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Original Research Article

Antimicrobial Resistance Pattern of Uropathogens with Special Reference to Escherichia Coli, among Patients with Urinary Tract Infection in a Tertiary Care Hospital in South India

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Abstract: Increasing antimicrobial resistance among uropathogens is of great concern at present. The present scenario may be due to irrational use of antibiotics to treat urinary tract infections. Objective of the study is to know the antimicrobial resistance pattern of uropathogens among patients with Urinary Tract Infection(UTI). Clean Catch Midstream urinary samples were collected from 756 patients clinically suspected to have UTI , by standard methods processed and isolates identified by standard biochemical reactions. The antibiotic susceptibility testing was done by Kirby- Bauer Disc diffusion method according to CLSI guidelines. *Escherichia coli* was the commonest isolate followed by *Klebsiella spp, Pseudomonas aeruginosa,,Proteus spp, Candida spp*, *Acinetobacter spp, Staphylococcus aureus and Enterococcus faecalis and Citrobacter koseri*. Most of the bacteria exhibited resistance to quinolones, gentamicin, cephalosporins and trimethoprin sulphamethoxazole. *E.coli* was sensitive to amikacin and imipenem. Uropathogens are becoming resistant to commonly used antibiotics. Urine culture sensitivity should be done in patients with UTI before starting antibiotics and irrational use of antibiotics should be abandoned.
Keywords: *Escherichia coli*, Urinary Tract Infection, uropathogens, antimicrobial resistance.

INTRODUCTION

Urinary tract infection is second only to respiratory infection as the most common type of infection. About 40% of women and 12% of men have a urinary tract infection at some time in their life. The use of antibiotics is of utmost necessity in the management of urinary tract infections to prevent complications. But empirical antimicrobial treatment is initiated in almost all cases of UTI before the arrival of laboratory results of urine culture. Thus due to frequent misuse of antimicrobials, resistance among the uropathogens is increasing [1].

E. coli is the most common organism causing UTI , and becoming resistant to most commonly used antibiotics. Many of the uropathogens are developing multidrug resistance. Moreover, UTI is now becoming increasingly tough to control because of emergence of bacteria harboring Extended-Spectrum Beta-Lactamases (ESBL). From place to place the pattern of resistance to antibiotics also varies. Therefore there is need for periodic monitoring of etiologic agents of UTI, and their resistance pattern. The present study was done to study the current antibiotic resistance pattern in the uropathogens isolated in a tertiary care hospital.

MATERIALS AND METHODS

The study was conducted in a tertiary care hospital in South India over a period of 6 months. Midstream urine samples were collected from 756 suspected cases of UTI(both in- patients and out-patients) in a sterile container after obtaining informed consent. The samples were inoculated onto Blood agar and MacConkey agar plates using standard loop by semiquantitative method and incubated aerobically at 37^{o} C for 24 hours. A growth of $\geq 10^{5}$ colony forming units /ml was considered as significant bacteriuria. The cultures were identified using standard biochemical reactions.

The isolates were subjected to Antimicrobial susceptibility testing by Kirby Bauer Disc diffusion method on Mueller Hinton Agar plate according to Clinical Laboratory Standards Institute guidelines. The

antibiotics used were Ampicillin (AMPI-10ug), Amikacin (AK-30ug), Trimethoprim+Sulphamethazole (SXT-25µg), Gentamicin (GEN-10µg), Ciprofloxacin (CIP-5µg), Norfloxacin (NOR-10ug), Cefotaxime (CE-30ug), Ceftazidime (CFZ-30ug) and Imipenem (IMI-10ug). The results were tabulated and analysed statistically.

RESULTS

Out of 756 samples processed 285 were positive for urine culture.

Among the culture positive patients 173 were females and 112 patients were males. The rest of the urine samples showed insignificant bacteriuria or were sterile.

Table 1 shows that the Urinary Tract Infection was more common in reproductive age group females (23.6%) and in males it was slightly higher in older age group (22.32%).

Table 2 Shows the most common micro organism isolated from patients with UTI is *E. coli* (35.7%), followed by *Klebsiella spp* (18.5%), *Proteus spp* (13.65%), *Staphylococcus aureus, Candida spp, Pseudomonas aeruginosa, Acinetobacter spp, Enterococcus spp and Citrobacter koseri.*

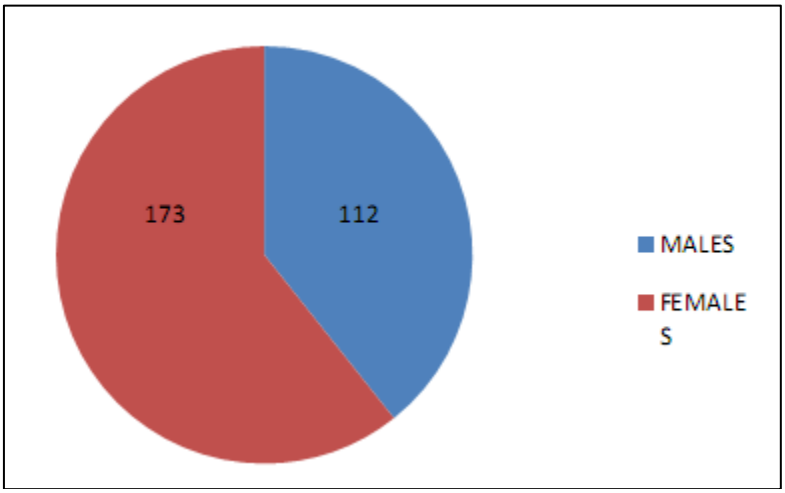

Fig-1: Gender Distribution Among Patients With UTI (n=285)

Table 1: Age Distribution Of Patients With Urinary Tract Infections (n=285)

AGE GROUP (in years)	MALES(112) (in %)	FEMALES(173) (in %)
0-10	7(6.25)	9(5.2)
11 -20	18(16.07)	29(16.7)
21 -30	16(14.2)	41(23.6)
31 -40	11(9.8)	23(13.2)
41 -50	10(8.9)	22(12.7)
51 -60	12(10.7)	21(12.1)
61 -70	25(22.32)	16(9.2)
➢ 70	13(11.6)	12(6.9)

Table 2: Distribution Of Uropathogens Among Patients With Urinary Tract Infection(n=285)

MICRO ORGANISM	NO OF ISOLATES	PERCENTAGE
E.coli	102	35.7
Klebsiella spp	53	18.5
Proteus spp	39	13.6
Staphylococcus aureus	25	8.7
Pseudomonas aeruginosa	18	6.3
Acinetobacter spp	14	4.9
Enterococcus faecalis	9	3.1
Citrobacter koseri	4	1.4

Table 3: Distribution of antimicrobial resistance pattern(in percentage) among different uropathogens isolated from patients with UTI

ISOLATE	AMPI	AK	GEN	SXT	CIP	NOR	CE	CFZ	IMI
E.coli	81.3	15.6	93.1	73.5	72.5	77.5	23.4	26.5	0
Klebsiella spp	28.3	11.3	18.86	65.2	68.6	58.5	23.4	31.8	0
Proteus spp	48.7	17.8	79.4	87.9	12.3	60	14.9	15.4	0
Staphylococcus aureus	73.7	-	-	61.5	34.5	71.2	33.6	30.4	0
Pseudomonas aeruginosa	44.4	20	91.6	98	87.6	94	38.8	33.3	0
Acinetobacter spp	-	19.9	86	92.5	59.7	82.2	32	28.3	0
Enterococcus faecalis	-	20.4	-	31.6	47.8	70.4	9.8	10.6	0
Citrobacter koseri	40.6	10.9	90.6	72.5	25	25	25.6	26.8	0

The anti-microbial resistance was very low for Amikacin and Cephalosporins. All the isolates were susceptible to Imipenem. Resistance percentage to the commonly used drug like cotrimoxazole and quinolones were high. The most common isolate *E. coli* shows increased resistance to most commonly used antibiotics used to treat UTI.

DISCUSSION

About 150 million people developed urinary tract infection each year [2]. They are more common in women than men. In women, they are the most common form of bacterial infection [2]. Up to 10% of women have a urinary tract infection in a given year and half of women having at least one infection at some point in their lives [3, 4].

Out of 285 patients positive for urine culture 173 were males and 112 were females which gives a male : female ratio of 1:1.54. Shah *et al* in a similar study has observed a female preponderance in patients suffering from UTI. Physiological and anatomical differences are accounted for the differences in males and females. This is because of the fact that compared to females,in males the drier environment in the urethra prevents the optimal growth of bacteria. The antimicrobial activity of prostate secretions and longer distance between the anus and urethra meatus are among the factors responsible for the differences in prevalence between the two genders [5].

23.6% of females affected were of the age group of 21-30 years. This shows that the females suffer from UTI most commonly during the reproductive age. The anatomical relationship of the female's urethra and vagina makes it liable to trauma during sexual intercourse as well as bacteria been massaged up the urethra into the bladder during pregnancy and child birth [6]. Among men UTI is more common in elderly age group (22.32%)This may be due to the prostatic enlargement in men is more common in this age group [7].

Table 2 shows the distribution of uropathogens among patients suffering from UTI. *E. coli* is the commonest pathogen causing UTI and accounts for 37.5% of the total uropathogens isolated. This correlates with other similar studies carried out in various teritiary care hospitals in India [8, 9]. *Escherichia coli* is a major cause of UTI, and it accounts for approximately 70 to 95% of community-acquired cases and 50% of all hospital-acquired infections [10]. These organisms are responsible for significant social and economic costs for both communities and public health resources. The second most common uropathogen isolated in the present study is *Klebsiella spp* accounting for 18.5% followed by *Proteus spp.(*13.6%).

The antibiotic resistance to commonly used drugs to treat UTI like cotrimoxazole and quinolones is very high. The resistance of *E. coli* to Ampicillin (81.3%) is very high which is comparable to study conducted by Gupta et al who reported a 76% resistance of *E. coli* to ampicillin [11]. E.*coli* also showed increased resistance to commonly used antibiotics like gentamycin (93.1%), cotrimoxazole (73.5%), ciprofloxacin (72.5%) and Norfloxacin (77.5%). It was highly sensitive to amikacin and cephalosporins. It showed 100% sensitivity to Imipenem. Thus the commonest isolate *E. coli* showed multidrug resistance.

Not only E.*coli*, but the other *Enterobactericeae* isolated in the present study like *Klebsiella* and *Proteus* also showed high resistance to gentamycin, cotrimoxazole and quinolones.*Citobacter* was highly sensitive to quinolones. Emergence of non-fermenters like *Pseudomonas aeruginosa* and *Acinetobacter spp* and their resistance to third generation Cephalosporins was considerable. All the uropathogens isolated were sensitive to Imipenem.

CONCLUSION

The present study reveals the increasing antibiotic resistance trend among uropathogens particularly *E.coli* which is the most common isolate among organisms causing UTI and the importance in rationalising their use in the current scenario.As bacterial resistance to the commonly used antimicrobial agents has increased considerably among *E.*

coli causing UTIs, proper selection of antibiotics and their conservative use should be followed in every health care set-up which will greatly help in reducing the rate of increase in resistance. Also, periodic monitoring of antimicrobial susceptibility pattern of causative agent in a particular setting will be helpful in guiding proper use of antimicrobial agents.

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