

Microbiological Profile of Nosocomial Urinary Tract Infections in a Tertiary Care Hospital

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Abstract: Nosocomial urinary tract infections account for upto 40% infections in hospitals and 23% of infections in intensive care units. Most urinary tract infections develop in patients with indwelling urinary catheters. This study was conducted in the Department of Microbiology in association with Department of Medicine, Pt. B.D. Sharma PGIMS, Rohtak. All the seriously ill patients admitted in the department of medicine over a period of one year were included in the study and incidence of hospital acquired urinary tract infections was determined in them. Urine samples of subjects of the study were collected first at the time of admission to rule out community acquired infections and then after 48 hours of admission. A total of 125 patients, categorised as seriously ill were included in the study. Patients with cerebrovascular accidents constituted the major chunk (25%) of the total subjects included in the study. *Candida* spp (11) was the commonest microorganism isolated from patients having UTI. The prevalence of multidrug resistant strain in our study was 80.0%.

Key words: Nosocomial, Bacteria, Fungi, drug resistance.

INTRODUCTION

Nosocomial infections occur worldwide and affect both developed and resource-poor countries. Such infections are a major source of morbidity, mortality and increased financial burden. Nosocomial infections add to functional disability and emotional stress of the patient and may in some cases lead to disabling condition that reduces the quality of life. Hospital-acquired infections add to the imbalance between resource allocation for primary and secondary health care by diverting scarce funds towards the management of potentially preventable conditions [1].

The most commonly encountered HAIs are urinary tract infections (UTIs), surgical site infections (SSIs), and pneumonia and bloodstream infections (BSIs) [2].

Nosocomial urinary tract infections account for upto 40% infections in hospitals and 23% of infections in intensive care units. Most urinary tract infections develop in patients with indwelling urinary catheters. Urinary catheters interfere with normal host immune defences and allow formation of biofilm, which enables bacterial colonisation and affects the specific etiologic organisms found in catheter, associated UTI (CAUTI) in multiple ways such as making their eradication difficult and shielding from the effects of the antimicrobial agent [3].

In the present study, one of the commonly used parameters for assessing the burden of health care associated infections in any institute i.e. urinary tract infections was studied. Microbiological profile of

clinical isolates recovered from seriously ill patients, who are more vulnerable to acquire health care associated infections, by virtue of factors ranging from altered level of consciousness, impaired immune response launching capacity, to being remaining admitted in the acute health care providing facility for extended periods of time was studied.

MATERIALS & METHODS

This study was conducted in the Department of Microbiology in association with Department of Medicine, Pt. B.D. Sharma PGIMS, Rohtak. All the seriously ill patients admitted in the department of medicine over a period of one year were included in the study and incidence of hospital acquired urinary tract infections was determined in them.

Urine samples of subjects of the study were collected first at the time of admission to rule out community acquired infections and then after 48 hours of admission. Samples were also collected after

development of clinical signs and symptoms of hospital acquired infections (HAIs). A total of 125 patients were enrolled for the study with any of the following condition or disorders defined under “seriously ill” category:

- Septicaemia
- Hepatitis
- Diabetes mellitus
- Cerebrovascular accident
- Meningitis
- Chronic renal failure
- Severe anaemia
- Chronic obstructive pulmonary disease
- Poisoning
- Acute renal failure
- Others

Inclusion criteria

Following criteria was fulfilled to qualify as patient having UTI

Patient had at least one of the following signs or symptoms with no other recognized cause: fever (>38°C), urgency, frequency, dysuria or suprapubic tenderness. A positive case of UTI is defined as a patient with positive urine culture. i.e >10⁵ cfu/ml in voided or >10² in non voided sample or urine with one or two species of microorganisms with or without clinical symptoms.

All the samples were processed by conventional microbiological methods. The organisms isolated were identified following the standard protocol, and the antimicrobial susceptibility testing of the isolates was performed using Kirby-Bauer disc diffusion technique [4].

OBSEVATIONS

Table 1 shows the distribution of the patients based on the underlying medical illness for which the admission was done. A total of 125 patients, categorised as seriously ill were included in the study. Patients with cerebrovascular accidents constituted the major chunk (25%) of the total subjects included in the study. This was followed by patients with Type 2 Diabetes mellitus who accounted for around 17.6% of total cases. Other patients included in the study had a diagnosis of chronic kidney disease (CKD), hepatitis, chronic obstructive pulmonary disease (COPD), septicemia etc. in decreasing order of frequency. Miscellaneous group included patients with diseases like intracranial mass, seizure disorder, acute pancreatitis, acute lymphocytic leukaemia (ALL), left ventricular failure (LVF) etc.

Table 2 shows that *Candida* spp (11) was the commonest microorganism isolated from patients having UTI. Out of 11 isolates of *Candida* spp, four were recovered from patients having type 2 DM, followed by 2 isolates from patients having cerebrovascular accident(n=2) and one each from patients having COPD, poisoning, ARF, septicemia and hemoptysis.

Both the isolates of *E. coli* were resistant to ampicillin, amoxycylav and ciprofloxacin. Ceftazidime, cotrimoxazole, norfloxacin and meropenem were effective in 50% of the isolates. The only isolate of *Acinetobacter* spp was sensitive to ciprofloxacin, cotrimoxazole, imipenem and piperacillin-tazobactam.

Both Strains of coagulase negative staphylococci were sensitive to clindamycin, linezolid and norfloxacin. Ofloxacin, cefoxitin, gentamicin, nitrofurantoin and ceftriaxone were sensitive in 50% of the isolates, while no strain was sensitive to erythromycin and ampicillin.

Table-1: Distribution of study participants according to associated co-morbidities

Clinical diagnosis	Number (n)	Percentage (%)
DM Type 2	22	17.6
CVA	25	20.0
CKD	10	12.5
Hepatitis	07	5.6
COPD	07	5.6
Anaemia	03	2.4
Meningitis	04	3.2
Poisoning	04	3.2
ARF	02	1.6
Septicaemia	05	4.0
Miscellaneous	36	28.8
TOTAL	125	100

Table-2: Distribution of microorganisms from patients with UTI with respect to underlying clinical condition

Clinical diagnosis	Total no. of isolates	Type of isolate			
		<i>E. coli</i>	CoNS	<i>Acinetobacter</i> spp	<i>Candida</i> spp
DM Type 2	05		01		04
CVA	04	01	01		02
CKD	00				
COPD	02			01	01
ANAEMIA	00				
POISONING	01				01
ARF	02	01			01
SEPTCEMIA	01				01
MISCELLANEOUS	01				01
TOTAL	16	02	02	01	11

DISCUSSION

Health care associated infections include all clinically evident infections that do not originate from patient's original admitting diagnosis. The term nosocomial infection or hospital acquired infection is applied to any clinical infection that was neither present nor was incubating at the time of patient getting admitted in the hospital [1].

In the present study, age of patients enrolled for the study ranged from 15 to 85 years with mean age of patients being 50 years. The results of the present study are similar to those of Osmani and colleagues and Alexander and colleagues who reported mean age of 48.6 and 50.6 years respectively [5, 6]. However, the mean age was comparatively lower than one reported by Mythri and Kashinath who reported the mean age of 56 years in their study. The difference might be due to the fact that Mythri and Kashinath included all the patients admitted in hospital, whereas this study was performed on seriously ill medical patients [7].

The incidence of nosocomial infections in the present study was 12.8%. An incidence, bits lower that is 10.93% was quoted by Pratham and colleagues [8]. *In contrast much higher incidence of 28% was quoted in a study conducted by Ginawi et al.* [9] An extremely higher incidence of 44.8% was reported by Vincent *et al.* [10] *This could possibly be due to fact that they included all the patients admitted in ICU, irrespective of underlying diagnosis.*

In the present study, the rate of nosocomial infections due to fungi was higher 68.7% (11/16) as compared to that with bacterial etiology, 31.2% (5/16). A study by Mitt *et al.* reported 94% of all HAIs due to bacterial etiology and 6% due to fungal etiology [11]. *Candidaalbicans* was the only fungal pathogen isolated from urine in the present study. Increased rate of fungal isolation may be due to increased use of antimicrobial agents and presence of urinary catheters use leading to colonisation with *Candida* spp.

Among the pathogens responsible for causing urinary tract infection, *Candida* spp. was responsible

for 11 out of 16 (68.7%) cases. The other two pathogens in decreasing order of incidence were *Escherichiacoli* (*E. coli*) and coagulase negative Staphylococci (CoNS) recovered from 12.5% cases each. In contrast, in a study conducted by Shalini S *et al.* *Klebsiella pneumoniae* (*K. pneumoniae*) was the commonest (63.1%) pathogen recovered from critically patients having UTI, followed by *P. aeruginosa* (15.7%), and *Candida* spp. (10.5%)[12]. A study by Bagachi evaluated the microbiological profile of pathogens responsible for catheter associated urinary tract infection. The commonest organism found to be responsible was *E. coli* (34.85%), followed by *Klebsiella* spp. (19.7%), *P. aeruginosa* (12.12%), *Candida* spp. (10.6%), *Enterococcus* spp. (6.06%) and others [13]. The high prevalence of *Candida* spp in present study can be attributed to increased use of extended spectrum antimicrobial agents, presence of indwelling urinary catheter, underlying immunosuppression, female gender and extended stay of hospitalization.

Among the isolates recovered from the patients with UTI, *S. aureus* was isolated from two patients (12.5%) and both were uniformly sensitive to all the antimicrobial agents. Both the isolates of *E. coli* were sensitive to nitrofurantoin, norfloxacin, imipenem, piperacillin-tazobactam, amikacin, gentamicin and doxycycline. Both the isolates of *E. coli* were resistant to ampicillin, ciprofloxacin and amoxycylav. The only isolate of *Acinetobacter* spp. was sensitive to cotrimoxazole, piperacillin-tazobactam, imipenem and ciprofloxacin. Coagulase negative staphylococci (CoNS) were isolated from two patients. Both the isolates of CoNS were sensitive to clindamycin, linezolid and norfloxacin. Resistance was seen to ampicillin and erythromycin in both the cases. In the study by Ghadiri, it was observed that *E. coli* was responsible for causing UTI in 66.7% of seriously ill medical patients. This was followed by CoNS recovered from 11.7% of critically ill patients. In this study, the highest rate of resistance was seen to nalidixic acid (57.7%). Maximum sensitivity was seen for amikacin (97.5%), imipenem (97.5%), gentamicin (95.0%), followed by ceftazidime (91%), tetracycline (88%), ciprofloxacin (60%) and cotrimoxazole (50%) [14].

Bagachi *et al.* reported the prevalence of *E. coli* and CoNS in their study as 3.85% and 6.06% respectively [13]. Resistance pattern shows that maximum resistance was seen against ampicillin, amoxycylav, cotrimoxazole, followed by gentamicin, norfloxacin, ciprofloxacin, ceftazidime, ceftriaxone, nitrofurantoin, piperacillin-tazobactam, imipenem. Co NS showed maximum resistance to ampicillin while 50% of isolates were resistant to norfloxacin, nitrofurantoin, tetracycline, cotrimoxazole, gentamicin and pencillin G. None of the strains was resistant to vancomycin and ceftazidime. Recent U. S. data indicate that *E. coli* to be the most common etiologic gram-negative organism, followed in descending order of frequency by *P. aeruginosa*, *Klebsiella* spp, *Enterobacter* species, and *A. baumannii*[15,16].

The prevalence of multidrug resistant strain in our study was 80.0%. The high incidence of antimicrobial resistant strains isolated from patients is a worrisome and this issue needs to be addressed adequately. To control these infections and to prevent antibiotic resistance, it is suggested that the committee for controlling health care associated infections should be more active and the extended spectrum antimicrobials should be used with more caution and their long term use should be discouraged wherever possible.

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