

The Prospective Study of Urinary Tract Infection among Indoor Patients who Underwent Catheterization

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ABSTRACT

Introduction: Urinary tract infection among indoor patients who underwent urethral catheterization is one of the most common nosocomial infections. Infection in catheterized patients is a result of biofilm formation along catheter that ascends into urinary bladder along the internal and external catheter surfaces. Acquisition of new bacteriuria while a catheter remains in situ is 3 to 7% each day. The aim and objective of this study was to estimate the rate of CAUTI in catheterized indoor patients with their demographic distribution and clinical presentation.

Material and methods: We conducted prospective study of 200 cases of indoor patients with age <80 years who underwent catheterization for various surgical indication from September 2017 to October 2019. After taking informed and written consent of patients, we studied CAUTI by culture and sensitivity testing of patient's urine, graphs were obtained and result analyzed.

Results: We had studied 200 indoor patients in which 32 had CAUTI(16%),out of which 68% patients were female, major age group in CAUTI was 60-79 years(44%). 88% CAUTI were asymptomatic. Mean duration of catheterization in CAUTI was 6.2 days.7 type of organism were isolated from 32 patients of CAUTI, Escherichia coli was most frequently isolated microorganism (26%), Candida albicans was second common organism(20%). Out of 32 patients of CAUTI 29(90%) were unimicrobial and 3(10%) were polymicrobial.

Conclusions: According to this study Urinary tract infection in catheterized patients was major cause of nosocomial infection. Major patients of CAUTI were asymptomatic but they were big reservoir of cross infection. So we should develop standard infection control programs, implement them and monitor to control CAUTI.

Keywords: Urethral Catheter , Urine Culture Sensitivity, Catheter Associated Urinary Tract Infection.

INTRODUCTION

Urinary tract infection acquired after urinary catheterization is one of the most common cause of hospital acquired infections.^{1,2} CAUTI is accounting for up to 40% of all nosocomial infections and more than 1 million cases in US hospitals and nursing homes each year.^{3,4} In 2011,there were an estimated 93,300 cases of CAUTI in US acute care hospital.² CAUTIs are major reservoir of antibiotic-resistant organism in the hospital, they are rarely symptomatic.⁵ The most common clinical presentation of symptomatic catheter-acquired urinary infection is fever alone. Localizing signs or symptoms that may be present include suprapubic pain

or tenderness, costovertebral angle pain or tenderness, catheter obstruction, or acute hematuria. If fever develops in indwelling catheter patient CAUTI is more likely. The most effective preventive strategy is to limit urethral catheterization to patients with absolute indications and to remove the device as soon as possible.

Infection in individuals with an indwelling catheter is usually a result of biofilm formation along the catheter that ascends into the bladder along both the internal and external catheter surfaces. A biofilm on an indwelling urinary catheter consists of adherent microorganisms, their extracellular products, and host components deposited on the catheter.⁶ Biofilm formation is universal on indwelling catheters. It is initiated immediately following catheter insertion. A urine specimen for culture with a quantitative count greater than 10⁵ CFU/mL of one or more organisms is consistent with the diagnosis. However, although a positive urine culture is essential for a diagnosis of urinary infection, it does not confirm symptomatic infection. Symptomatic infection may occur with quantitative counts of less than 10⁵ CFU/mL, but this is uncommon. When a lower quantitative count of organisms is isolated, the diagnosis of symptomatic urinary infection should be reconsidered.

Kunin et al⁷ did prospective study of elderly patients in nursing home who developed CAUTI. Tambyah et al⁵ did prospective study of 1497 catheterized patients to observe CAUTI. The aim and objective of this study was to estimate the rate of CAUTI in catheterized indoor patients with their demographic distribution and clinical presentation.

MATERIAL AND METHODS

This prospective study of urinary tract infection among indoor 200 patients who underwent catheterization was conducted during the period of September 2017-October 2019 at General Surgery department of Sir Takhatsinhji

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General Hospital and Government Medical College, Bhavnagar, Gujarat, India. Institutional Review Board of Government Medical College, Bhavnagar granted approval of this study.

Inclusion criteria includes indoor patients below 80 years of age who were catheterized.

Exclusion criteria includes outdoor patients and patients above 80 years of age.

Indications for catheterization were Acute abdomen, perineal surgery, unconscious head injury patients, critical burns patients, any obstructed hernia patients, patients with acute urinary retention and operated for BPH etc. Both two- way and three- way Foley's catheter were used. In patients who were able to pass urine we had taken sample of urine before catheterization and sent it for urine culture sensitivity in microbiology department and second sample of urine at the time of removal of catheter taken in conscious patient. If patient not able to pass urine, urine sample for culture sensitivity was collected immediately after urethral catheterization. A urine specimen for culture with a quantitative count greater than 10^5 CFU/mL of one or more organisms was consistent with the diagnosis of CAUTI. However, although a positive urine culture was essential for a diagnosis of urinary infection, it did not confirm symptomatic infection. Symptomatic infection may occur with quantitative counts of less than 10^5 CFU/mL, but this was uncommon. When a lower quantitative count of organisms were isolated, the diagnosis of symptomatic urinary infection was reconsidered. For unconscious patients with indwelling catheter, the urine specimen was collected by aspiration of urine through the main tubing with due aseptic precaution. In patients with severe clinical presentations (i.e., high fever, severe sepsis/septic shock) blood cultures were obtained and a peripheral leukocyte count was done to rule out CAUTI. All patients with indwelling catheter with positive urine culture sensitivity were confirmed by blood culture and total leukocyte count. All patients with CAUTI were treated by antibiotics according to culture sensitivity report.

The data of study were collected, analyzed and interpreted accordingly. Excel software was used to analyze the data.

RESULTS

A total 200 indoor catheterized patients were studied prospectively and here are the results.

Age distribution

In this study out of 200 patients 168 were without CAUTI and 32 had CAUTI. Major proportion of patients affected with CAUTI was in age group of 60-79 years (14 patients). [Table 1]

Sex distribution

Out of 32 patients with CAUTI 20 patients were female and 12 were male. The incidence of CAUTI was much higher in female (20/84 [24%]) than in male (12/116 [10.3%]), $P < 0.001$. [Table 2]



Figure-1: Two way Foley's catheter



Figure-2: Three way Foley's catheter

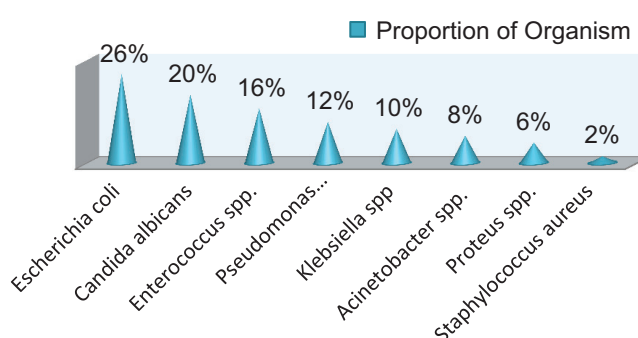


Chart-1: Organism found in cautis

Age groups (in years)	No. of patients without CAUTI	No. of patients with CAUTI	Total
0-19	20	4	24
20-39	35	9	44
40-59	49	5	54
60-79	64	14	78
	Total=168	Total=32	200

Table-1: Age distribution

Symptoms of patients with cauti

Among CAUTI patients approximate 88% of patients were asymptomatic & only 12% patients (out of 32 patients with CAUTI) were symptomatic. The most common clinical presentation of symptomatic catheter-acquired urinary infection was fever, other signs and symptoms were suprapubic pain or tenderness, pyuria, catheter obstruction, or hematuria. All patients with CAUTI were treated by antibiotics according to culture sensitivity report. Patients with CAUTI had more catheter days (mean 6.2 days) as compare to patients without CAUTI (5.1 Days) [Table 3]. Overall 8 different types of pathogens were isolated from the urine culture of 32 patients with CAUTI. Escherichia coli was the most frequently isolated microorganism (26%) followed by Candida albicans (20%), Enterococcus spp. (16%) the second and third most common organism, with least common isolated organism was staphylococcus aureus (2%) [Chart 1].

Sex, No. (%)	Patients without CAUTI	Patients with CAUTI	Total no.	P-Value
Male	104(62%)	12(38%)	116	<0.001
Female	64(38%)	20(62%)	84	
	Total=168	Total=32	200	

Table-2: Sex Distribution

	Patients without CAUTI	Patients with CAUTI
Days catheterized before onset of infection	5.1 days	6.2 days

Table-3: Significance of catheter days in CAUTI.

DISCUSSION

In this study out of 200 patients 168 were without CAUTI and 32 had CAUTI. In this study catheter associated urinary tract infection rate in catheterized patients was 16%, which correlate with study Magill SS et al² where rate of CAUTI was 14%, in study Tambyah PA et al⁵ rate of CAUTI was 14.9%. In patients with CAUTI major proportion of patients were from age group of 60-79 years (14 patients, 44%), which correlate with study Sangamithra V et al⁸ where major age group with CAUTI was >60 years (49%).

Urinary tract infection more commonly involve lower urinary tract and is significantly more common in females.⁹ It may be due to short female urethra as compare to male. Out of 32 patients with CAUTI 20 patients were female and 12 were male. The incidence of CAUTI was much higher in female (20/84 [24%]) than in male (12/116 [10.3%]), $P < 0.001$. [Table 2] which correlate with study Tambyah et al⁵ where incidence of CAUTI was much higher in female- 23% than in male-9%, female patients in CAUTI were 147/224(66%) and 77/224(34%). P value is < 0.001 .

In this study among CAUTI patients approximate 88% of patients were asymptomatic & only 12% patients (out of 32 patients with CAUTI) were symptomatic, in study Tambyah et al⁵ 90% of infected patients were asymptomatic. In symptomatic patients common symptoms were high temperature, supra pubic pain, dysuria, urgency etc. In this study patients with CAUTI had more catheter days (mean 6.2 days) as compare to patients without CAUTI (mean 5.1 DAYS), it correlate with study Tambyah et al⁵, where patients with CAUTI had more catheter days (6.4 days) as compare to patients without CAUTI (4.4 days).

In this study overall eight different types of pathogens were isolated from the urine culture of 32 patients with CAUTI. *Escherichia coli* was the most frequently isolated microorganism (26%), followed by *Candida albicans* (20%), *Enterococcus* spp. (16%) and least common organism isolated was *Staphylococcus aureus* (2%), which correlate with Laupland et al¹⁰ who found that the most frequent micro organisms in UTIs were *Escherichia coli* (23%), *Candida albicans* (20%), *Enterococcus* spp. (15%) and *Staphylococcus aureus* (1%). In present study out of 32 CAUTI patients 29(90%) were unimicrobial and 3(10%) were polymicrobial, which comparable to study of Tambyah et al⁵ in which 220(94%) were unimicrobial and 15(6%) were polymicrobial ($P < 0.001$).

CONCLUSION

By the help of this study we found that urinary tract infection in catheterized patients was major cause of nosocomial infection, in which more patients were female with more than 60 years age and asymptomatic. Chances of Catheter Associated Urinary Tract Infection increased with prolonged catheterization as compare to short duration catheterization. Critically ill patients are more prone to develop CAUTI due to prolong requirement of indwelling catheter. Patients with CAUTI whether symptomatic or asymptomatic are big reservoir of cross infection in hospital so we should develop effective infection control programs with strict implementation, and monitoring with standard protocol to control CAUTI rate. Major focus must be on absolute indication and standard aseptic method of Foley's catheterization followed by proper catheter care with catheter removal as early as possible.

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