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RESEARCH ARTICLE

BACTERIOLOGICAL PROFILE AND ANTIBIOGRAM OF UROPATHOGENS ISOLATED FROM CATHETERIZED AND NON CATHETERIZED PATIENTS AT A TERTIARY CARE CENTRE

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ABSTRACT

Urinary Tract Infections (UTI) are a major cause of morbidity leading to serious long term complications. Profile of uropathogens and the pattern of their antimicrobialsusceptibility vary widely in different geographical regions. The present study was undertaken to determine the bacteriological profile and antibiogram of uropathogens isolated from catheterized and non-catheterized patients at a tertiary care centre. Urine samples were collected from patients with UTI attending a tertiary care hospital. The clean-catch technique of midstream urine was used for patients without catheterization while specimens of catheterized patients (> 48 hours) were collected from proximal part of catheter after aseptic precautions.Profile of bacterial isolates in both the catheterized (50) and non-catheterized (50) groups were almost similar. Commonest organism isolated was *Escherichia coli,* followed by *Klebsiella spp*. However, difference in the antibiogram was noted in isolates from both the groups. Our study shows that, *E.coli* was the most common uropathogen and profile of uropathogens was similar in catheterized and non-catheterized groups. However, difference in the antimicrobial sensitivity pattern in either group emphasizes that different factors play role in determining antibiotic sensitivity of uropathogens isolated from catheterized v/s non catheterized patients. Also, unnecessary catheterization should be avoided and indiscriminate use of antimicrobials in patients with UTI should be discouraged. Urine culture and sensitivity should guide the treatment of UTI in both catheterised and non-catheterised patients.

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INTRODUCTION

Urinary tract infections (UTIs) are the most common infections encountered in tertiary care settings. (Mishra *et al*., 2006) In spite of availability of antibiotics, a rise in the incidence of UTI is being observed in all age groups and both genders. (Shah *et al*., 2015) Among hospitalized patients, more than 80% of nosocomial UTIs are catheter-associated (CAUTI). (Garg *et al*., 2015) A variety of organisms can cause UTI including bacteria, fungi and viruses; bacteria being responsible for 95% of the cases. (Preethishree and Rai, 2016) *Escherichia coli* remains the most frequent cause of UTIs, followed by, *Klebsiella species, Pseudomonas aeruginosa, Proteus mirabilis, Acinetobacter species, Enterococcus* species and *Staphylococcus* species. Though UTI is primarily diagnosed based on signs and symptoms rather than isolated laboratory findings; knowledge of the etiological agents of UTI and their antimicrobial susceptibility pattern is necessary for ensuring appropriate treatment. Also, the distribution of pathogens that cause UTIs is changing (Swetha and Rao, 2014; Orhue, 2014). In such a scenario, empiric treatment of UTI, may lead to incomplete cure and emergence of multi drug resistant bacteria. So, itbecomes important to know the etiological agents of UTI and their antimicrobial susceptibility pattern for ensuring appropriate treatment. Hence, this study was undertaken to know the profile of uropathogens and their antibiogram in our hospital, so as to guide for treatment of UTI with appropriate antibiotics.

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MATERIALS AND METHODS

The study was conducted in the Department of Microbiology, BangaloreMedicalCollegeand Research Institute, Bengaluru. The study protocol was approved by the Institutional Ethical Committee and informed consent was obtained from the patients who participated in thestudy.

Sample size

Total 100 patients were included in the study.

Inclusion criteria

- 50 urine samples were collected from patients diagnosed with UTI, without catheterization.
- 50 urine samples were collected from patients diagnosed with UTI, with urinary catheter insertion for >48 hours.

Exclusion criteria

- Patients with any signs or symptoms of UTI before catheter insertion were excluded.
- Patients treated with antibiotics before the sample collection.
- Pregnant women.

Sample collection

- From patients without catheterization- Mid stream clean catch urine was collected in a sterile wide mouthed universal container taking aseptic precautions.
- From patients with catheterization- urine was collected with a sterile disposable syringe from proximal part of the catheter, after cleaning and clamping the catheter tube.

Culture

All the urine samples were sent to the microbiology department for culture and sensitivity testing. Semi-quantitative culture of urine samples was done by calibrated loop method as per standard guidelines. The urine cultures of colony count $>10^5$ colony forming units (CFU)/mLwith no more than two species of microorganisms were considered as positive for UTI and cultures showing growth of more than two types of bacteria were considered contaminated. Cultures with significant growth were identified as per standard guidelines.

Antimicrobial susceptibility testing

Antimicrobial susceptibility testing was performed by Kirby-Bauer's disk diffusion method on Mueller-Hinton agar (Hi Media, Mumbai, India) as per the Clinical Laboratory Standards Institute (CLSI) 2014 guidelines, using antibiotic discs (Hi Media Mumbai, India).

RESULTS

Fifty urine samples were collected from patients diagnosed with UTI, without catheterization and 50 urine samples were collected from patients diagnosed with UTI, with urinary

Table 1. Organism wise distribution of isolates

Non Catheterised (50)			Catheterised (50)		
Organisms	Number ofisolates (n)	Percentage (%)	Organisms	Number ofisolates (n)	Percentage (%)
Escherichia coli	38	76	*Escherichia coli*	30	60
Klebsiella spp	06	12	*Klebsiella spp*	09	18
Proteus spp	02	04	Proteus spp	05	10
Pseudomonas aeruginosa	02	04	*Pseudomonas aeruginosa*	04	08
Staphylococcus aureus	02	04	Citrobacter spp	01	02
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Total	50	100	Total	50	100

Table 2. Antimicrobial Susceptibility Pattern of Gram negative bacteria from Non-catheterized Samples

Antimicrobial	*E.coli* (N=38) %	*Klebsiella spp* (N=06) %	*Proteus spp* (N=02) %	*Pseudomonasaeruginosa* (N=02)%
Amikacin	25 (66 %)	03(50 %)	02(100 %)	01(50 %)
Gentamicin	15 (39 %)	02(33 %)	02(100 %)	01(50 %)
Ceftriaxone	09(24 %)	00(00 %)	02(100 %)	01(50 %)
Ceftazidime	05 (13 %)	00(00 %)	00(00 %)	01(50 %)
Cefotaxime	03(08 %)	00(00 %)	02(100 %)	01(50 %)
Piperacillin-Tazobactam	16 (42 %)	02(33 %)	02(100 %)	01(50 %)
Norfloxacin	02(05 %)	01(17 %)	01(50 %)	01(50 %)
Imipenem	10(26 %)	01(17 %)	02(100 %)	02(100 %)
Aztreonam	02(05 %)	00(00 %)	02(100 %)	02(100 %)
Nitrofurantoin	08(21 %)	02(33 %)	02(100 %)	01(50 %)
Cotrimoxazole	03(08 %)	03(50 %)	02(100 %)	01(50 %)
Colistin	ND	ND	ND	02(100 %)
Polymyxin B	ND	ND	ND	02(100 %)

Table 3. Antimicrobial Susceptibility Pattern of Gram negative bacteria from Catheterized samples

Antimicrobial	*E.coli* (N=30) %	*Klebsiella spp* (N=09)	*Proteusspp* (N=05)	*Pseudomonas aeruginosa* (N=04)	*Citrobacter spp* (N=01)
Amikacin	08(27 %)	00(00 %)	00(00 %)	01(25 %)	00(00 %)
Gentamicin	08(27 %)	00(00 %)	00(00 %)	01(25 %)	01(100 %)
Ceftriaxone	09(30 %)	02(22 %)	01(00 %)	01(25 %)	01(100 %)
Ceftazidime	02(06 %)	01(11 %)	00(00 %)	01(25 %)	01(100 %)
Cefotaxime	01 (03 %)	01(11 %)	00(00 %)	01(25 %)	00(00 %)
Piperacillin-Tazobactam	12(44 %)	00(00 %)	01(00 %)	01(25 %)	01(100 %)
Norfloxacin	07(23 %)	00(00 %)	00(00 %)	02(50%)	00(00 %)
Imipenem	15(50 %)	00(00 %)	03(60 %)	02(50%)	01(100 %)
Aztreonam	08(27 %)	00(00 %)	02(40 %)	02(50%)	00(00 %)
Nitrofurantoin	19(63 %)	02(22 %)	00(00 %)	02(50%)	01(100 %)
Cotrimoxazole	18(60 %)	05(55 %)	00(00 %)	02(50%)	01(100 %)
Colistin	ND	ND	ND	04(100%)	ND
Polymyxin B	ND	ND	ND	04(100%)	ND

catheter insertion for >48 hours. Profile of bacterial isolates in both the catheterized and non-catheterized groups were almost similar. Commonest organism isolated was *Escherichia coli,* followed by *Klebsiella spp* (Table 1). Among the non-catheterized group, antimicrobial sensitivity testing of the Gram negative isolates revealed that, majority of the Gram negative isolates showed increased resistance to commonly used oral antibiotics viz nitrofurantoin and cotrimoxazole. Resistance to injectable antibiotics viz. aminoglycosides, piperacillin tazobactam etc was less among Gram negative isolates (Table 2). Only one isolate was Gram positive viz. *S.aureus*, which was a sensitive to all antibiotics. Among catheterized group, commonest reason for catheterization was Post-surgical (86%) followed by ICU admission (77%). In catheterized group, Gram negative isolates showed more sensitivity to commonly used oral antibiotics. However, resistance to injectable antibiotics viz. aminoglycosides, piperacillin tazobactam, imipenem etc was more compared to isolates from non-catheterized group. Only one was a Gram positive isolate viz. *Enterococcus spp*, which was sensitive to all antimicrobials. *Pseudomonas aeruginosa* isolated from both the groups showed 100% sensitivity only to polymyxin B and colistin.

DISCUSSION

UTIs are one of the most common diseases diagnosed worldwide. Most UTIs are treated empirically and with the availability of new antimicrobials management of UTIs has improved. However, increase in antimicrobial drug resistance has jeopardized the management of UTI. The selection of antimicrobial agent should be determined not only by the most likely pathogen but also by its susceptibility pattern. Thus, knowledge of local bacteriological profile of uropathogens and their antibiogram is essential for prudent empiric therapy of UTIs. (Sahu and Sinha, 2012; Kibret and Abera, 2014; Sharma *et al*., 2011) Further, pathogens responsible for CAUTI and their antibiotic sensitivity pattern also vary with time and place. (Chatterjee *et al*., 2016) *E.coli* was the commonest pathogen isolated in both catheterized and non-catheterized urine samples in our study and Gram positive organisms were very less in comparison to Gram negative isolates. Similar findings have been noted in other studies as well. (Kibret and Abera, 2014; Jitendranath *et al*., 2015) Among the catheterized group, most of the organisms isolated were sensitive oral antibiotics viz nitrofurantoin and cotrimoxazole (*E.coli* showed highest sensitivity). Increased resistance to injectable drugs viz aminoglycosides, 3rd generation cephalosporins, carbapenems etc. This is in comparison with other studies. (Chatterjee *et al*., 2016) In non-catheterized group, reduced sensitivity was noted to nitrofurantoin and cotrimoxazole, however the isolates were sensitive to injectable drugs viz aminoglycosides, 3rd generation cephalosporins, carbapenems etc. Studies with separate data for catheterized and non-catheterized samples have not been undertaken commonly. However, findings in our study can be attributed to the fact that being a tertiary care centre patients would have already been treated with oral drugs like nitrofurantoin and cotrimoxazole, leading to reduced sensitivity to these drugs. Possible explanation for increased sensitivity to injectable drugs is that ambulatory non catheterized patients are less likely to be treated with injectable drugs. High resistance was noted in isolates from both catheterized and non-catheterizedgroupto norfloxacin, indicating that indiscriminate use of fluoroquinolones in UTI should be discouraged. Limitations of our study were small study population and the fact that demographic data of the patients could not be collected due to various constraints. Also, various mechanisms of drug resistance viz ESBL, Amp C, MBL were not tested in this study.

Conclusion

Our study reveals that, Gram negative isolates were commonest pathogens in bothcatheterized and non-catheterized urine samples, commonest being *E.coli*. Indiscriminate use of oral antibiotics seems to be the main factor for drug resistance in ambulatory non catheterised patients with UTI. Urinary catheterization should be avoided as, CAUTI increases morbidity and mortality and prolongs the hospital stay. Increased resistance to injectable higher drugs among isolates from catheterized patients not only render these drugs ineffective but also make the treatment of CAUTI very difficult.

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