DOI:10.21276/sjpm

Saudi Journal of Pathology and Microbiology
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2518-3362 (Print)
ISSN 2518-3370 (Online)

Original Research Article

Diagnosis the Sensitivity and Resistant Pattern of Microorganisms Detected in Catheter Associated Urinary Tract Infection to Different Antibiotics at Few Hospitals in Bangladesh

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Abstract: Catheter associate Urinary tract infection (CAUTI) is common health care–associated infection and widely found in hospitals and long term care facilities. Recent studies reported urinary pathogens showing resistance to most commonly prescribed antibiotics. Area specific study to find out the pathogen responsible for CAUTI and their resistant pattern which will be helpful for clinician to choose proper treatment and strategies to prevent infection in future. The infection rate was 52% among 200 patients using indwelling catheter. It was anticipated when catheter was used for longer period infection rate up to 60%. *E. coli* was most frequent detected bacteria and amikacin found most effective among the antibiotic we tested. Overall hospital stay and financial burden of patients increased due to CAUTI compared to the patients without infection**.**

Keywords: CAUTI, microorganisms, antibiotic, short term and long term catheter, hospital stay.

INTRODUCTION

Urinary tract infection is the most common and serious hospital acquired infection whole over the world and 80% of this infection due to indwelling urethral catheter [1-3]. Weinstein et al repoted twelve to sixteen percent of patients who hospitalize had a urinary catheter [4]. In the National Healthcare Safety Network (NHSN) 2011 published a surveillance report indicate nearly 80% of patients in who admitted in adult critical care units had an indwelling catheter, among these 17% of those on medical wards, 23% on surgical wards, and 9% on rehabilitation units [5, 6]. The frequent use of indwelling catheter increase the risk and chance of nosocomial infection like Urinary Tract Infections which is also called Cathet- Associated UTI (CAUTI) [6, 7]. catheter-associated urinary tract infection is common, costly [8], and huge burden to health care system which is reasonably preventable [9]. When indwelling urinary catheters are in situ for less than 30 days termed as short and on the other hand more than 30 days considered as chronic [10]. Infection acquired by urinary catheter is usually differentiate as asymptomatic bacteriuria and symptomatic catheter associated urinary tract infection (CA-UTI) but most of the cases very difficult to distinguish [2, 6, 10, 11]. For better and successful management and treatment, it is important to know and understand the possible site of infection and condition of infection uncomplicated or complicated, chance of re-infection or relapse [12]. As the length or duration of catheterization consider the most vital risk factor for development of infection and most effective way to reduce chance of infection by reducing the use of urinary catheterization and remove the catheter as soon as possible when it is not needed [6, 13, 14]. The primary cause of CAUTI is development of a pathogenic biofilm on the surface of the indwelling urinary catheter [15]. Flow of warm nutritious urine and matrix gel help bacteria to grow and form colony and 5X 109 viable cells per centimetre were reported in biofilm on an indwelling urinary catheter [15]. Microorganisms in biofilm mode are developed as resistant to antimicrobial therapy whereas normal condition they are sensitive to antibiotics [16]. Some previously published Studies from south Asian countries like Nepal, India and Bangladesh have reported high resistance of the urinary microorganisms to commonly used antibiotics [17-19]. Therefore, the present study was undertaken and reported the pattern of organisms causing CAUTI and their antibiotic susceptibility pattern in different types patient. Moreover, we aim to study the outcome and financial burden due to CAUTI especially middle and low income patients of northern part of Bangladesh who admitted different government and private hospitals. This paper also addresses strategies, detect risk factors to reduce the chance of infection in future.

MATERIALS AND METHODS

Study Population & Period

A total of 200 patients was observed and tested for CAUTI in three different hospital (public and two clinics) located in Northern part of Bangladesh during the period of 1st September 2015 to 31st August 2016. The category of patient both male and female, pregnant patients [20], patient with diabetes and non-diabetic (Table 1). All patients with indwelling catheter due to urinary retention or incontinence were considered as subject. Biofilm developed inner surface of indwelling catheter seen by naked eye was included in this study and samples of urine were collected for microscopic examination and cultured. Subject's co morbid illness, physical and clinical presentation, length of catheterization data was collected and to check relapse patients were on antibiotics advised to stop taking. The samples were cultured in blood agar and MacConkey's medium and incubated at 37°C room overnight 105cfu/ml considered as a significant bacteriuria and lower colony counts for symptomatic patient's also considered and standard method were used [18]. Kirbybauer technique was used for bacterial isolation and disc diffusion method for testing antibiotic susceptibility using antibiotics like ampicillin, cephalexin, gentamicin, amikacin, ciprofloxacin and ceftazidime [18, 21].

Table 1: Patients characteristics (n=200) and total infected 105

Category of patients/types of CAUTI	Age (Mean ± SD) years	Suspected CAUTI
Male (100)	**45 ± 25**	**55**
Female (40)	**40 ± 20**	**20**
Diabetic (30)	**55 ± 10**	**20**
Caesarean patients (30)	**30 ± 10**	**10**
Symptomatic	Lower abdominal and loin pain, Fever and chill	**~10%**
Asymptomatic	-	**~90%**
Short and medium term catheter (100)	-	**45%**
Long term catheter (100)	-	**60%**

RESULTS AND DISCUSSION

The urine samples collected from patients according to table 1. Out of 200 catheterised patients, 105 were suspected to CAUTI (Figure 1). Among those (105) we identified 75 samples were found significant bacteriuria (68%) and 10% showed insignificant bacteriuria, 10% sample were sterile and non-pathogenic bacteriuria nearly 12%. The most common bacteria grown on the culture media, detected microorganisms such as E. coli almost 60% in all cases, Klebsiella spp range (8% to 20%) and Enterococcus spp (3% to 10%) (Table 2). Other bacteria like Candida sp. (5% to 8%), Pseudomonas aeruginosa (~2%), Staphylococcus saprophyticus (1% to 5%) (Table 2).

Table 2: Bacteria isolated and identified from urine samples of catheterised patients (n=105)

Microorganism	Patients with diabetes	Male	Female	Caesarean patients
E. coli	**65%**	**55 %**	**60%**	**58%**
Pseudomonas aeruginosa	**1%**	**1%**	**2%**	**-**
Staphylococcus saprophyticus	**4%**	**1%**	**1%**	**5%**
Klebsiella spp	**8%**	**15%**	**20%**	**15%**
Enterococcus spp	10%	**10%**	**3%**	**7%**
Candida sp.	5%	**8%**	**6%**	**7%**
Other organisms (Citrobacter, Proteus etc)	7%	**10%**	**8%**	**8%**

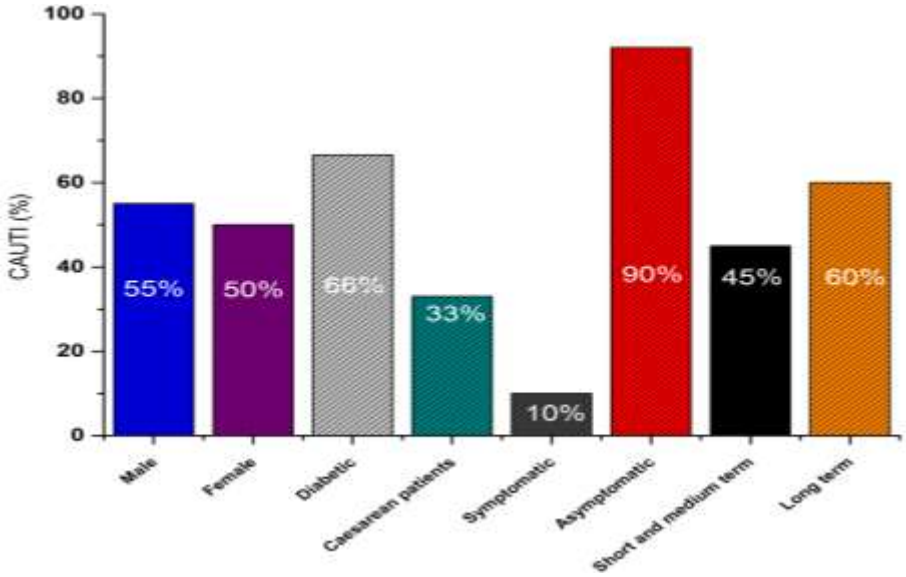

Fig-1: The percentage of patient of different categories suffering CAUTI

Then we decided to check antibiotic susceptibility testing using antibiotic like ampicillin, cephalexin, gentamicin, amikacin, cotrimoxazole, ciprofloxacin and ceftazidime (Table 3). The highest sensitivity was for amikacin (77%), ceftazidime (66%), ciprofloxacin (61%) and all other tested antibiotic susceptibility (37% to 55%) (Table 3). We also reported resistant to all tested antibiotics were found in case of E.coli (5%), klebsiella (2%) and Staphylococcus spp (1%).

Table 3: Antibiotic susceptibility testing

Microorganisms	**Sensivity (%)**							**Resistance to all (%)**
	ampicillin	**cephalexin**	**gentamicin**	**amikacin**	**cotrimoxazole**	**ciprofloxacin**	**ceftazidime**	
E. coli	**68**	**58**	**75**	**85**	**45**	**65**	**70**	**5**
Pseudomonas aeruginosa	**46**	**45**	**72**	**55**	**35**	**50**	**40**	**-**
Staphylococcus saprophyticus	**25**	**60**	**62**	**86**	**54**	**60**	**60**	**1**
Klebsiella spp	**32**	**15**	**55**	**68**	**25**	**75**	**80**	**2**
Enterococcus spp	18	**30**	**50**	**90**	**45**	**55**	**80**	**-**
Candida sp.	Not determine	Not determine	Not determine	Not determine	Not determine	Not determine	Not determine	Not determine
Other organisms (Citrobacter, Proteus etc)	Not determine	Not determine	Not determine	Not determine	Not determine	Not determine	Not determine	Not determine
Mean	**37.8**	**41.6**	**53**	**76.6**	**40.8**	**61**	**66**	Not determine

As CAUTI increase the duration of hospital stay of patients we monitored due to catheter-associated urinary tract infection patients needed to stay longer period time compare to without infection. Those 95 patients admitted in hospital due to different clinical situation and they had been used catheter but not identified as CAUTI (Table 1) discharged from hospital 10 ± 8 days on the other hand patients detected both symptomatic and non-symptomatic CAUTI released from hospital 13 ± 10 days. These infected patient's also was prescribed a range of antibiotics which increased cost of treatment. Moreover, when patient admitted in that two selected private clinics instead of government hospital they suffered more financial burden compared to the patients admitted into public hospital.

CONCLUSION AND FUTURE DIRECTION

Among different types of patient, we monitored, patients with diabetic found highest rate of catheter associate infection 66% and more patient who had indwelling catheter for longer period of time more

susceptible to infection up to 60% whereas for shorter and medium term that was 45%. E.coli was the most common bacteria identified in all samples which showed higher sensitivity to amikacin and lowest to cotrimoxazole. The most successful antibiotics amikacin, ceftazidime, and ciprofloxacin among the drugs we tested if we consider the mean value. Overall the hospital stay increased the patients with CAUTI were 13 ± 5 days where as other noninfected patients were 10 ± 8 days. Findings of the research project we can consider some interventions that should be implemented in future to reduce the infection. Development and review the policies related to catheter indications, selection, and training and aseptic ways to catheter insertion and maintenance according to local evidence based practise, population and patient clinical condition, experience, and resources [6, 22]. Try to avoid indwelling urinary catheter to prevent CAUTI except special conditions [23]. Instead of indwelling catheter, if possible use intermittent catheterization, and external condom catheters [6]. Selection of proper indwelling urinary catheter are also vital to minimize infection such Nitrofurazone coated catheters might reduce infection rate [24]. Always implement recommended proper insertion and maintainece techniques such as proper hand hygiene, sterile equipments and closed drainage system [13, 14] those we found lackage in our invesigated hospitals. As this study was only one public hospital and two private hospitals located in northern part of Bangladesh further regular monitoring all other hospitals and large number of patients on that region to identify exact information about infection and resistance pattern of different microorganism.

ACKNOWLEDGEMENTS:

The authors thankful to all the patients who participated in this project and all the staffs of these hospitals for their continuous support and co-operation.

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