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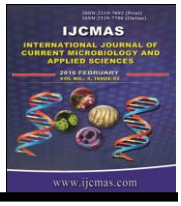

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Urinary Pathogens and their Antibiotic Susceptibility Pattern in MIMS, Mandya, India

Mamatha P Samaga* and N.S. Sahana Shetty

Department of Microbiology, MIMS, Mandya, India
**Corresponding author*

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A B S T R A C T

Urinary tract infection (UTI) represents one of the most common diseases encountered in medical practice today, occurring from the neonate to the geriatric age group. Urinary tract infection (UTI) can be caused by Gram-negative bacteria such as *Escherichia coli*, *Klebsiella* species, *Enterobacter* species, *Proteus* species and gram-positive bacteria like *Enterococcus* species, and *Staphylococcus saprophyticus*. This study was conducted to know the uropathogens and trend of antibiotic susceptibility pattern of uropathogens in our setting, thus can help in deciding empirical treatment of UTI. This retrospective study was carried out in the Department of Microbiology, MIMS, Mandya. The urinary pathogens and their antibiotics susceptibility patterns from January - December 2014(One year) were studied from the records of Microbiology laboratory. A total of 357 urine samples were processed. Among them, 127 (35.5%) samples yielded significant growth. Among 110 samples from males, 30 (27.2%) yielded significant growth, majority yielded *Escherichia coli* 18(60%) followed by *Staphylococcus aureus* 3(10%), *Candida* 3(10%), *Pseudomonas aeruginosa* 2(6.7%), *Citrobacter* 2(6.7%) and *Klebsiella* 2(6.7%). Among 247 samples from females, 97 (39.2%) yielded significant growth, majority yielded *Escherichia coli* 34 (35%) followed by Staphylococcus aureus 16 (16.4%), CONS 11(11.3%), *Klebsiella* 10(10.3%), Candida 9(9.3%), *Enterococci* 8 (8.2%), *Acinetobacter* 5(5.1%), *Citrobacter* 3(3%), and *Morganella* 1(1%). Prevalence of UTIs was more in females(39.2%) when compared to males(27.2%). In our study *E.coli* was most resistant to Ampicillin (96.2%). It was most sensitive to Imipenem (100%) followed by Piperaciliin-tazobactum (81.92%) . All the Gram positive bacteria were also highly resistant to ampicillin and showed 100% sensitivity to vancomycin. Urinary pathogens showed resistance to commonly used antibiotics like Ampicillin, Cotrimoxazole. The susceptibility patterns of urinary pathogens should be considered before starting empirical treatment for UTI.

Introduction

Urinary tract infection (UTI) represents one of the most common diseases encountered in medical practice today, occurring from the neonate to the geriatric age group (Tambekar, *et al.*, 2006). A global estimation of yearly episodes of UTI could be in the range of 150 million with a large proportion of the infections being inapparent

while some episodes manifest with obvious clinical features. (Al-Asmary SM *et al.*, 2004) Manifestations of UTIs vary from mild symptomatic cystitis to pyelonephritis and septicemia (Naveen R *et al.*, 2005).

Urinary tract infection (UTI) can be caused by Gram-negative bacteria such as *Escherichia coli*, *Klebsiella* species, *Enterobacter* species, Proteus species and gram-positive bacteria like Enterococcus species, and *Staphylococcus saprophyticus*. *E. coli* is the most common organism causing both community as well as hospital acquired UTI (Sobel JD *et al.*, 2010).

Treatment of UTI is often started empirically and therapy is based on information determined from the antimicrobial resistance pattern of the urinary pathogens (Wilson ML, 2004). Distribution of urinary pathogens and their susceptibility to antibiotics varies regionally so it becomes necessary to have knowledge of distribution of these pathogens and their susceptibility to antibiotics in a particular setting (Farrell DJ *et al.*, 2003).

Periodic evaluation of antimicrobial activity of different antibiotics is essential as the pattern of antibiotic sensitivity may vary over short periods (GK Rai *et al.*, 2008).

This study was conducted to know the uropathogens and the antibiotic susceptibility pattern of uropathogens in our setting, thus can help in deciding empirical treatment of UTI.

Materials and Methods

This retrospective study was carried out in the Dept. of Microbiology, MIMS,Mandya. Approval was obtained from the Institutional Ethical Committee. The urinary pathogens and their antibiotics susceptibility patterns from January - December 2014 (One year) were studied from the records of Microbiology laboratory. Clean catch midstream urine sample collected in sterile container was received in the Microbiology laboratory.

Microscopy was done and each sample processed on blood agar and mac conkey agar. Culture positive result was given if the number of bacteria grown on culture media exceeded 10^5 colony forming units (CFU) per ml of urine in case of clean-catch midstream urine but based on type of urine sample (straight catheterisation) submitted and clinical history (acute urethral syndrome, antibiotic therapy) of the patient, lower colony counts (10^3 CFU/ml) were also considered significant in some cases.When polymorphic bacterial growth (more than two bacterial species growth) was observed, the samples were classified as contaminated and excluded from the study. Bacterial identifi cation was done by colony morphology, Gram staining and standard biochemical tests (Betty AF *et al.*, 2007).

Antibiotic susceptibility testing was done by Kirby Bauer disk diffusion method as per CLSI guidelines (CLSI, 2011). Descriptive statistics was used to analyze the data. Antimicrobial sensitivity of the confirmed micro-organisms was done by disc diffusion method on Muler Hinton agar. Antibiotic susceptibility tests and interpretations were carried out for bacterial isolates by the Kirby-Bauer technique.(Bauer AW *et al.*, 1966) The antibiotics tested were Nitrofurantoin(300 µg), Amikacin(30µg), Cotrimoxazole (25 µg), Gentamycin(10µg), Ciprofloxacin(5 µg), Erythromycin(15 µg), Nalidixic acid(30 µg), Norfloxacin(10 µg) , Ampicillin(10µg) and Imipenem(10µg), Cefotaxime(30µg), Ceftriaxone(30µg), oxacillin (1 µg).

Results and Discussion

A total of 357 urine samples were processed. 110 samples were from males and 247 were from females. Among them, 127 (35.5%)samples yielded significant growth. Among 110 samples from males, 30 (27.2%) yielded significant growth, 62 (56.3%) showed no growth and 18 (16.3%) had non-significant bacteriuria.

Among 30 samples from males with significant bacteriuria, majority yielded *Escherichia coli*, 18(60%) followed by Staphylococcus aureus 3(10%), Candida 3(10%), Pseudomonas aeruginosa 2(6.7%), Citrobacter 2(6.7%) and *Klebsiella* 2(6.7%) (Fig 1).

Among 247 samples from females, 97 (39.2%) yielded significant growth, 124 (50.2%) yielded no growth and 25 (10.1%) yielded non-significant bacteriuria. Among 97 samples with significant bacteriuria, majority yielded *Escherichia coli* 34 (35%).Other isolates were *Staphylococcus aureus* 16 (16.4%), CONS 11(11.3%), *Klebsiella* 10(10.3%), *Candida* 9(9.3%), *Enterococci* 8 (8.2%), *Acinetobacter* 5(5.1%), *Citrobacter* 3(3%), and *Morganella* 1(1%) as shown in Fig 2. Prevalence of UTI was more in females compared to males.(Table 1).The antibiotic sensitivity pattern of Gram negative and Gram positive bacteria are shown in Tables 2 and 3 respectively.

Table.1 Sex-wise Distribution of Prevalence of Urinary Tract Infection

SEX	No. of samples processed	No. of samples with significant growth	Percentage
Male	110	30	27.2
Female	247	97	39.2

Table.2 In vitro Antibiotic Sensitivity Pattern of Gram Negative Bacteria.Percentage is Written in Paranthesis

	E.coli N=52	***Klebsiella N=12***	***Citrobacter spp. N=5***	***Pseudomonas aeruginosa N=2***	***Acinetobacter N=5***	***Morganella N=1***
Ampicillin	2 (3.8)	0	1 (20)	0	0	0
Cotrimoxazole	15 (28.8)	3 (25)	2 (40)	0	0	0
Cefotaxime	32 (61.5)	5 (41.6)	2 (40)	2 (100)	3 (60)	0
Ceftriaxone	40 (76.9)	6 (50)	2 (40)	2 (100)	3 (60)	1 (100)
Amikacin	45 (86.5)	8 (66.7)	3 (60)	1 (50)	4 (80)	1 (100)
Nitrofurantoin	42 (80.7)	4 (33.3)	1 (20)	1 (50)	3 (60)	0
Ciprofloxacin	40 (76.9)	3 (25)	2 (40)	1 (50)	3 (60)	0
Gentamycin	39 (75)	3 (25)	3 (60)	0	1 (20)	0
Imipenem	52 (100)	10 (83.3)	5 (100)	2 (100)	4 (80)	1 (100)
Norfloxacin	42(80.7)	7 (58.3)	3 (60)	0	3 (60)	1 (100)
Piperacillin-Tazobactum	50 (96.1)	11 (91.7)	4 (80)	2 (100)	4 (80)	1 (100)

Table.3 In vitro Antibiotic Sensitivity Pattern of Gram Positive Bacteria. Percentage is Written in Paranthesis

	Staphylococcus aureus N=19	**CONS N=11**	**Enterococcus spp. N=8**
Ampicillin	3 (15.7)	2 (18.1)	0
Cotrimoxazole	6 (31.5)	5 (45.4)	0
Erythromycin	5 (26.3)	3 (27.2)	0
Amikacin	19 (100)	10 (90.9)	0
Gentamycin	14 (73.6)	9 (81.9)	0
Ciprofloxacin	10 (52.7)	10 (90.9)	1 (12.5)
Vancomycin	19 (100)	11 (100)	8 (100)
Oxacillin	9 (47.3)	9 (81.9)	-

Fig.1 Frequency of Uropathogens in Males

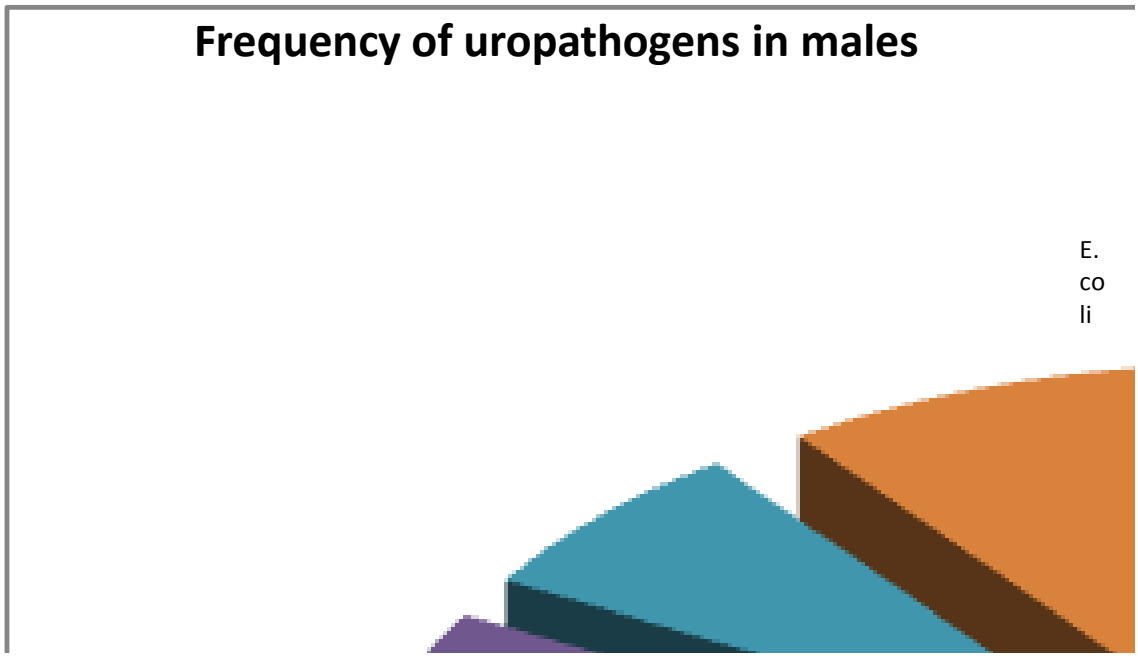
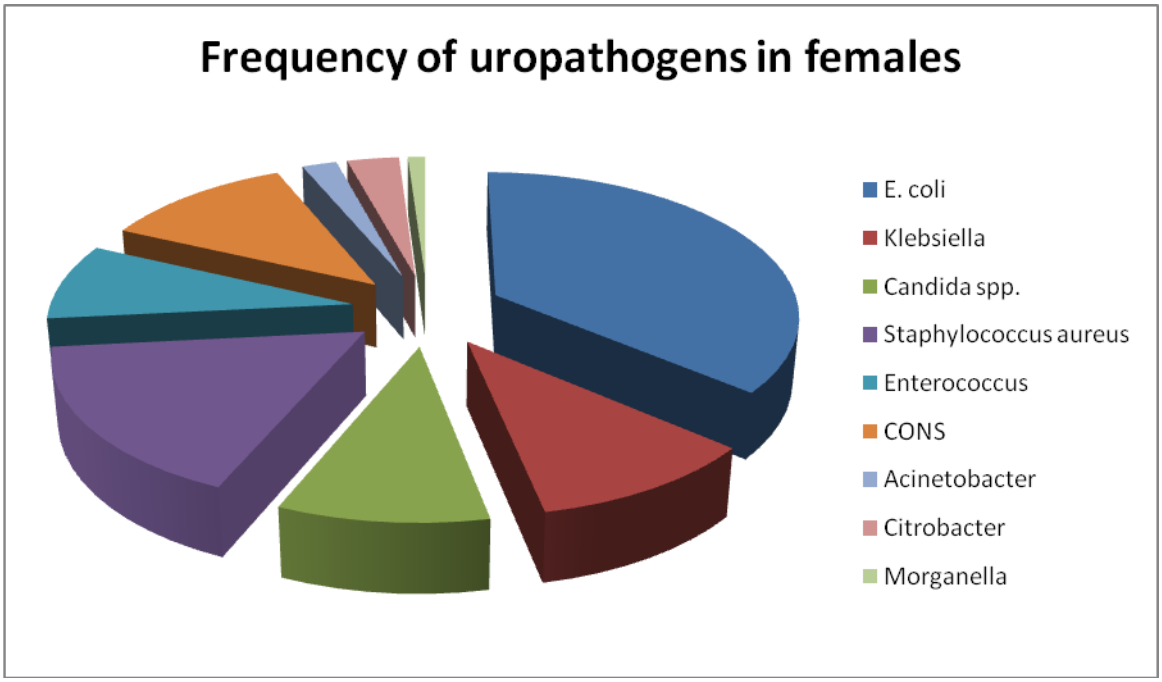


Figure.2 Frequency of Uropathogens in Females



Prevalence of UTIs was more in females (39.2%) when compared to males (27.2%). This was in agreement with other studies (Bashir MF *et al.,*. 2008 and Getenet B. *et al.,* 2011). Women are more prone to UTIs than men because, in females, the urethra is much shorter and closer to the anus.(Dielubanza EJ *et al.*, 2011).

E.coli was the most common isolated organism in our study both in males and females (60% in males & 35% in females). This was similar to other studies .(Gupta KD et al,1999; Moges AF et al, 2002, Sibi et al 2011).

Other uropathogens isolated were Staphylococcus aureus, Coagulase negative Staphylococci, *Klebsiella*, Pseudomonas aeruginosa, Acinetobacter, Citrobacter, Morganella. Candida was isolated in 12 cases, 3 males & 9 females.

In our study E-coli was most resistant to Ampicillin (96.2%). It was most sensitive to Imipenem (100%) followed by Piperaciliin-tazobactum (81.92%) . The similar findings were seen in a study by Bashir MF et al who concluded that bacteria showed high resistance to older urinary antimicrobial agents such as ampicillin which may be due to its increased usage.(Bashir MF *et al.*, 2008) 76.9% of *E. coli* were sensitive to ciprofloxacin and 28.8% were sensitive to cotrimoxazole. Over the last decade, the treatment of choice for urinary tract infections (UTIs) has changed from co-trimoxazole to quinolones owing to the rate of resistance to Co-trimoxazole and its high level of therapeutic failure.(Yilmaz K *et al.*, 2005).

Akram *et al.*, reported ciprofloxacin resistance rates ranging from 47% to 69% among Gram negative organisms in their study in India (Akram M *et al.*, 2007). 61.5% of *E. coli* were sensitive to cefotaxime & 76.9% were sensitive to

ceftriaxone. Sharifian *et al.*, reported highest susceptibility percentage of E.coli to ceftriaxone (97.8%) and cefotaxime (95.2%) in 2006 in Tehran (M. Sharifian *et al.*, 2006).

Only 15.7% of Staphylococcus aureus were sensitive to Ampicillin.All the Gram positive bacteria were 100% sensitive to vancomycin. The limitation of the study is that this being a retrospective study, the clinical history of the patients couldn't be traced.

In conclusion, higher prevalence of UTI was seen in females. Gram negative organisms were the most commonly isolated organisms in UTI among which *E. coli* was the most frequent causative agent both in males and females. Urinary pathogens showed resistance to commonly used antibiotics like Ampicillin, Cotrimoxazole. The susceptibility and resistance patterns of urinary pathogens should be considered before starting empirical treatment for UTI.

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