

Original Research Article

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Bacteriological Study of Catheter Associated Urinary Tract Infection in a Tertiary Care Hospital

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ABSTRACT

Catheter associated urinary tract infections (CAUTI) are one of the most common cause of hospital acquired infections or nosocomial infections. Indwelling urinary catheterization in hospital setting has become a potential source for drug resistance and has now gained a prime importance in patient outcome. Hence, the aim of this study is to isolate uropathogens from CAUTI and find out antimicrobial sensitivity pattern among the isolates. This study was conducted over a duration of 2 years and urine samples were collected from 126 catheterized patients. The urine samples were processed microbiologically and antimicrobial sensitivity was performed. Out of 126 catheterized patients, 26 developed CAUTI and *Escherichia coli* 17 (65.3%) was the most common organism followed by *Proteus* species 4 (15.38%), *Klebsiella pneumoniae* 2 (7.6%), *Enterococcus* species 2 (7.6%) and staphylococcus epidermidis 1 (3.8%). Enterobacteriaceae showed significant resistance to drugs like gentamycin, ciprofloxacin, and ceftazidime and were highly sensitive to drugs like imipenem, meropenem, nitrofurantoin, amikacin, ceftazidime - clavulanic acid and piperacillin - tazobactam. Among the gram positives, enterococcus 2 (7.6%) was the most common organism followed by staphylococcus epidermidis 1 (3.8%). Only one (3.8%) ESBL producer was detected among gram negative bacilli. 26 patients (20.63%) developed CAUTI among the analyzed 126 patients. Among these 13 (50%) developed CAUTI on 7th day of catheterization. Hence, dedicated infection control practice along with early diagnosis and timely therapeutic management is very important to control these CAUTI.

Keywords

CAUTI,
infection
control,
ESBL,
Escherichia coli.

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Introduction

Catheter associated urinary tract infection is one of the most common cause of hospital acquired infections. The indwelling catheterization has become a potential cause for morbidity among patients admitted in the hospital and has gained a prime importance in patient outcome. Bacteriuria develops in

around 10 to 15% of hospitalized patients with indwelling urethral catheter. Among the community acquired pathogens *E. coli* is responsible for approximately 80 to 90% of cases followed by other gram negative bacilli and gram positive cocci. CAUTI in patients with indwelling urinary catheters is

presumed by the presence of signs or symptoms compatible with urinary tract infection with no other identified source of infections along with 10^5 or more CFU/ml of one bacterial species in a single catheter urine specimen (48 hours catheterization) or in a mid stream voided urine specimen from a patient whose catheter has been removed within the previous 48 hours. In appropriate use of antimicrobial agents and inappropriate following of preventive bundles has led to increase in emergence of multidrug resistant uropathogens and increased risk of mortality in hospitalized patients (Hooton *et al.*, 2009).

Materials and Methods

This study was conducted over a period of 2 years in a tertiary care hospital PESIMSR, Kuppam. A total of 126 urine samples were collected from patients who were catheterized.

The following patients were excluded from the study:

- Patients who were earlier treated with UTI were excluded.
- Patients already suffering from cystitis and prostatic enlargement.
- Patients on suprapubic catheter, nephrostomy tube and condom catheter were excluded.

Samples were collected on first day of catheterization, later repeated every alternate day till 11th day. First day sample was collected and processed to rule out prior urinary tract infection. The samples collected were inoculated onto blood agar and Macconkey agar by using standard calibrated loop. Samples which had $\geq 10^5$ CFU/ml were processed further for

biochemical reactions and antimicrobial sensitivity testing. Screening of ESBL producing strains was done using ceftriaxone, ceftazidime, aztreonam, cefotaxime and cefpodoxime. CAUTI in patients with indwelling urinary catheters is presumed by the presence of signs or symptoms compatible with urinary tract infection with no other identified source of infections along with 10^5 or more CFU/ml of one bacterial species in a single catheter urine specimen (48 hours catheterization) or in a mid stream voided urine specimen from a patient whose catheter has been removed within the previous 48 hours.

Results and Discussion

Out of the 126 patients analyzed, 26 (20.63%) of them developed CAUTI. Among them 12 (46.1%) were female and 14 (53.9%) were male. 13 (50%) of them developed CAUTI on the 7th day of catheterization. *Escherichia coli* 17 (65.3%) was the most common organism isolated followed by proteus species 4 (15.38%), *Klebsiella pneumoniae* 2 (7.6%), *Enterococcus* species 2 (7.6%) and *Staphylococcus epidermidis* 1 (3.8%). Gram negative bacilli were predominant than gram positive cocci. Among gram positive cocci *Enterococcus* species 2 (7.6%) was the most common followed by *Staphylococcus epidermidis* 1 (3.8%). The sensitivity of all the organisms was assessed based on CLSI guidelines. Enterobacteriaceae showed significant resistance to drugs like gentamycin, ciprofloxacin, and ceftazidime and were highly sensitive to drugs like imipenem, meropenem, nitrofurantoin, amikacin, ceftazidime - clavulanic acid and piperacillin - tazobactam. Among the gram positives, *Enterococcus* 2 (7.6%) was the most common organism followed by *Staphylococcus epidermidis* 1 (3.8%). Only one (3.8%) ESBL producer (*Klebsiella*

pneumoniae) was detected among gram negative bacilli.

Out of 126 catheterized patients analyzed for CAUTI, 26 (20.63%) developed catheter associated urinary tract infection, which is similar to studies done by Kulkarni *et al.*, (Kulkarni *et al.*, 2014), Bhatia *et al.*, (Bhatia *et al.*, 2010), Bagchi *et al.*, (Bagchi *et al.*, 2015). Male predominance was seen compared to females, which was similar to that reported by Jaggi *et al.*, (Namitha Jaggi *et al.*, 2012). 23 (88.46%) patients were found to develop CAUTI after 7 days of

catheter insertion, which correlated with studies done by Kulkarni *et al.*, Prolonged catheterization was found to be associated with increased cases of CAUTI, therefore proper maintenance and care of catheter is required to reduce the incidence of CAUTI (Sabir *et al.*, 2014). Among the uropathogens isolated *E. coli* was the most common followed by *Proteus vulgaris*, *Klebsiella*, *Enterococcus* species and *Staphylococcus epidermidis*. These findings matched with that of Bagchi *et al.*, Kazi *et al.*, (Mohammad Mukhit Kazi *et al.*, 2015), and Jayashri *et al.*, (Jayashri *et al.*, 2015).

Table.1 organisms isolated from urine of catheterized patients

Organisms	Total isolates-n	Percentage %
<i>Escherichia coli</i>	17	65.3%
<i>Klebsiella pneumoniae</i>	2	7.6%
Proteus species	4	15.38%
<i>Enterococcus</i> species	2	7.6%
<i>Staphylococcus epidermidis</i>	1	3.8%

Table.2 Antibiotic sensitivity pattern of gram positive organisms

Antimicrobials	<i>Staphylococcus epidermidis</i> (%)	<i>Enterococcus</i> species (%)
Ampicillin	100	50
Amikacin	100	-
Amoxycillin - clavulinic acid	100	-
Clindamycin	100	50
Co-trimoxazole	100	-
Ciprofloxacin	100	50
Erythromycin	100	50
Gentamycin	100	-
Levofloxacin	100	-
Nitrofurantoin	100	100
Norfloxacin	100	0
Ofloxacin	100	0
Penicillin	0	0
Teicoplanin	100	100
Vancomycin	100	100

Table.3 Antimicrobial sensitivity pattern of gram negative bacilli

Antimicrobials	<i>Escherichia coli</i> (%)	<i>Klebsiella pneumoniae</i> (%)	<i>Proteus species</i> (%)
Amikacin	87	100	75
Ampicillin - sulbactam	87	50	75
Ceftriaxone	72	50	50
Ceftazidime	74	50	75
Ceftazidime - clavulanic acid	88	50	100
Ciprofloxacin	24	50	25
Gentamycin	87	50	25
Imipenem	100	100	100
Meropenem	100	100	100
Nitrofurantoin	94	100	100
Piperacillin - tazobactam	87	50	75

Enterobacteriaceae showed significant resistant to common antibiotics like Ciprofloxacin, gentamycin, and ceftriaxone. Most of the gram negative bacilli showed complete sensitivity to drugs like nitrofurantoin, imipenem, meropenem, piperacillin-tazobactam, and ampicillin-sulbactam. Most of the gram positives showed complete sensitivity to drugs like vancomycin, teicoplanin, and nitrofurantoin (Anupurba *et al.*, 2003).

In conclusion, prolonged catheterization is an important risk factor for the development of hospital acquired infections like CAUTI. Among the uropathogens isolated *E. coli* is the most common agent. Uropathogens isolated from CAUTI showed one ESBL producer and some of them resistant to commonly used antibiotics. This shows that appropriate timely diagnosis and management is very important to control these pathogens. Strict aseptic precaution has to be taken while insertion and daily catheter care to reduce CAUTI. Strict antibiotic stewardship and antibiotic policy following can reduce inappropriate use of antimicrobials.

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