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## Research Article

# Catheter Associated Urinary Tract *Candida* Infections in Intensive Care Unit Patients

## Abstract

**Introduction:** Health care associated infections (HCAIs) or nosocomial infections have a propensity to strike in the critical care areas. Surveillance of HCAIs, so as to define the magnitude and nature of the problem, is the primary step towards reducing the risk for infection in vulnerable hospitalized patients. The present study was conducted in a rural tertiary care teaching hospital with an aim to determine the rate of catheter associated urinary tract *Candida* infections in medical intensive care unit patients.

**Methods:** A prospective study was done on catheter associated urinary tract infection (CAUTI). The urine samples were collected and processed following standard microbiological protocols.

**Results:** The overall rate of CAUTI was found to be 1.6 per 1000 catheter days. The rates of catheter associated bacteriuria and candiduria in our health care setup were noted as 1.2 and 0.4 respectively.

**Conclusion:** The present surveillance study helped us to generate institutional data regarding CAUTI in ICU patients with a special reference to candiduria. In our institute, the incidence of candiduria was low.

## Introduction

Health care associated infections (HCAIs) are cross infections arising in hospitals. These infections are neither present nor incubating upon hospital admission. The incidence of HCAIs is usually high in intensive care unit (ICU) and seems to be related to an extent to management decisions and practices.

HCAIs infections can lead to complications in 25–50% of those admitted to ICUs [1]. Approximately half of all cases of HCAIs are associated with indwelling medical devices [2]. Therefore the greatest threat against safety in ICUs is from device associated infections (DAIs), particularly ventilator-associated pneumonia (VAP), central venous catheter (CVC)-related blood stream infection and catheter-associated urinary tract infection (CAUTI).

Over the past few decades the isolation of *Candida* spp. has been increasingly reported from DAIs especially those involving the blood stream and urinary tract [2]. Nearly about 10–15% of health care associated UTIs are caused by *Candida* spp [3]. As number of literature on CAUTI are focused on bacterial isolates, the present study was conducted in a rural tertiary care teaching hospital with an aim to determine the

rate of catheter associated urinary tract *Candida* infections in medical ICU patients.

## Materials and Methods

The present study was conducted in the department of Microbiology, Rural Medical College and Hospital of Pravara Institute of Medical Sciences (Deemed University), Loni, Maharashtra, India for a period of 5 years (January 2011 to December 2015). The protocol of the study was approved by Institutional Ethics Committee.

Urine sample was aseptically collected from sampling port of indwelling urinary catheter with sterile syringe and needle from suspected cases of CAUTI. The patient was labelled as a case of CAUTI, when a catheterized patient developed one or more of the following conditions after 48 hours admission to ICU: fever, urgency, suprapubic tenderness, dysuria, turbid urine and burning micturition.

The urine samples were inoculated by calibrated loop (0.01mL) onto blood agar, MacConkey's agar and Sabouraud dextrose agar (SDA) supplemented with 100 µg/ml of chloramphenicol. The culture plates were incubated at 37°C for 24–48 h.

Colony count of  $> 10^4$  colony form units (CFUs)/mL was considered as significant for candiduria whereas, in case of bacteriuria, colony count of  $10^5$  CFU/mL was considered as significant. Additionally, a Gram stained smear was prepared from a centrifuged urine sample [3].

*Candida* isolates were identified upto species level by combination of germ tube test, sugar assimilation and chromogenic assay on HiChrome *Candida* agar (Himedia Laboratories Pvt. Ltd. Mumbai). HiCandida identification kit (Himedia Laboratories Pvt. Ltd. Mumbai) supplemented the species identification. Bacterial isolates were identified as per standard microbiological protocol.

The rate of CAUTI was expressed as the number of CAUTI per 1000 device days and was calculated using the following formula.

$$\frac{\text{Number of patients developing CAUTI} \times 1000}{\text{Total number of catheter days}}$$

## Results

In these five years period, a total of 108 (2.2%) out of 4889 patients admitted to ICU for more than 48 h developed CAUTI. The total device days were 63784. The overall rate of CAUTI was found to be 1.6. Out of these 108 CAUTI cases, bacteria were isolated from a total of 77 (1.5%) cases. Catheter associated candiduria was noted in 31 (0.7%) cases.

The rates of catheter associated bacteriuria and candiduria in our health care setup were noted as 1.2 and 0.4 respectively. The spectrum of microorganism isolated from CAUTI is shown in Table 1.

*E. coli* (33.7%) followed by *Klebsiella pneumoniae* (22.2%) and *Enterococcus* spp. were predominant bacterial isolate in the present study. Predominance of Non *albicans Candida* (NAC) spp. over *C. albicans* was noted. *C. tropicalis* followed by *C. glabrata* were the major NAC spp.

**Table 1:** Spectrum of microorganisms isolated from catheter associated urinary tract infections.

I. Bacterial isolates	
<i>E. coli</i>	26 (33.8)
<i>Klebsiella pneumoniae</i>	17 (22.1)
<i>Enterococcus</i> spp.	11 (14.3)
<i>Pseudomonas aeruginosa</i>	09 (11.7)
<i>Staphylococcus aureus</i>	09 (11.7)
Coagulase negative Staphylococci	05 (6.5)
<b>Total</b>	<b>77</b>
II. <i>Candida</i> isolates	
<i>C. albicans</i>	07 (22.6)
<i>C. tropicalis</i>	15 (48.4)
<i>C. glabrata</i>	06 (19.3)
<i>C. krusei</i>	03 (9.7)
<b>Total</b>	<b>31</b>

## Discussion

Surveillance of HCAs is one of the important functions of Hospital Acquired Infection Control Committee. The purpose of surveillance of HCAs is to reduce the incidence of nosocomial infections, which in turn will reduce the associated morbidity, mortality and costs. The primary aim of surveillance of nosocomial infections is to establish its baseline rates in a particular health care setup. Once these rates are known, the surveillance can continue and further trends can be effectively monitored.

In the present study, the overall rate of CAUTI was 2.2% or 1.6 per 1000 device days. This rate was low than those reported by Prasanna et al. [4] and Datta et al. [5]. However, the rate of CAUTI at our setup was high compared to that reported by Singh et al. [6]. The CAUTI rates reported in various studies are highly variable and range from 4.4 to 56.5% or 1.7 to 30 infections per 1000 device days [6]. Several possible explanations can be given to a lower rate of CAUTI in ICU patients at our health care setup. The first possibility can be attributed to the intense efforts of Hospital Infection Prevention and Control Committee of our institute which unceasingly monitor every aspect of Infection Prevention and Control. The other possibilities include maintenance of meticulous hygiene of hospital, conduction of regular sensitization programmes and strict adherence to universal standard precautions.

In this study, the incidence of catheter associated bacteriuria was high compared to candiduria. The rate of catheter associated bacteriuria was 1.5% or 1.2 per 1000 device days. *E. coli* (33.7%) was the predominant isolate. This member of *Enterobacteriaceae* family is the most commonly isolated bacterial pathogen from hospital acquired UTI [7]. *E. coli* is the commonest facultative anaerobic commensal of gastrointestinal tract. Although both commensal and uropathogenic *E. coli* (UPEC) strains colonize human gastrointestinal tract only UPEC can selectively proliferate in the urinary system [7]. The pathogenicity of UPEC can be attributed to various virulence factors like haemolysin, P fimbriae, S fimbriae and cytotoxic necrotizing factor 1. In addition, few strains UPEC bear surface pili particularly type I fimbriae, which bind to latex catheters and human kidney epithelial cells [8].

In the present surveillance, the rate of catheter associated candiduria was 0.7% or 0.4 per 1000 device days. The incidence of catheter associated candiduria was low. Candiduria is a relatively rare finding in a structurally normal urinary tract [9,10]. It is strongly associated with presence of indwelling urinary catheters and other risk factors like diabetes mellitus, extremes of age, female sex, use of immunosuppressive agents and broad spectrum antibiotic therapy [11,12].

In our study, *C. albicans* was isolated from only 07 CAUTI patients whereas, NAC spp were isolated from 24 cases. In recent years, incidence of *Candida* infections due to NAC spp. is increasing compared with that of *C. albicans*. NAC spp. are not only better adapted to the urinary tract but also are difficult eradicate compared to *C. albicans* [13]. *C. tropicalis* was the predominant NAC spp. in the present study. In recent

years, *C. tropicalis* is increasingly reported from various types of candidiasis [14,15]. This NAC spp. often demonstrates reduced susceptibility to fluconazole [15]. Jain et al. [3], also reported this NAC spp. as the frequent cause of candiduria in catheterized ICU patients.

## Conclusion

Surveillance of health care associated infections, so as to define the magnitude and nature of the problem, is the major step towards reducing the risk for infection in vulnerable hospitalized patients. The present surveillance study helped us to generate institutional data regarding CAUTI in ICU patients with a special reference to candiduria. In our institute, the incidence of candiduria was low. The predominance of NAC spp. over *C. albicans* was noted. Surveillance of health care associated infections though a very tedious process has many beneficial outcomes. The data obtained from surveillance can convince clinicians and hospital administrators of the need for improvements in infection prevention and control practices.

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