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Original Research Article

Increase in catheter associated urinary tract infections in intensive care units at a tertiary care centre: A cause of concern

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Abstract

Aim: Health-care associated infections (HAIs) affect 5-20% of patients admitted in the hospitals. Catheter-associated urinary tract infections (CAUTI) are the commonest HAIs accounting for about 35-45% of these nosocomial infections due to lack of aseptic procedures and prolonged catheterization. The spectrum and antimicrobial resistance pattern of micro-organism that cause CAUTIs vary among institutions and can change from year to year.

Materials and Methods: A retrograde analysis was performed on patients with indwelling catheters admitted in medical and surgical ICU. The patient's demographic details (name, age,sex), date of hospital admission, provisional diagnosis, treatment details, time and date of catheter insertion and removal were recorded as per CDC criteria. CAUTI was diagnosed as per CDC guidelines.

Results and Conclusions: A total of 687 patients were catheterized in ICU for an aggregate of 2748 patient days. The device utilization rate was 0.66. The prevalence of CAUTI per 1000 device days was 8.73.The causative uropathogens included *Candida*, *E.coli*, *Enterococcus* spp. A high degree of resistance was observed in all the isolates. There is a need to introduce appropriate measures aimed at proper use of catheters, to organise more frequent suitable personnel training and emphasis on hand washing procedures.

Keywords: Catheter-associated; urinary tract; intensive care units; health-care associated infections

1. Introduction

Health care associated infections (HAIs) affect 5-20% of patients treated in the hospital settings. These have a significant influence on patient morbidity and mortality [1]. Furthermore, these nosocomial infections escalate the cost and the length of stay in hospital. Patients in the intensive care units (ICUs) are at a high risk of device associated infections, due to their underlying immunosuppressive conditions and invasive medical procedures [2]. Health care associated infections are 5-10 times more frequently observed in ICUs, despite low percentage of the patients being treated in ICU [1].

It is observed that hospital acquired urinary tract infections account for about 35-45% of the nosocomial infections[3-5] and about 80% of these are related to the use of urethral catheters[6,7,8]. Approximately 14-38% of the indwelling urethral catheters are placed without a specific medical condition, although guidelines and components of care for catheterization are introduced, which are aimed at reducing catheter related complications [7-9]. It is observed that 30-40% of the gram negative septicemia acquired in the hospital, originates in the urinary tract [5].

The frequency, epidemiology and antimicrobial resistance pattern of micro-organisms, that cause catheter associated urinary tract infections (CAUTIs) vary among institutions and can change from year to year. The infection control measures in Indian hospitals are, however, constrained by the paucity of research in this field. Therefore, hospital specific prevalence and antibiotic resistance patterns for CAUTI causing organisms should be determined to initiate early and effective empiric antimicrobial therapy. So, the present study was carried out to determine the prevalence and antibiogram of organisms in CAUTI at a tertiary care center.

2. Material and methods

The study was performed on patients with indwelling catheters, admitted in medical and surgical ICU at Bhagat Phool Singh, Government Medical College for Women, Khanpur Kalan, Sonepat, Haryana, from May 2014 to January 2015. The patient's demographic details (name, age and sex), date of hospital admission, provisional diagnosis, treatment details, time and date of catheter insertion and removal were recorded as per CDC criteria [10].

CAUTI was diagnosed as per CDC criteria with presence of at least two of the following features with no other recognized cause: fever, urgency of micturition, dysuria or suprapubic tenderness and pyuria or positive urine culture [10]. The urine samples were obtained from the patients admitted in ICUs and sent to the Microbiology Department. An urine culture was considered positive with more than or equal to 10^5 organisms/ml of urine, with no more than two species of micro-organisms. The bacterial isolates were identified by standard methods and antibiotic susceptibility test was carried by Kirby Bauer disc diffusion method using ampicillin(10µg), amoxycillin-clavulinc acid (20/10µg), ciprofloxacin (5µg), norfloxacin (10µg), nitrofurantoin (300 µg), cefuroxime (30µg), ceftriaxone (30µg), imipenem (10µg), doxycycline (30µg), piperacillin-tazobactum (100/10µg), meropenem(10µg), amikacin (30µg), gentamicin (10µg) and cotrimoxazole (1.25/ 23.75 µg) as per CLSI guidelines[11]. Device utilization rate was calculated by dividing the total number of device days by the total number of patient days. Rate of CAUTI per 1000 device days were calculated by dividing the total number of infections by the total number of specific device days and multiplying result by 1000[10].

3. Results

During the study period of nine months, a total of 687 patients were catheterized in ICU for an aggregate of 2748 patient days. The mean age of the patient was 43.9 years and the device utilization rate was 0.66. The causative uropathogens included *Candida* spp.(n=14), *Escherichia coli*(n=8), *Citrobacter* spp.(n=2), *Klebsiella* spp(n=1), and *Enterococcus* spp.(n=2)(Figure 1). *Klebsiella* and C*itrobacter* spp. exhibited a high degree of resistance (100%) to all of the antimicrobials. *E.coli* isolates were moderately sensitive to imipenem(50%) and aminoglycosides(37.5%)(Figure 2). However, no resistance was observed in *Enterococcus* isolates. The prevalence of CAUTI per 1000 device days was 8.73. The overall CAUTI rate was 3.49%.

Figure 1: Distributions of organisms causing catheter-associated UTI

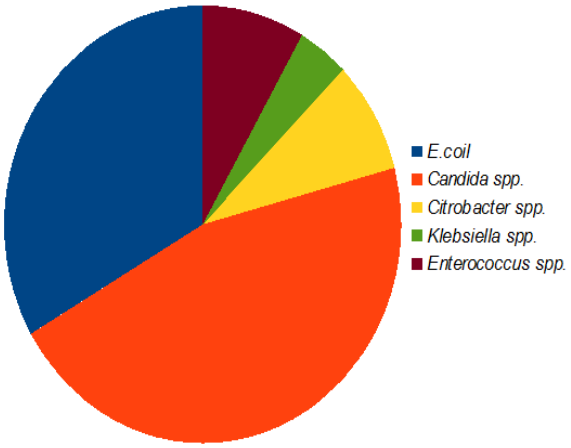
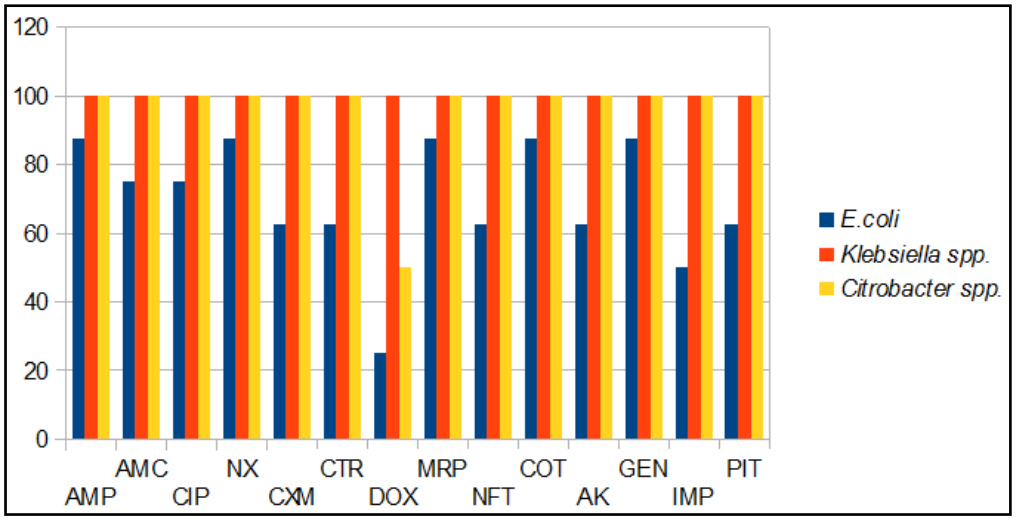


Figure 2: Antimicrobial resistance pattern of Gram negative organisms



AMP-ampicillin; AMC-amoxycillin-clavulinic acid; CIP-ciprofloxacin; NX-norfloxacin; CXM-cefuroxime; CTR-ceftriaxone; DOX-doxycycline; MRP-meropenem; NFT-nitrofurantoin; COT-cotrimoxazole; AK-amikacin; GEN-gentamicin; IMP-imipenem; PIT-piperacillin-tazobactum

4. Discussion

Catheter associated UTI is a serious cause of morbidity and mortality in ICU patients. In the present study, CAUTI per 1000 device days is 8.73 which is comparable with Dogru *et al*[12]. International Nosocomial Infection Control Consortium (INICC) had reported CAUTI rate of 7.1 in 422 ICUs of 36 developing countries from January 2004 to December 2009[13]. But in contrast,our rate is quite high than those reported by National Healthcare Safety Network (NHSN) system (8.73 vs 2.9)[14]. Rosenthal *et al*[13] and Leblebicioglu *et al*[15] have stated that the difference in rate of nosocomial infections may be observed in developed and developing countries, due to difference in the usage of technology. However, the catheter utilization ratio in our study was lower as compared to NHSN (0.66 vs 0.70)[14].

The present study has shown *Candida* species as the most frequently isolated uropathogen. This is in consistent with the findings of the previous studies [16,17]. This may be attributed to the fact that, *Candida* species, a normal genital flora becomes pathogenic under various factors like prolonged catheterization, surgery, broad spectrum antibiotics etc.[5]. In our study, *E. coli* is the predominant Gram negative pathogen causing CAUTI. The NHSN data also shows *E.coli* as the major pathogen, accounting for 26.8% of the total isolates [14]. Laupland *et al*[18] also demonstrated *E.coli* as the most common etiological agent followed by *Candida* spp. *E.coli* has the capacity to adapt and survive in urinary tract by producing several virulence factors. Among the Gram positive isolates, *Enterococcus* spp. was most frequently isolated which is in consistent with the study by other authors [16,17]. NHSN data also showed that 15.1% of all the isolates belonged to *Enterococcus* spp.[14].

The ICU bacterial flora is characterized by high antibiotic resistance. The spectrum of resistance observed in the present study highlights the most alarming situation of multidrug resistance. The data from INICC also reveals a high degree of resistance in all the isolates [13,19]. Vancomycin resistant *Enterococcus* isolates were not observed in our study as compared to Tigen *et al*[16]. An increasing resistance to the antimicrobials is a worldwide concern which limits the therapeutic options and emphasizes the urgent need for implementation of strict hospital infection control measures.

Active surveillance of infections has become the intrinsic element of quality and risk management. The limitation of our study is that it is a retrospective analysis that was conducted on the basis of data from a single hospital. Our hospital is a tertiary care centre and caters critically ill patients, which sometimes result in inappropriate antibiotics usages and high rates of device associated infections. But as suggested by Singh *et al*[20], institutional surveillance data cannot be generalised, so an urgent task is to build up a sentinel network that will routinely assess the rates of hospital acquired infections. These sentinel surveillance data will help for guideline formulation, recommendation and implementation of an effective hospital infection control policy.

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