

Incidence of Urinary Tract Infection in Catheterised Geriatric Patients in a Tertiary Care Centre in North India

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Abstract

Background

Catheter-Associated Urinary Tract Infections (CAUTI) are the most common cause of Hospital-acquired infection affecting about 150 million individuals annually worldwide. UTIs are grouped into uncomplicated and complicated infections especially in elderly patients. Data on CAUTIs in geriatric age group in hospital are very less. This study was done to elucidate the causative factors for CAUTIs and related outcomes (in terms of length of stay and mortality), in geriatric patients (>65yrs) admitted to a tertiary care hospital in Northern India.

Methods

A prospective study was conducted on consecutive 100 patients who had undergone urinary bladder catheterization from period between 01 Jul 2020 to 01 Jul 2021 at tertiary care service hospital in Jalandhar, Punjab, India. All Geriatric patients (>65yrs age) who presented to the hospital were included in the study. Written informed consent was taken from all the included patients.

Results

Mean age of study subjects in present study was 76.3 years with 69% male and 31% female subjects. The incidence of UTI among catheterized patients was 63%. The incidence of CAUTI was much higher in women than in men which is in consonance with other studies. In our study about three fourths (77.6%) catheterized patients with more than 7 days duration developed UTI. In the present study almost half (52.4%) of the patients developed bacteriuria within the first week while 87.3% developed bacteriuria within 2 weeks. Symptomatic UTI was observed in 51.9% episodes where fever was the most observed symptom (81.5%) followed by pain (50%).

Conclusion

Modifiable risk factors should be addressed adequately and prevent avoidable catheterization to reduce incidence of UTI.

Keywords: CAUTI; Complicated UTI; Catheterization in elderly; Infection

Abbreviations: CAUTI: Catheter Acquired Urinary Tract Infection; UTI: Urinary Tract Infections

Introduction

Catheter Acquired Urinary Tract Infection (CAUTI) is one of the most common health cares acquired infections affecting about 150 million individuals annually worldwide [1]. Urinary Tract Infections (UTI) are grouped into uncomplicated and complicated infections [2]. Uncomplicated UTIs occur in immuno-competent females, with no history of urinary tract manipulation or structural abnormalities in the urinary tract. Complicated UTIs occur in the presence of a structural or functional abnormality like patients with urinary tract obstruction or urinary retention (due to neurological disease-paraplegia etc.), immuno-compromised state, pregnancy, or those with an indwelling foreign body such as a stone, ureteral stent, or

urinary catheter. UTIs in men are considered complicated (shorter urethra length, antibacterial prostatic secretions act as natural barriers against infection). In 2011, there were an estimated 93 000 cases of CAUTI in United States acute care hospitals [3] making it the most common nosocomial infection leading to increased duration of hospitalization, antibiotics misuse/overuse and great financial burden. Well known risk factors for CAUTI are age, female sex, diabetes, and prolonged catheterization time. CAUTIs can lead to devastating complications such as sepsis and MODS, and an estimated 13,000 deaths each year can be attributed to healthcare associated UTIs [4]. About 70-80% of these infections are attributable to use of an indwelling urethral catheter. Almost 69% of these are avoidable [5]. The measure proven to be effective in reducing CAUTI rates can be summarized as avoiding unnecessary catheterization, reducing duration of catheterization (depending upon necessity and risk vs benefits), maintaining asepsis for insertion and using hydrophilic-coated catheters [6,7]. Indwelling urinary catheters are generally considered to be short term if they are in situ for less than 30 days and chronic or long term when in situ for 30 days or more [8]. Indwelling catheter use in acute care facilities is usually short term, while chronic catheters are most common for residents of long-term care facilities. The daily risk of acquisition of bacteriuria with an indwelling catheter is 3-7%. The rate of acquisition is higher for women and older persons Bacteriuria is universal once a catheter remains in place for several weeks. Patients with chronic indwelling catheters are assumed to be continuously bacteriuric. Clinical and microbiologic considerations may vary for short- and long-term catheters. Urinary catheter acquired infection is usually manifested as asymptomatic bacteriuria (CA-ASB). The term Catheter Associated Urinary Tract Infection (CAUTI) is defined as UTI in an individual whose urinary bladder is catheterized within the past 48 hours leading to a symptomatic infection (symptoms may include-fever, suprapubic tenderness, costovertebral angle tenderness, urinary frequency or urgency or dysuria) urine culture with more than 10⁵CFU/mL of one bacterial species [9] (non-bacterial pathogens have been excluded since 2015). For a short-term indwelling catheter, the frequency of infection is directly related to the duration of catheterization. Men have a somewhat lower incidence than women. Approximately 80% of hospitalized patients with an indwelling catheter receive antimicrobial therapy for some indication [10]. Around 60-80% of hospitalized patients with an indwelling catheter receive antimicrobials, usually for indications other than urinary tract infection. If a patient is receiving antimicrobial therapy, onset of bacteriuria is delayed. During the initial 4 days of catheterization, concomitant antimicrobial therapy is associated with a decreased rate of infection. The short-term risk of acquiring infection is increased when the urethral meatus is colonized by potential uropathogens. After 4 days the infection rate is similar, whether or not antimicrobials are continued, but more resistant organisms are isolated from patients receiving antimicrobials [10]. For persons with long term indwelling catheters, the incidence of new infection is similar to that with short-term catheterization; approximately 3-10% will contract a new infecting organism every day [11]. These organisms usually replace previously infected organisms or become an additional organism in poly-microbial infection. The

most common infecting organism is *Escherichia coli* [12]. Other Enterobacteriaceae as well as *Enterococci* spp, coagulase negative *Staphylococcus*, *Pseudomonas aeruginosa*, other non-fermenters, and *Candida* spp are also frequently isolated.

UTI is the second most common infection in the geriatric population [13]. Furthermore, urine and faecal incontinence, dehydration, impaired cognitive function, and limited activity increase their susceptibility to infections. Moreover, atypical symptoms (nausea, vomiting, abdominal pain, respiratory distress and altered sensorium) can cause delays in the diagnosis [14]. Data on CAUTIs in geriatric age group patients admitted in hospital are very less especially from the Indian subcontinent. This study was done to elucidate the causative factors for CAUTIs and related outcomes (in terms of length of stay and mortality), in geriatric patients (>65yrs) admitted to a tertiary care hospital in Northern India.

Materials & Methods

The present study was conducted to study the Incidence of urinary tract infections in catheterized geriatric patients.

Study area and study period

The study was conducted at Military hospital Jalandhar. The study was done for a period of one year from 1 Jul 2020 to 01 Jul 2021. The study commenced after due approval from the hospital ethics committee.

Inclusion criteria

- a. All patients >65yrs of age willing to participate in study, catheterized after admission in the hospital.

Exclusion criteria

- a. Patients unwilling to participate in the study.
- b. Patients who have been catheterized prior to hospitalization.
- c. Patients on treatment for urinary tract infection prior to hospitalization.
- d. Patients less than 65 years of age were not included in the study.
- e. Patients with preexisting structural abnormalities in urinary tract/strictures/high grade BPH/Obstructive uropathy and CKD patients were also excluded.
- f. Patients with dementia are unable to give informed consent.

Study design

Hospital based prospective observational study.

Sampling technique and sample size

Consecutive types of non-probability sampling were used for selection of study subjects. All the catheterized geriatric patients fulfilling eligibility criteria were included in the study after taking informed consent. The final sample size was 100 patients.

Methodology

All the admitted catheterized geriatric patients were first subjected to urine examination for albumin, sugar, blood, pus cells, and blood and urine culture. Catheters were routinely changed after 2 or more weeks or changed when there are clinical complaints of fever, dysuria, cloudy urine, blockage, or other symptoms of urinary tract infections. Urine culture was done on the 2nd day post catheterization followed by thrice a week thereafter till 1 week after the catheter had been removed. Blood examination comprised of Hb, TLC, DLC, ESR, S. urea, S. creatinine and blood sugar was done. Information regarding duration of catheterization, clinical features, diagnosis, etc. was recorded on a specially designed proforma.

Statistical analysis

All the collected data was entered into the Microsoft Excel sheet and then transferred to SPSS software ver. 17 for analysis. Appropriate statistical tests were applied based on type and distribution of data. P-value <0.05 was taken as a level of significance.

Results

The Incidence of UTI among catheterized patients was 63%. Over three fourth (77.4%) of the females with catheters developed UTI while 56.5% of catheterized males developed UTI (Tables 1-4). A significant association was observed between female gender and development of UTI in patients ($p < 0.05$). About half (52.4%) of the patients developed bacteriuria within 7 days while 87.3% developed bacteriuria within 2 weeks. About three fourth (77.6%) catheterized patients with more than 7 days duration developed UTI. Fever was the most commonly observed symptom (81.5%) followed by pain (50%), pyuria (27.8%), urgency (24.1%) and dysuria (16.75). Out of the total patients, 41.3% patients improved, 47.6% were bacteriologically cured while 7 (11.1%) patients died. Most of the organisms showed sensitivity towards Tigicyclin followed by Colistin and Magnex, while maximum resistance was observed for cephalosporin's followed by Nitrofurantoin and Amikacin (Tables 5-8).

Table 1: Distribution of subjects based on age groups.

Age Group (Years)	N	%
<65-70	11	11.0%
71-75	23	23.0%
76-80	49	49.0%
>80	17	17.0%
Total	100	100.0%

Table 2: Distribution of subjects based on gender.

Sex	N	%
Male	69	69.0%
Female	31	31.0%
Total	100	100.0%

Table 3: Distribution of subjects based on development of UTI

UTI	N	%
Yes	63	63.0%
No	37	37.0%
Total	100	100.0%

Table 4: Association of gender with development of UTI.

Sex	CAUTI	NO CAUTI	Total
Male	39	30	69
	56.5%	43.5%	100.0%
Female	24	7	31
	77.4%	22.6%	100.0%
Total	63	37	100
	63.0%	37.0%	100.0%
p-value<0.05			

Table 5: Distribution of subjects based on interval for bacteriuria.

Interval for Bacteriuria (n-63)	N	%
1-7 days	33	52.4%
8-14 days	22	34.9%
15-21 days	4	6.3%
>21 days	4	6.3%
Total	63	100.0%

Table 6: Distribution of subjects based on duration of catheterization.

Duration of Catheterisation	N	%
1-7 days	51	51.0%
8-14 days	31	31.0%
>14 days	18	18.0%
Total	100	100.0%

Table 7: Distribution of subjects based on symptoms.

Symptoms (n-54)	N	%
Fever	44	81.5%
Pain	27	50.0%
Pyuria	15	27.8%
Urgency	13	24.1%
Dysuria	9	16.7%

Table 8: Distribution of subjects based on clinical outcome.

Clinical Outcome	N	%
Cured	30	47.6%
Improved	26	41.3%
Death	7	11.1%
Total	63	100.0%

Discussion

A hospital based prospective observational study was conducted with the aim of studying the Incidence of UTI in catheterized Geriatric patients. It comes a close second to respiratory infections among hospitalized patients and community-dwelling adults more than 65 years of age [15]. The mean age of study subjects in present study was 76.3 years with 69% male and 31% female subjects. The incidence of UTI among catheterized patients was 63%. In the study by Tambyah PA et al. [16] the incidence of CAUTI was found to be 14.9% and the incidence of CAUTI was much higher in women (23.2%) than in men [16] (8.9%) which is in consonance with our study. The incidence of UTI is higher in women compared with men across all age groups. Over 10% of women older than 65 years of age reported having a UTI within the past 12 months. This number increases to almost 30% in women over the age of 85 years [17,18]. In both men and women over the age of 85 years, the incidence of UTI increases substantially. A small cohort study in this age group found the incidence of UTI in women to be 0.13 per person-year and 0.08 per person-year in men [19]. Age-associated changes in immune function, exposure to nosocomial pathogens and an increasing number of comorbidities put the elderly at an increased risk for developing infection [20]. Catheter-associated bacteriuria is the most common infection in both hospitals and long-term care facilities [21]. In a study by Leticia-Kriegel AS et al. [22] it was found that approximately 12% of patients who have a catheter inserted for 30 days developed CAUTI [22]. In our study about three fourths (77.6%) catheterized patients with more than 7 days duration developed UTI. In the present study almost half (52.4%) of the patients developed bacteriuria within the first week while 87.3% developed bacteriuria within 2 weeks. Symptomatic UTI was observed in 51.9% episodes where fever was the most commonly observed symptom (81.5%) followed by pain (50%).

Conclusion

Development of prevention strategies, including aseptic insertion of urinary catheters, minimizing use of catheters and minimizing duration of catheter use, has led to a decrease in the incidence of CAUTI [23]. As our population ages, the burden of UTI in older adults is expected to grow, making the need for improvement in diagnostic, management and prevention strategies critical to improving the health of older adults. These will also aid in improving antibiotic accuracy and stewardship.

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