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A Study On Catheter Associated Uti In ICU Patients In A Tertiary Care Hospital.

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ABSTRACT

Catheter associated urinary tract infection is an important healthcare associated infection. More than 80% of nosocomial UTIs are catheter- associated. Patients in intensive care unit have more risk of acquiring catheter associate UTI. Based on this our aim is to determine the incidence rate of symptomatic catheter associated urinary tract infection in intensive care unit set-up, to isolate the organisms involved in symptomatic catheter associated UTI, to determine the antimicrobial sensitivity pattern of the isolates. A total of 200 patients admitted in medical ICU and put on Foley's catheter were included in the study and followed up for the development of symptomatic CAUTI. The urine samples from the catheter were collected on day 1 and then on day 3,5,7 and every weekly tillthe patient is in hospital. The samples were processed as per standard guidelines. Total 52 patientsdeveloped Symptomatic catheter associated UTI, thereby the incidence being 26 %. *Pseudomonas aeruginosa* was the commonest isolate followed by *Klebsiella pneumoniae, Escherichia coli, Enterococcus faecalis* and *Candida spp*. each. High degree of antibiotic resistance was observed. On the whole the bacterial isolates were more sensitive to piperacillin-tazobactam, imipenem and meropenem. Development of catheter associated UTI is common in critically ill patients Emphasis should be placed on good catheter management and reducing the duration of catheterization to reduce its incidence. Knowledge of resistant pattern can help in implementing proper antibiotic therapy and infectioncontrol policy.

Keywords: Catheter, urinary tract infection, Intensive care unit.

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INTRODUCTION

Catheter associated urinary tract infection is an importanthealthcare associated infection. Urinary tract infection (UTI) is the most common nosocomial infection which accounts for as many as 35% [1] of the cases. Among these, more than 80% of nosocomial UTIs are catheter- associated. As compared to patients in non-critical area, those in intensive care unit have more risk of acquiring catheter associated UTI [2].

If a patient has an indwelling catheter for 48 hours or more and then develops signs and symptoms of UTI, it is considered as symptomatic catheter associated UTI. It is of two types: Symptomatic & Asymptomatic bacteremia catheter associated UTI. Symptomatic The signs and symptoms either are localized to the urinary tract or can include otherwise unexplained systemic manifestations, such as fever. The source of infection can either be endogenous or exogenous. Even after using closed, sterile drainage system and inserting the catheter aseptically, patients still acquire the infection [3]. A numberof risk factors are implicated in the causation of catheter associated UTI. These include female sex, old age, increased duration of hospital stay and catheterisation, impaired immunity, diabetes mellitus, renal dysfunction, incontinence, orthopedic causes.

The causative organisms include Gram negative bacilli, Gram positive bacteria and even Candida spp. Earlier themost common organism was *Escherichia coli*. Recent studies indicate a shift towards non-fermentative gram- negative bacilli, *Enterococcus spp.* and *Candida spp*.

Due to intense microbial exposure, antimicrobial resistant organisms are frequently isolated in these cases. This results in prolonged hospital stay and increased cost of healthcare. Eventually there is overall increased morbidity and mortality. Due to increase in prevalence ofmultidrug resistant isolates, early detection is crucial. This study will help in preparation of effective infection control policies and proper hospital antimicrobial policy, thereby decreasing the incidence of antimicrobial resistance. Hence aim of our study is to determine the incidence rate of symptomatic catheter associated urinary tract infection in intensive care unit set-up, to isolate the organisms involved in symptomatic catheter associated UTI, to determine the antimicrobial sensitivity pattern of the isolates.

MATERIALS AND METHODS

This study was done as a case control study for a period of two years in Intensive care unit and Department of microbiology of Chengalpattu Medical College Hospital in 200 patients who satisfied inclusion and exclusion criteria. Approval of the Institutional Ethics Committee was obtained before starting the study.Informed written consent was taken from all the patients included in the study.

Data were collected from the patients included in the study using a preformed structured questionnaire. Indication for Foley's catheter was noted. Daily examination of the patients was done to look for any evidence of urinary tract infection such as fever, suprapubic tenderness and costovertebral angle tenderness. Urine specimens were collected aseptically.

Descriptive analysis of all the explanatory and outcome parameters was presented as frequencies and percentages.The association between explanatory and outcome variables was analyzed by calculating odds ratios and their 95% confidence intervals. Statistical significance ofthis association was analyzed using chi square test. IBM SPSS version 24 were used for analysis.

RESULTS

In this study, total of 200 patients were enrolled and included in the final analysis. In our study around 52 patients developed catheter related UTI which was around 26% prevalence.

The age distribution of the participants showed, maximum proportion (33%) of subjects belonging to 18 to 30 years. The proportion of subjects with age between 31 to 40 years, 41 to 50 yrs, 51 to 60 years, 61 to 70 yrs and 71 to 80 yrs was 24%, 18%, 11% 10% and 4% respectively. In our study males constituted 57% andfemales contributed 43% of study subjects.

In majority of Patients total catheter days were in the range of 8 to 14 days (85%).In 1 to 7

days range 22 (11%) and in 15 to 21 days only 8 (4%) patients were there. The indication for catheterization was valid for all cases, mostly it was to monitor urinary output and to relieve urinary retention in few cases.

A total of 52 (26%) of patient's developed symptomatic catheter associated UTI during the hospital stay. Among that 38 (73%) developed it on 14th day, followed by 8 (15.3%), who developed on day 10. Remaining 6 (11.5%) subjects developed UTI on 21st day.

The descriptive analysis of all the potential risk factors fordevelopment of symptomatic UTI is presented was done. A total of 52 (26%) of participants were aged above 50 years. The proportion of subjects who had catheterizationfor more than 10 days was 43% .17% of subjects had Diabetes mellitus. The proportion of subjects, who were suffering from neurological, respiratory conditions, was 18% and 11% respectively. Only 5% of subjects were suffering from urological/nephrological conditions and 5 patients each had steroid use and otherimmunocompromised conditions. 3 patients each had faulty catheter care.

The occurrence of catheter associated UTI was found highest in age group 71-80 years. However, the association was not statistically significant between the age groups and occurrence of catheter associated UTI in the study population. The odds of occurrence of symptomatic UTI were 1.52 times in people above 50 years, compared with people below 50 years, which was statistically not significant.

Female gender had 2.5 times higher risk of developing UTI, compared to males. None of the patients catheterized for less than 10 days had UTI. The patients who were on steroids had 1.81 times more risk of developing UTI, compared to other people. The patients with faulty catheter care had 1.440 times risk of developing UTI. However, it was not statistically significant.

Table 1: Descriptive analysis of Organism isolated instudy group.

Organism Isolated	Frequency	Percent
Candida Species	12	15.0
Gram negative bacilli		
Enterobacteriaceae	28	34.5
Non-fermenters	26	32.5
Gram positive organisms	14	17.5
Total	80	100.0

Majority of the organisms isolated belonged to Enterobacteriaceae (34.5%) and non- fermenters (32.5%). Candida species (15.0%) and Gram-positive organisms (17.5%) contributed to the remaining portion of the organisms.

Table 2: Descriptive analysis of Organism isolated instudy group (N=80).

Organism Isolated	Frequency	Percent
Candida species	12	15
Enterobacteriaceae		
Escherichia coli	12	15.0
Klebsiella oxytoca	2	2.5
Klebsiella pneumoniae	14	17.5
Non-fermenters		
Pseudomonas aeruginosa	20	25.0
Pseudomonas stutzeri	4	5.0
Pseudomonas fluorescens	2	2.5
Gram Positive organisms		
Staphylococcus aureus	2	2.5
Enterococcus faecalis	12	15.0
Total	80	100.0

Pseudomonas aeruginosa was the most common isolate (25%) followed by *Klebsiella pneumoniae*

(17.5%), *Enterococcus faecalis* (15%), *Escherichia coli* (15%) andCandida spp. (15%). Other isolates were *Pseudomonas stutzeri* (5%), *Klebsiella oxytoca* (2.5%), *Pseudomonas* fluorescence (2.5%). and Staphylococcus aureus (2.5%).

There was a high degree of resistance observed among Enterobacteriaceae. However, they were commonly sensitive to piperacillin-tazobactam, imipenem and meropenem.

Among Pseudomonas aeruginosa isolates, majority of them were sensitive to Imipenem (90%), meropenem (90%) and Piperacilin-tazobactam (70%). Among *Pseudomonas stutzeri* and *P.fluorescens* isolates, all the isolates were sensitive to imipenem and meropenem. Only 50% of *Pseudomonas stutzeri* were sensitive toPiperacilin- tazobactam.

Among 6 isolates of Enterococcus species 100% were sensitive for vancomycin. The proportion of isolates sensitive for nitrofurantoin, norfloxacin, tetracycline and high level gentamicin was 66.7%, 50%, 16.7% and 83.3% respectively. None of the isolates were sensitive topenicillin.

Staphylococcus aureus isolate was sensitive to nitrofurantoin, tetracycline, vancomycin and linezolid.

DISCUSSION

Catheter associated urinary tract infection is the commonest device associated nosocomial infection. Atotal of 100 patients admitted in medical ICU were enrolledin the study and followed up for the development of catheter associated UTI. In this study, only symptomatic cases were included under catheter associated UTI.

The rate of device associated infections shows variation in India. According to a study conducted by Angshuman Jana et al [4], the incidence was 31.85%. Another study by Neha Garg et al [5], found the incidence to be 20%. Habibiet al [6], conducted a study in and reported CAUTI as 24%of nosocomial UTIs. In this study, out of 100 patients, 52patients were diagnosed to develop symptomatic UTIduring their course of hospitalization. Therefore, the incidence was 26% which was similar to above studies

The age distribution of the study subjects showed maximum proportion (33%) of the patients belonged to 18-30 years. Males constituted 57% and females 43% of the study subjects. In majority of the patients (85%), totalcatheter days were in the range of 8-14 days. The indication of catheterisation was found to be valid in all patients. Among 26 patients who developed symptomaticcatheter associated UTI, 19 developed in day 14.

A number of risk factors implicated with the development of symptomatic UTI were studied. Age ≥ 50years showed increased development of CAUTI, the risk being 1.52 times. The incidence was also higher among females (34.88%) than males (19.3%). Similar results were seen in studies conducted by Priya et al [7], andAgrawal et al [8].

Duration of catheterisation and length of hospital stay constitute an important risk factor and has been cited in studies by Priya Datta et al [8]. In this study, maximum patients (85%) belonged to the category of duration of catheterisation for 8 to 14 days. Among patients catheterized for 14 days, 86.3% developed UTI and among patients catheterized till 21 days, 75% developed the infection. This is due to the fact that the longer a patient stays in the ICU and catheterized, more are the chances that he will get colonized with multidrug resistant organisms present in the environment, Faulty catheter care is another risk factor, but in this study, it wasnot found to be statistically significant.

Co-morbidities have significant association with the development of catheter associated UTI. In this study all these co-morbidities were statistically significant. These results are similar to study by Priya Datta et al [7], where diabetes and COPD had significant association.

In this study, the predominant isolates were Gram negative bacilli comprising 67% of the isolates among which Enterobacteriaceae were 34.5% and non-fermenters 32.5%. This finding was similar to other studies done by Neha Garg et al (80%) [5] and C.M. Poudel et al (66.67%) [9].

The organisms causing UTI vary from one geographical area to another and there is changing trend over a period of time. A prospective study conducted by Tullu MS et al [10] found the commonest organism was *Escherichia coli*. Wazait et al [11], although reported similar result, noticed a declining trend over the period time. *Enterococcus spp.* was isolated as the second commonest organism.

Study by Neha Garg et al [5], found *Escherichia coli* as the commonest isolate (40%) followed by *Citrobacter koseri* (20%), *Staphylococcus aureus* (15%), *Klebsiella oxytoca* (10%), *Acinetobacter spp* (5%). *Pseudomonas aeruginosa* (5%) and *Enterococcus faecalis* (5%). In the present study, *Pseudomonas aeruginosa* was the commonest isolate (25%) followed by *Klebsiella pneumonia* (17.5%), *Escherichia coli, Enterococcus faecalis* and *Candida spp.* (15%) each. *P.stutzeri* comprised 5% and *Klebsiella oxytoca*, *P.fluorescens* and *Staphylococcus aureus* 2.5% each. Among the gram positive bacteria, *Enterococcus faecalis* comprised 6 isolates and *Staphylococcus aureus* one isolate. There is an increasing trend of Enterococcus faecalis causing catheter associated UTI.

Different studies have shown high degree of antibiotic resistance among the pathogens causing UTI such asstudies by Angshuman et al [4], and Chanda R. Vyawahare et al [12]. It is reported that catheterizationincreases the prevalence of UTI caused by some highly resistant pathogens and the resistant pattern of the isolate's changes from time to time. In the present study, among Enterobacteriaceae, the organisms were mostly resistant to ampicillin, amikacin, gentamicin, nitrofurantoin, norfloxacin, cotrimoxazole, tetracycline, cefotaxime and ceftazidime. For piperacillin-tazobactam, sensitivity was more – *E.coli* (83.3%), *K.oxytoca* (100%) and*K.pneumoniae* (42.9%). All isolates were uniformly sensitive to imipenem and meropenem except one isolateof *K.pneumoniae* which was resistant to carbapenems.

Among non-fermenters, *P.aeruginosa* was predominantly sensitive to piperacillin-tazobactam, imipenem and meropenem. Among gram positive cocci, *E.faecalis* was 100% sensitive to vancomycin, 83.3% to high level gentamicin, 66.7% to nitrofurantoin and 50% to norfloxacin. Low level of sensitivity was seen for tetracycline. One isolate of *S.aureus* was MRSA which was sensitive to nitrofurantoin, tetracycline, vancomycin and linezolid. In the study, one Staphylococcus aureus isolated was MRSA and there were no vancomycin resistant enterococci. Antimicrobial resistance is the main concern in healthcare associated infections because of the rapid increasing incidence.

CONCLUSION

Development of CAUTI is common in critically ill patients. Emphasis should be placed on good catheter management and reducing the duration of catheterization rather than prophylaxis in order to reduce the incidence ofcatheter-related UTI. Culture and susceptibility testing play an important role in the management of catheter associated UTI. Antimicrobial resistance is a growing threat worldwide. Knowledge of resistant pattern can help in implementing proper antibiotic therapy and infection control policy such as avoidance of overuse of antimicrobials, use of drugs for which pathogens are sensitive.

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