Original Article

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Bacteriological Profile of Uropathogens and their Susceptibility Pattern : A Study From a Tertiary Care Centre of Eastern India

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Abstract

Introduction: Urinary tract infection (UTI) is one of the most common bacterial infections in developing countries. We face difficulties in choosing antibiotics during treatment of UTI due to emerging antimicrobial resistance among the predominant uropathogens.

Aims: This study was undertaken to know the prevalence and antibiogram of uropathogens in our hospital and to determine the type and antibiotic resistance pattern of the urinary pathogens.

Materials and Methods: The study was carried out on 103 consecutive patients suffered from UTI admitted at in-patient department of School of Tropical Medicine, Kolkata during one year.

Results: In the present study we isolated 103 bacteria in suspected cases of UTI. Among the bacterial profile of UTI, Escherichia coli was the predominant isolate (36.89%) followed by *Klebsiella* species, *Enterococcus* species, Staphylococcus species, *Pseudomonas aeruginosa and* Citrobacter species. We found only one each case of *Acinetobacter* species, Serratia and Stenotrophomonas maltophilia.

Conclusion: Emerging bacterial drug resistance has both clinical and financial implications for therapeutic purpose. Spectrum of bacterial drug resistance in an institution is important for epidemiological as well as clinical purposes.

Keywords: Uropathogens; Emerging antimicrobial resistance; Antibiotic susceptibility

Introduction

One of the most common bacterial infections in humans is urinary tract infections (UTIs). As they are not reportable diseases accurate assessment of the incidence of UTIs is difficult. It is the most common nosocomial infection. It is more common in catheterised patients (3.2%), even with adequate aseptic precautions during instrumentation [1]. 50% of the patients with in dwelling catheters have UTI with multidrug resistant bacteria (Ananthanarayan and Paniker, 2009). Females are more prone to acquire UTI and recurrent UTI especially between 1 to 50 years of age. Antimicrobial resistance (AMR) is a threatened problem worldwide in both hospital and community acquired infections [2]. Developing countries face the major brunt of the problem of AMR due to high prevalence of infections, irrational and indiscriminate use of antimicrobials with easy over the counter availability of drugs and lack of clinical microbiology laboratories for antimicrobial susceptibility testing.

Treatment outcomes depends on infections caused by resistant bacteria resulting in gradual narrowing of scope for effective molecules to combat even common community acquired bacterial infections including UTIs [3,4]. Treatment of UTI is often empiric and the extensive and inappropriate use of antibiotics which causes emergence of multi drug resistant bacteria that is a major problem worldwide. So, there is a need for hospital based studies in different areas to provide the pattern of sensitivity of the microorganisms to help formulate local empirical treatment guidelines for UTI. This study was undertaken to know the microbiological etiology and to study the antimicrobial susceptibility pattern of the uropathogens in a teaching hospital in Kolkata, Eastern India.

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Materials and Methods

It was a single centre, prospective, observational study. The study was done on 103 consecutive patients suffered from UTI admitted at in-patient department of Carmichael Hospital for Tropical Diseases, School of Tropical Medicine, Kolkata for one year period. A total of 103 clean catch midstream urine samples collected from suspected case of UTI and send for routine testing and culture sensitivity. All the selected patients were subjected to detailed assessment including focussed interview and history elicitation. Urine samples were tested for the presence of pus cells and the probable bacteria by performing a wet mount and a Gram stain smear. Then urine samples were inoculated on Blood agar and Mac Conkey agar media and incubated aerobically overnight at 37^0C. The bacterial isolates were identified and antimicrobial sensitivity test (AST) was done in VITEK. The antibiotic discs used for the AST included: ampicillin, amoxicillin/clavulanic acid, piperacillin/ Tazobactam, Cefuroxime, Cefuroxim Axetil, Ceftriaxone, Cefoperazone/Salbactam, Cefepime, Imipenem, Meropenem, Amikacin, Gentamicin, Nalidixic Acid, Ciprofloxacin, Levofloxacin, Nitrofurantoin, linezolid, vancomycin, Colistin and Trimethoprime/Sulfamethoxazole.

Results

In the present study 50.48% were males and 49.51% were females with male: female (1.01:1) (Fig. 1).

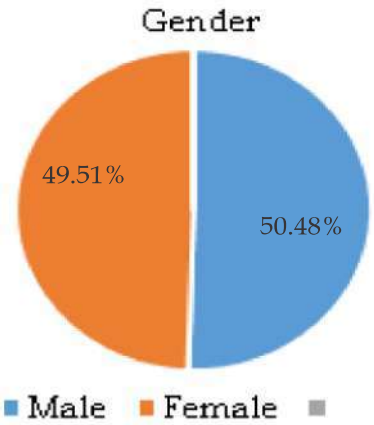

Fig. 1:

Out of 103 patients, age of the patient range from 16–82 years. Most patients are between 31–60 years of age. Most of the patient presented with fever and dysuria but a good number of patient (11.65%) was asymptomatic and they were diagnosed during evaluation of other disease (Table 1).

Table 1: Presenting symptoms

Symptoms	Number of Patients	Percentage
Fever	55	53.39
Dysurea	34	33
Increased frequency of micturition	20	19.41
Pain abdomen	13	12.62
Sepsis	12	11.65
Asymptomatic	12	11.65

In the present study we isolated 103 bacteria in suspected cases of UTI. Among the bacterial profile of UTI, Escherichia coli was the predominant isolate accounting for 36.89% followed by *Klebsiella* species, *Enterococcus* species, *Staphylococcus* species, *Pseudomonas aeruginosa* and *Citrobacter* species. We found only one each case of Acinetobacter species, Serratia and *Stenotrophomonas* maltophilia. Among 38 *Escherichia coli* isolates ESBL found in 3 cases, among 22 *Klebsiella* species isolates 3 cases were Klebsiellaoxitoca and others were *Klebsiella pneumoniae,* among 13 *Staphylococcal* species isolated 8 were *S.aureus* and 5 were *S.coagulase* negative (Table 2).

Table 2: Bacterial Profile of UTI

Bacteria isolated	Number	Percentage
Escherichia coli	38	36.89
Klebsiella species	22	21.35
Enterococcus species	17	16.5
Staphylococcus species	13	12.62
Pseudomonas aeruginosa	7	6.79
Acinetobacter species	1	0.97
Citrobacter species	3	2.91
Serratia	1	0.97
Stenotrophomonas maltophilia	1	0.97

Among gram negative organisms, maximum resistance was observed for ampicillin and amoxicillin/clavulanic acid (70–80%), cotrimoxazole (50–63%), cephalosporins (upto 60%), fluoroquinolones (42–68%) and amynoglycosides (28–54%) (Table 3).

In case of common Gram positive cocci, maximum resistance was observed against Ampicillin (92.3%) among *S.aureus* isolates and MRSA was 23.07%. *Enterococcus spp* had fluroquinolone (80–90%) and high level aminoglycoside resistance as 58.82%. (Table 4).

Table 3: Resistance pattern of Common Gram negative uropathogens

Antibiotics	*E. coli* (n=38)	*Klebsiella* (n=22)	*Pseudomonas* (n=7)
ampicillin	15 (39.47%)	18 (81.81%)	-
amoxicillin/clavulanic acid	27 (71.05%)	16 (72.72%)	-
piperacillin/Tazobactam	10 (26.31%)	13 (59.09%)	2 (28.57%)
Cefuroxime	10 (26.31%)	-	-
Cefoperazone/Salbactam	2 (5.26%)	-	2 (28.57%)
Ceftriaxone	23 (60.52%)	14 (63.63%)	3 (42.85%)
Trimethoprime/ Sulfamethoxazole	24 (63.15%)	11 (50%)	1 (14.28%)
Nitrofurantoin	7 (18.42%)	5 (22.72%)	2 (28.57%)
Ciprofloxacin	23 (60.52%)	15 (68.18%)	3 (42.85%)
Nalidixic Acid	1 (2.63%)	-	-
Gentamicin	14 (36.84%)	12 (54.54%)	2 (28.57%)
Amikacin	15 (39.47%)	11 (50%)	2 (28.57%)
Meropenem	11 (28.94%)	9 (40.90%)	1 (14.28%)
Imipenem	10 (26.31%)	-	-
Colistin	2 (5.26%)	3 (13.63%)	Nil (all sensitive)

Table 4: Resistance pattern of Common Gram positive uropathogens

Antibiotics	*Staphylococcus aureus* (n=13)	*Enterococcus spp* (n=17)
ampicillin	12 (92.3%)	10 (58.82%)
Amoxicillin/clavulanic acid	9 (69.23%)	9 (52.94%)
MRSA	3 (23.07%)	-
Levofloxacin	6 (46.15%)	14 (82.35%)
Ciprofloxacin	9 (69.23%)	16 (94.11%)
Gentamicin (120)	4 (30.76%)	10 (58.82%)
Vancomycin	Nil (all sensitive)	3 (17.64%)
Linezolid	Nil (all sensitive)	Nil (all sensitive)
Erythromycin	-	2 (11.76%)
Nitrofurantoin	Nil (all sensitive)	3 (17.64%)
Meropenem	-	1 (5.88%)
Fosfomycin	-	2 (11.76%)
Trimethoprime/Sulfamethoxazole	6 (46.15%)	3 (17.64%)

Discussion

Urinary tract infection remains one of the most common infections. The study was carried over 103 confirmed cases of UTI. It is well documented that UTI is more common in females than inmales due to certain anatomical and physiological factors [5]. But in our study male and female patient number was almost same. It may be due to it is a tertiary care centre and here among admission patient number of female patient is less than the male patient. Here all patients with confirmed UTI in this study were from admitted and hence, infection was mixed community acquired and nosocomial. *E.coli* was the most common isolate constituting 36.89% of all uropathogens in this study which correlates with most of the studies conducted in India. Community Studies have reported isolation rates of *E.coli* between 55–83% [6,7]. While, studies on inpatients with hospital acquired UTI have reported lesser *E.coli* isolation rates varying between 40–50% [8,9]. But studies from some other parts of the country have shown higher isolation rates (65%

to more than 90%) [8]. This difference probably due to ours is a tertiary care center as compared with the primary and secondary care levels of these centers.

Klebsiella species, the second most common isolate in the present study, accounted for 21.35%, which is quite high incidence than other studies of different parts of India [5,8]. We found gram positive bacteria *Enterococcus* species and *Staphylococcus* species in 16.5 % and 12.65% cases respectively which is little high in incidence than other studies. This is because we studied at a tertiary care centre and all patient were from inpatient department. *E.coli* had very high resistance against cephalosporins -Ceftriaxone and Ciprofloxacin (both 60.52%) and also Trimethoprime/Sulfamethoxazole (63.15%) (Table 3).

We commonly use cotrimoxazole and fluoroquinolones as drugs ofchoice to treat common bacterial infections including community acquired UTI but they havelost their effectiveness against most frequent uropathogens [5]. In this study, the resistance of uropathogens to fluoroquinolones was high (42–68%) in gram negative bacteria and (46–94%) among gram positive bacteria.Indiscriminate usage and over the counter availability of antibiotics could explain emergence of drug resistant. This finding seriously limits choice of easy and effective antibiotic options available for UTI. Nitrofurantoin, an oral narrow spectrum antibiotic with no systemic action, is a popular therapeutic option for UTI treatment. High Nitrofurantoin sensitivity has been reported against all pathogens, including 90.6% against *E.coli* [8]. In our study we also found high Nitrofurantoin sensitivity in both gram positive and gram negative bacteria.

Conclusion

Emerging bacterial drug resistance has both clinical and financial implications for therapeutic purpose. Spectrum of bacterial drug resistance in an institution is important for epidemiological as well as clinical purposes. Physicians needs guidance for selection of antimicrobials for UTI by culture and sensitivity results and empirical therapy must be based on local epidemiological data, which should be constantly updated.

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