

# Incidence and Microbiology of Catheter Associated Urinary Tract Infection in Hospitalized Patients in a Tertiary Care Hospital in Kumaon Region

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## ABSTRACT

Catheter-associated urinary tract infection (CAUTI) is a major preventable cause of in-hospital morbidity and urinary catheterization is the most common risk factor of UTI. In this tertiary care institute, we have studied the incidence, microbiology, and the antibiotic sensitivity pattern in catheterized patients. All hospitalized patients in the General Surgery Department of any age group or sex undergoing catheterization (>48 hours) were studied. 1724 catheterized patients have analyzed during the study phase and out of which 246 patients had culture-positive UTI (incidence rate-14.26%). The most common predisposing factor identified as obstructive uropathy (24.8%) followed by malnourishment, other chronic illnesses, and previous history of surgeries. Most common organism *E.coli* (52%) was isolated and sensitive antibiotic was fosfomycin (92.7%).

**Keywords:** Catheter-associated urinary tract infection, UTI, Hospital acquired infection

## INTRODUCTION

Catheter-associated urinary tract infection (CAUTI) is a major preventable cause of in-hospital morbidity and incurs a significant cost on health-care. It is defined as the presence of at least one of the following signs and symptoms after 48 hours of catheterization with no other recognized cause; fever (>100 °C), urgency, frequency, dysuria, suprapubic tenderness,

pelvic discomfort, costovertebral angle tenderness, hematuria, rigors or delirium in the patient with a positive urine culture. [1] Urinary tract infection (UTI) as the most common healthcare-associated infection accounts for up to 36% of all healthcare-associated infections. CAUTI accounts for up to 80% of these. [2] In hospitalized patients, catheter-associated bacteriuria accounts for many episodes of nosocomial bacteremia, and one study has found an association with increased mortality. [3]

The most important predisposing factor for nosocomial UTI is urinary catheterization. The indwelling urethral catheter introduces an inoculum of bacteria into the bladder at the time of insertion, cause movement of pathogens from the meatus to the bladder, allows spread of pathogens to the bladder contaminated tube or bag and provides a frequently manipulated foreign body which is a predisposing factor for pathogens to grow. [4] Several risk factors have been associated with CAUTI. Duration of catheterization, female sex, and diabetes was found to be significantly associated with the acquisition of the infection. Existing data suggest that long-term catheterization potently induces chronic inflammation of the bladder, which likely results in permanent structural changes. [5] Gokula RR et al conducted a review where they found that a physician or

nurse explicitly documented the reason for catheter placement in only 13%. No order for catheterization was written in 33% of the charts. This indicates that interventions are needed to decrease the inappropriate use of urinary catheters. [6] In this study, we have analyzed the incidence and bacteriology of CAUTI in a tertiary care setup.

## MATERIAL AND METHODS

This is an observational prospective clinical study conducted in the Department of General Surgery, Dr. Susheela Tiwari Government Hospital & medical college, Haldwani, Uttarakhand, India from January 2018 to Sept 2019. All hospitalized patients in the General Surgery Department of any age group or sex undergoing catheterization and gave consent were included in the study. The patient who was having already established UTI and duration of catheterization <48 hours were excluded. All patients were catheterized under universal aseptic precautions with no-touch technique. The urine specimen was collected on the 3rd and 7th day of catheterization through the Foley's catheter with universal precautions and was then sent for routine & microscopy and culture & sensitivity analysis. We used standard statistical tools for analysis. We analyzed the incidence of CAUTI, causative organisms, and antibiotic sensitivity patterns in our center.

## OBSERVATIONS AND RESULTS

A total of 1724 patients hospitalized under the Department of General Surgery, GMC Haldwani was catheterized for >48 hours. Out of these patients, 246 were found to be suffering from Catheter-associated Urinary tract infection (CAUTI) which was confirmed via urine culture and sensitivity (14.26%). Out of 246 patients, 146 were female (59.3%) and 100 were male patients (40.7%).

Around 24.8 % of patients were suffering from Obstructive Uropathy. Other risk factors were malnourishment (11.8%)

and H/O surgery (11.8%), Diabetes Mellitus (10.6%), Immunosuppression (9.8%), and other Chronic Illness (11.8%) (Table 1). According to our results most of the patients were of middle age (42+/-20 years) group (Table 2).

**Table 1: Comorbidities in the patients, diagnosed with catheter induced urinary tract infection**

Risk Factors	Frequency	%
Obstructive Uropathy	61	24.8%
H/O Surgery	29	11.8%
Chronic Illness	29	11.8%
Malnourished	29	11.8%
Diabetes Mellitus	26	10.6%
Immunosuppression	24	9.8%

**Table 2: Age Distribution of patients diagnosed to have CAUTI**

Age Groups	Frequency	%
1 - 10 yrs	23	9.3%
11 - 20 yrs	14	5.7%
21 - 30 yrs	38	15.4%
31 - 40 yrs	49	19.9%
41 - 50 yrs	43	17.5%
51 - 60 yrs	28	11.4%
61 - 70 yrs	30	12.2%
>70 yrs	21	8.5%
Total	246	100%
Mean ± SD	42.03 ± 20.85	
Min - Max	1 - 88	

According to microbial data maximum patients were infected with E.coli (52%). The second most frequent organism was Enterococcus fecium (26%). The rest results are charted in Table 3.

**Table 3: Organisms seen in patients diagnosed to have CAUTI**

Organism	Frequency	%
<i>E. coli</i>	128	52.0%
<i>Enterococcus fecium</i>	64	26.0%
<i>Klebsiella</i>	20	8.1%
<i>Citrobacter</i>	14	5.7%
<i>Pseudomonas</i>	8	3.3%
<i>MRCONS</i>	2	0.8%
<i>MRSA</i>	2	0.8%
<i>Enterbacter</i>	2	0.8%
<i>MSSA</i>	2	0.8%
<i>Proteus vulgaris</i>	2	0.8%
<i>Staphylococcus saprophyticus</i>	1	0.4%
<i>Acinetobacter</i>	1	0.4%
Total	246	100%

We have classified causative organisms according to age distribution. E.coli was found to be present in almost all age groups. Proteus and enterobacter were more commonly associated with younger age groups (Table 4).

**Table 4: Causative Organisms correlation with the patient age groups**

Organism	Age Groups									P value
	1 - 10 yrs	11 - 20 yrs	21 - 30 yrs	31 - 40 yrs	41 - 50 yrs	51 - 60 yrs	61 - 70 yrs	>70 yrs		
n	23	14	38	49	43	28	30	21		
Acinetobacter	n							1	0.150	
	%							4.8%		
Citrobacter	n		3	5	4	2			0.277	
	%		7.9%	10.2%	9.3%	7.1%				
E. coli	n	17	8	18	24	23	10	15	13	0.255
	%	73.9%	57.1%	47.4%	49.0%	53.5%	35.7%	50.0%	61.9%	
Enterobacter	n		2							<0.001
	%		14.3%							
Enterococcus fecium	n	3		16	14	8	9	10	4	0.032
	%	13.0%		42.1%	28.6%	18.6%	32.1%	33.3%	19.0%	
Klebsiella	n	1	4		1	5	7	1	1	<0.001
	%	4.3%	28.6%		2.0%	11.6%	25.0%	3.3%	4.8%	
MRCONS	n				2					0.323
	%				4.1%					
MRSA	n							2		0.043
	%							6.7%		
MSSA	n							2		0.043
	%							6.7%		
Proteus vulgaris	n	2								0.007
	%	8.7%								
Pseudomonas	n			1	2	3			2	0.344
	%			2.6%	4.1%	7.0%			6.7%	
Staphylococcus saprophyticus	n				1					0.776
	%				2.0%					

According to the sensitivity pattern, Fosfomycin was the most sensitive antibiotic and Imipenem was the least sensitive antibiotic (Table 5).

**Table 5: Antibiotic Sensitivity in patients diagnosed to have CAUTI**

ANTIBIOTICS	SENSITIVITY	
	Frequency	%
Fosfomycin	228	92.7%
Cotrimoxazole	47	19.1%
Cephazolin	28	11.4%
Nitrofurantoin	28	11.4%
Ampicillin	20	8.1%
Gentamicin	18	7.3%
Imipenem	15	6.1%

## DISCUSSION

Urethral catheterization remains the most common cause of urinary tract infection. However, with some precautions, urinary tract infection can be avoided. Out of total patients (1724), who underwent urinary catheterization, 246 were found to be suffering from Catheter-associated Urinary tract infection (CAUTI) which was confirmed via urine culture & sensitivity. The incidence of urinary tract infection was 14.26% at our institute that is comparable with already published studies [6-11]

In our study majority of patients belonged to the age group of 21-50 years

with the highest number of cases belonging to the age group 31-40 years (19.9%). Out of 246 patients, 146 were female (59.3%) and 100 were male patients (40.7%).

Most common risk factor, as we observed, encountered was obstructive uropathy (24.8%) followed by chronic illness (11.8%) and malnourishment (11.8%). Existing data suggest that diabetes as the most common risk factor. [12]

In our microbiological data, E.coli was the most frequent organism (52%). Other organisms were Enterococcus fecium (26.0%). Other causative agents were Klebsiella, Pseudomonas, Proteus, Citrobacter, etc. Rezai MS et al (2017) reported similar results. [13] Javier Gil-Moradillo, Juan et al also reported that most commonly isolated were E. coli, Enterococcus, and P. aeruginosa in cases of CAUTI. [14]

In our results, the majority of cases were found to be sensitive to Fosfomycin (92.7%). Other antibiotics found useful were Nitrofurantoin, Amikacin, Linezolid, and Cephazolin. Least sensitive antibiotics were Chloramphenicol and Ciprofloxacin. In a study conducted by Stein GE et al, it has been seen that a single 3 g dose of

fosfomycin is equal to 7-day full-dose course of nitrofurantoin course.<sup>[15]</sup>

## CONCLUSION

With an incidence of 14.26%, CAUTI is one of the most common hospitals acquired infection in our institute. The most important predisposing factor for nosocomial UTI is urinary catheterization, especially in immunocompromised patients. The most common causative organism was found to be *E. coli* and most cases were sensitive to Fosfomycin. These results will guide us in devising appropriate antibiotic therapy.

## REFERENCES

1. Sameh R, Ismaila, Anis Fatimaa, Rehana Shafia, et al Urinary tract infection in children after cardiac surgery: Incidence, causes, risk factors and outcomes in a single-center study. (www.cdc.gov.in). Journal of Infection and Public Health (2016) 9, 600-610.
2. Vicki Parker, Michelle Giles, Laura Graham, et al Avoiding inappropriate urinary catheter use and catheter-associated urinary tract infection (CAUTI): a pre-post control intervention study. BMC Health Services Research (2017) 17:314.
3. Platt R, Polk BF, Murdock B, et al Mortality associated with nosocomial urinary-tract infection. N Engl J Med 1982; 307:637–642.
4. Daifuku R, Stamm WE. Bacterial Adherence to Bladder Uroepithelial Cells in Catheter-Associated Urinary Tract Infection. N Engl J Med. 1986; 314: 1208–1213.
5. Matthieu Rousseau, H.M. Sharon Goh, Sarah Holec, et al Bladder catheterization increases susceptibility to infection that can be prevented by prophylactic antibiotic treatment. JCI Insight. 2016;1(15):e88178.
6. Gokula RR, Hickner JA, Smith MA. Inappropriate use of urinary catheters in elderly patients at a midwestern community

- teaching hospital. Am J Infect Control. 2004 Jun;32(4):196-9.
7. Warren JW, Platt R, Thomas RJ, et al Antibiotic irrigation and catheter-associated urinary-tract infections. N Engl J Med 1978; 299:570.
8. Haley RW, Hooton TM, Culver DH, et al Nosocomial infections in U.S. hospitals, 1975-1976: estimated frequency by selected characteristics of patients. Am J Med 1981; 70:947.
9. Tambyah PA, Maki DG. Catheter-associated urinary tract infection is rarely symptomatic: a prospective study of 1,497 catheterized patients. Arch Intern Med 2000; 160:678.
10. Saint S. Clinical and economic consequences of nosocomial catheter-related bacteriuria. Am J Infect Control 2000; 28:68.
11. Leuck AM, Wright D, Ellingson L, et al Complications of Foley catheters--is infection the greatest risk? J Urol 2012; 187:1662.
12. Platt R, Polk BF, Murdock B, Rosner B. Risk factors for nosocomial urinary tract infection. Am J Epidemiol 1986; 124:977.
13. Rezai MS, Bagheri-Nesami M, Nikkhah A. Catheter-related urinary nosocomial infections in 8 intensive care units: An epidemiologic study in North of Iran. Caspian J Intern Med 2017; 8(2): 76-82.
14. Javier Gil-Moradillo, Juan Justo-Quintas, Esther García-Rojo, et al Prospective study analyzing risk factors and characteristics of healthcare-associated infections in a Urology ward. Investig Clin Urol 2017;58: 61-69.
15. Stein GE. Comparison of single-dose fosfomycin and a 7-day course of nitrofurantoin in female patients with uncomplicated urinary tract infection. Clin Ther 1999; 21:1864.

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