 days (34.37%) and >14 days (12.50%).

Table-3 and Figure-2 show that most common organism isolated is Escherichia coli (40.06%) among all isolates. After E. coli second most common isolate is

Klebsiella species (21.8%). After that pseudomonas species (10.33%), acinetobacter (7.81%), proteus (6.25%), S. aureus (4.68%) and enterococci(7.81%).

**Table.3: Different organisms isolated from urine sample of catheterized patients.**

Organism	Total isolates	Percentage
E.Coli	26	40.06%
Klebsiella	14	21.8%
Pseudomonas	7	10.93%
Acinetobacter	5	7.81%
Proteus	4	6.25%
S.aureus	3	4.68%
Enterococci	5	7.81%



**Fig.2: Diagram showing different organism isolated from urine sample in catheterized patients.**

## 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. [2] The associated morbidity and mortality are a major drain on hospital resources. Patients with indwelling urinary catheters, patients undergoing Surgical manipulations, long-stay, elderly male patients and patients with debilitating diseases are at high risk of developing nosocomial UTIs. The organisms responsible usually originate from patients' endogenous intestinal flora, but occasionally from the hospital environment. [7] Each year, more than 13000 deaths are associated with UTI. [2]

Furthermore, Nosocomial UTIs have been associated with increased length of hospital stay and cost. Despite their importance, there have only been very limited studies focused on nosocomial UTIs in the critically ill. [11]

The present study is focused mainly on catheter related urinary tract infections

occurring mainly in Medical Intensive care unit, Surgical Intensive care unit and gynecology ward. The main result of the present study is that in Hospital, female sex, length of hospital stay and duration of catheterization were independently associated with an increased risk of catheter-associated bacteriuria.

**Table.4: Comparison of incidence of UTI in different studies.**

Study	Place	Year	Incidence
Present Study	Jamnagar, Gujarat	2012-2013	32%
Bagchi et al [12]	Nagpur, Maharashtra	2011-2012	29.09%
Chih-Cheng Lu et al [13]	Chi Mei Medical Centre, Tainan, Taiwan	2000	57%
SomwangDanchaivijitr et al. [4]	Siriraj hospital,Bangkok, Thailand	2002-2003	73.30%
Karina Billote-Domingo et al [14]	Phillipines general Hospital, Phillipines	1998	51.40%

In table-4, Study by Chih-Cheng Lu et al Taiwan in 2000 has found overall incidence of UTI 57% in catheterized patients. Somwang Danchaivijitr et al. found that incidence of CAUTI was 73.3% in their study. Incidence of CAUTI in our study was found less than other compared studies except in study by Bagchi et al(29.09%), Karina Billote-Domingo et al [14] (51.40%) Garibaldi et al [15] (23%), Alavaren et al [16] (24.72%) Possible reason for that may be increased use of systemic antimicrobials active against urinary pathogens, increased attention to avoid unnecessary use of urinary catheterization and attention to hand washing among staff and doctors, proper environmental decontamination by effective disinfectants.

et al.(51.35%). In second week incidence decreased to 34.37% in present study and 37.84% in study by Somwang Danchaivijitr et al. [4]

**Table.5: Comparison of incidence of Bacteriuria and time interval.**

Days	Present Study(N=64)	Somwang.Danchaivijitr.et [4] al.(N=74)
2-7	53.12%	51.35%
8-14	34.37%	37.84%
>14	12.50%	10.81%

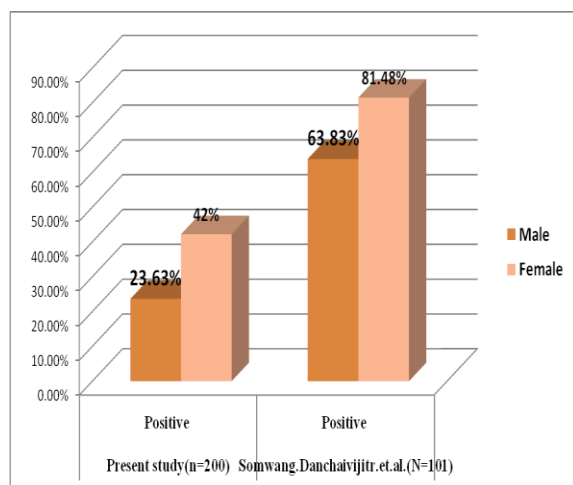
In table-6 present study E. coli (40.06%) was found the most common isolate among all microorganisms isolated. After E. coli, Klebsiella (21.8%) and Pseudomonas (10.93%) were the most common isolate. Several studies have found E. coli as most common uropathogens in catheter related urinary tract infection.

In Table-5, Present study shows that maximum incidence (53.12%) of bacteriuria occurs during first week of catheterization which is comparable with Richards et al. [17] This finding is also comparable with the Study conducted by Somwang Danchaivijitr

In Figure-3, Present study, out of total 110 male patient, 26(23.63%) have developed CAUTI while out total 90 female patients, 38(42.22%) have developed CAUTI. This shows higher incidence CAUTI in female patients. This indicates that females are more susceptible to CAUTI than male. Female sex was found to be a risk factor for CAUTI by Platt et al, [19] Maki DG et al, [20] Michael F Ksycki et al [21] and Carol E Chenoweth et al. [22] 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 anus in comparison to men urethra. [23]

**Table.6.Comparison of various isolates of UTI**

Organism	Present study, Jamnagar, Gujarat, India, 2012-2013	SomwangDanchaivijitr et al <sup>[4]</sup> , Siriraj hospital, Bangkok, Thailand, 2002	TrulsBjerklund Johansen et al. <sup>[18]</sup> Germany, 2003	Bagchi et al <sup>[12]</sup> Nagpur, Maharashtra, 2011-2012
E. Coli	40.06%	15.10%	31%	34.85%
Klebsiella	21.8%	10.70%	10%	19.7%
Pseudomonas	10.93%	11.30%	13%	12.12%
Acinetobacter	07.81%	13.20%	-	-
Proteus	06.25%	-	6%	3.03%
S.aureus	04.68%	-	-	4.55%
Enterococci	07.81%	12.60%	-	6.06%



**Fig.3. Comparison of Gender incidence with different studies**

During the last two decades bacterial resistance mediated by plasmids, which carry resistance genes to a large number of antibiotics, which are rapidly transferred, has worsened the scenario.<sup>[24]</sup> In this way urinary isolates of E. Coli and pseudomonas were more drug resistant and so urinary tract infection in catheterized patients is difficult to treat.

## CONCLUSION

The urinary tract of catheterized patients is highly susceptible to infection. Almost half of these patients who undergo short-term catheterization acquire urinary tract infection in seven days. An important problem identified with this kind of infection is the change in microbiological and antibiotic sensitivity pattern of the bacteria. There is an emergence of antibiotic-resistant organisms.

The incidence of Catheter Associated Urinary Tract Infection (CAUTI) in the

present study was 32%. From the present study, it can be concluded that insertion of catheter in urinary tract is associated with higher incidence of urinary tract infection in patients.

Higher incidence of CAUTI (42.23%) was found in female sex as compared to males (23.63%). This suggests that female sex is important risk factor for urinary tract infection because of short urethra and its proximity to the anus.

Results of the present study underline the necessity to reduce the duration of catheterization to decrease the occurrence of bacteriuria in ICU patients. Most common isolate found in our study was E. coli (40.06%) among all urinary pathogens and 2<sup>nd</sup> most common was Klebsiella (21.8%) species.

This study identified two important risk factors associated with Catheter Associated Urinary Tract Infection (CAUTI), female gender and duration of catheterization. Since the first risk factor is unalterable host factor, emphasis should be made on reducing the duration of catheterization in order to reduce the incidence of catheter-related UTI. Urinary catheters should not be used as a matter of convenience for the nursing staff or physicians during medical care of patients.

## REFERENCES

1. G. A. O' May, S. M. Jacobsen, D. J. Stickler, H. L. T. Mobley, and M. E. Shirtliff. Complicated Urinary Tract Infections due to Catheters.

- ClinMicrobiol Rev. 2008 Jan; 21(1):26-59.
2. Magill SS, Hellinger W, et al. Prevalence of healthcare-associated infections in acute care facilities. *Infect Control Hosp Epidemiol.* 2012;33:283-91.
  3. Diane K, Newman, RNC, MSN, CRNP, FAAN. Prevention and Management of Catheter-Associated UTIs. *Infectious Disease Special edition.* 2010.
  4. Danchaivijitr S, Dhiraputra C, Cherdrungsi R, Jintanothaitavorn D, Srihapol N. Catheter Associated Urinary Tract Infection. *J Med Assoc Thai* 2005; 88 (Suppl10): S26-30.
  5. Hootan T, Bradley S, et al. Diagnosis, Prevention and Treatment of Catheter-associated Urinary Tract infection in adults. *Clinical Infectious Diseases.* 2010;50:625-663.
  6. Nicolle, Lindsay E. Catheter-Related Urinary Tract Infection. *Drugs & Aging, Volume 22, Number 8, 2005* , pp. 627-639(13).<http://www.ingentaconnect.com/content/adis/dag/2005/00000022/00000008/art00001>
  7. Guide to the Elimination of CAUTIs (CAUTIs). An APIC guide, 2008. [www.apic.org](http://www.apic.org).
  8. Stamm W. Catheter-associated urinary tract infections: epidemiology, pathogenesis, and prevention. *Am J Med.* 1991 Sep 16; 91(3B):65S71S.
  9. Stensballe J, Treve M, Looms D, et al. Infection risk with nitrofurazone impregnated urinary catheters in trauma patients. *Annals of Internal Medicine.* 2007; 285.
  10. Cheesbrough M. *District Laboratory Practice in Tropical Countries.* 2<sup>nd</sup> ed. New Delhi; Cambridge University Press; 2006.
  11. Kevin B Laupland, Sean M Bagshaw, Daniel B Gregson, Andrew W Kirkpatrick, Terry Ross and Deirdre L Church. Intensive care unit-acquired urinary tract infections in a regional critical care system. *Critical Care* 2005, 9:R60-R65.
  12. Bagchi, Jaitly, Thombare. Microbiological evaluation of catheter associated urinary tract infection in a tertiary care hospital. *International Journal of Biological and Health Science* Vol. 1 Issue 2 Jan. 2013
  13. Chih-Cheng Lu, M.D. The Incidence of Urinary Tract Infection in Patients with a Chronic Indwelling Urethral Foley Catheter. *Incont Pelvic Floor Dysfunct* 2007;2:67-68.59.
  14. Karina Billote-Domingo, M.D., Myrna T. Mendoza, M.D., Tessa Tan Torres, M.D. Catheter-related Urinary Tract Infections: Incidence, Risk Factors and Microbiologic Profile. (*Phil J Microbiol Infect Dis* 1999; 28(4):133-138.
  15. Garibaldi RA, Burke JP, Dickman ML and Smith CB (1974): Factors predisposing to bacteriuria during indwelling urethral catheterization. *N Engl J Med.* 1974 Aug 1; 291(5):215-219.
  16. Alavaren HF, Lim JA, Velmonte MA and Mendoza MT (1993): Urinary Tract Infection in Patients with Indwelling Catheter, *Phil J Microbiol Infect Dis* 1993; 22(2):65-74.
  17. Richards MJ, Edwards JR, Culver DH and Gaynes RP (2000): Nosocomial infections in combined medical-surgical intensive care units in the United States. *Infect Control Hosp Epidemiol.* 2000 Aug; 21(8):510-5.
  18. Truls E. Bjerklund Johansen, Mete Çek, Kurt G. Naber, Leonid Stratchounski, Martin V. Svendsen, Peter Tenke. Hospital acquired urinary tract infections in Surgical departments: pathogens, susceptibility and use of antibiotics: Data from the PEP and PEAP-studies. *Int J Antimicrob Agents.* 2006 Aug; 28 Suppl 1:S91-107. Epub 2006 Jul 7.
  19. Platt R, Polk BF, Murdock B and Rosner B (1982): Mortality associated with nosocomial urinary-tract infection. *N Engl J Med.* 1982 Sep 9; 307(11):637-42.

20. Maki Dennis G and Tambyah Paul A (2001): Engineering out the risk of infection with urinary catheters, Emerging Infectious Diseases., Vol. 7, No. 2, 1-6. March-April 2001.
21. Michael F and Namias Nicholas (2009): Nosocomial Urinary Tract Infection. Surg Clin N Am 89 (2009) 475-481.
22. Chenoweth Carol E and Saint Sanjay (2011): Urinary Tract Infections, Infect Dis Clin N Am 25 (2011) 103-115.
23. Marc Leone, Jacques Albanèse, Franck Garnier, Christophe Sapin, Karine Barrau, Marie-Christine Bimar, Claude Martin. Risk factors of nosocomial CAUTI in a polyvalent intensive care unit. Intensive Care Medicine; July 2003, Volume 29, Issue 7, pp 1077-1080.
24. Ram S, Gupta R, Gaheer M. Emerging antibiotic resistance among the uropathogens. Indian J Med Sci 2000; 54(9):388-94.

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