AN OBSERVATIONAL STUDY TO EVALUATE THE PREVALENCE AND ANTIBIOTIC RESISTANCE PATTERN OF URINARY TRACT INFECTION IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Urinary tract infection is one of the prevailing infections affecting worldwide. Its clinical characteristics and susceptible rates of bacteria are important in determining the treatment of choice and duration. This study aimed to determine the prevalence, aetiology, risk factors and the pattern of antibiotic resistance of uropathogens from patients in a tertiary care hospital. A total of 102 cases were collected. All relevant data were collected and documented in a suitably designed data collection form and the prevalence and risk factor were assessed. The data with regard to culture and sensitivity of the organisms isolated from patient's urine were collected from reports of laboratory from which causative uropathogens and their resistance pattern were assessed. Out of 102 urinary tract infection cases 67 were females and 35 were males. A total of 73 positive samples were evaluated; *Escherichia coli* was the predominant isolates (72.6%) followed by *Klebsiella pneumonia* (13.6%), *Pseudomonas aeruginosa* (8.2%) and *Citrobacter* (5.47%). Antibiotics which showed high resistance to uropathogens were amoxicillin, cephalexin, chloramphenicol, nalidixic acid, tetracycline and cotrimoxazole. In this study *Escherichia coli* was the predominant bacterial isolate and all isolates showed more sensitivity to nitrofurantoin, ceftriaxone and amikacin. Thus, these drugs may be used as an empirical therapy for urinary tract infection.

KEYWORDS: Prevalence, Antibiotic resistance, Urinary tract infection, *Escherichia coli*.

INTRODUCTION

Urinary tract infection is one of the most prevailing infections affecting worldwide that require treatment with antibiotics. Failure of antibiotics may lead to spreading of infection into the kidneys and blood stream and even become life-threatening. Uropathogens that resist one or more types of antibiotics are becoming more common.[1] Antibiotic resistance occurs when bacteria change in response to the use of these medicines which leads to higher medical cost, prolonged hospitalization, and increased mortality.[2] Globally, an estimate of occurrence of UTI result in as many as 8.3 million visits to outpatient clinics, 1 million visits to emergency unit and 1,00,000 patients hospitalized annually.[3] In India, there are more than 10 million cases per year. It is estimated that 50% of women experience at least one episode of UTI at some point in their lifetime and between 20% and 40% of women have recurrent episodes.[4] The primary risk factor for development of UTI includes female gender, pregnancy, menopause,

catheter associated infections, co morbid conditions like diabetes mellitus, kidney disorders and neurogenic bladder. Secondary risk factors of UTI include dysfunctional voiding, sexual activity, poor hygiene practices and dietary factors. The organisms causing most episodes of urinary tract infection are *Escherichia coli* (upto85%) and *staphylococcus saprophyticus* (upto10%) while *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* (*P.aeruginosa*) account for most of remaining infections.[5] Antibiotic resistance of uropathogen has become greater over the past 30 years.[6] In Britain between 1971 and 1992 the resistance rate of ampicillin increased from 12% to 43%. A study from Turkey showed resistance rates of 56% to ampicillin, 15% to ciprofloxacin, 36% to cotrimoxazole and 75% to cefuroxime.[7] According to a recent study from India, resistance rates of uropathogen were highly resistant to 76% of strains to 3rd generation cephalosporins. Thus, there is a necessity to investigate the antibiotic resistance

and sensitivity pattern for the bacterial isolates to provide appropriate and better treatment.[8]

In this study we have determined the aetiology of UTI and also investigated the prevalence of UTI's, risk factors and the pattern of antibiotic resistance of uropathogens from patients admitted to K.R Hospital.

MATERIALS AND METHODS
Study area and design
The study was done at Krishna Rajendra Hospital, Mysore, India from October 2017 to March 2018. The study included all patients who were admitted in hospital with symptoms of UTI during the study period and had UTI with or without positive urine culture reports.

Data collection
All relevant data of enrolled patients including demographic details like name, age, gender, body weight, clinical data such as past medical history, history of UTI, co morbidities (Diabetes mellitus, Stroke, Hypertension, Renal disease), history of menopause, urinating habits were collected from various data sources and documented in a designed data collection form. The data regarding culture and sensitivity of the organism isolated from patient's urine were collected from reports

in patient case record obtained from laboratory of K.R hospital.

Statistical analysis
Data were entered and analysed in the computer using SPSS version 20.0. Results were compiled as means and percentages and showed in form of graphs and tables.

Ethical considerations
Ethical clearance was obtained from the Instituitional Ethics Committee, Mysore Medical College and Research Institute (Ref no MMC EC 15/18). Data were collected after patients signed a written informed consent.

RESULTS
Gender and age distribution
Out of 102 UTI cases the prevalence of UTI was high among females accounting for 65.7% than males which accounts for 34.3%. Out of the total study population, 14.7% (n=15) belonged to the age group 18-28 years, 14.7% (n=15) to the age group 29-38 years, 29.4% (n=30) to the age group 39-48 years and 41.2% (n=42) belonged to the age group 49-60 years. Out of 35 male patients mean age was 49 years and out of 67 female patients mean age was 41 years shown in table 1.

Table 1: Gender and mean age distribution.

Characteristics	Frequency	Mean	SD
Male age	35	49	6.49
Female age	67	41	12.34

Co morbidities in UTI patients
The most common co-morbid conditions identified among UTI patients were Diabetes mellitus 50% (n=28), Renal failure 19.7% (n=11), Hypertension 16% (n=9), Anaemia 12.5% (n=7) and CVA 1.8% (n=1) as shown in "Fig. 1".
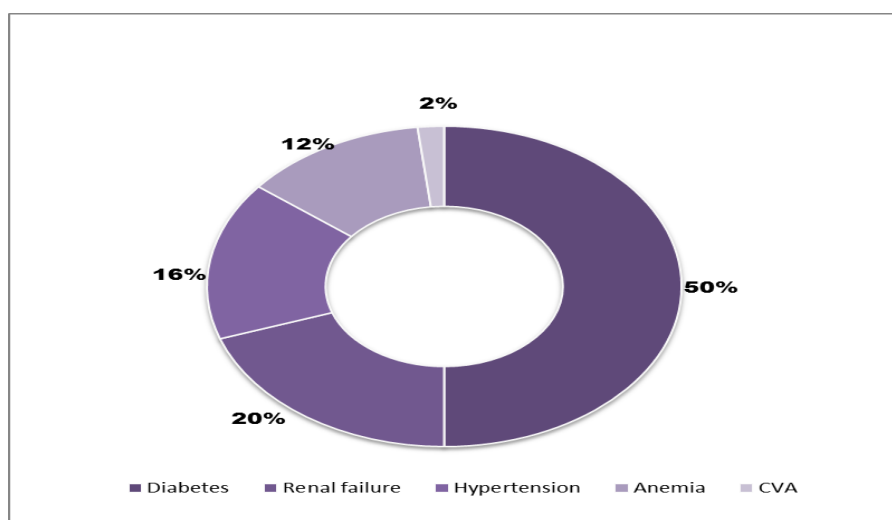

Fig. 1: Co-morbidities in UTI patients.

Urinating Habits in urinary tract infection patients
Out of 102 patients, 44.3% hold urine for > 1 hour, 35.3% urinate less than 5 times per day, 18.6% urinate

more than 5 times per day and 2% hesitate to excuse oneself to urinate as mentioned in Table 2.

Table 2: Urinating habits in UTI patients.

Urinating habit	Frequency (n=102)	Percentage (%)
Urinate > 5times/day	19	18.6
Urinate<5 times/day	36	35.3
Holding urine for > 1hr	45	44.3
Hesitate to excuse oneself to urinate	2	2
Total	102	100

Frequency of sexual activity in female UTI patients
Among 67 female UTI patients, 68.6% (n=46) were sexually active and 31.4% (n=21) were sexually non active as shown in "Fig 2".
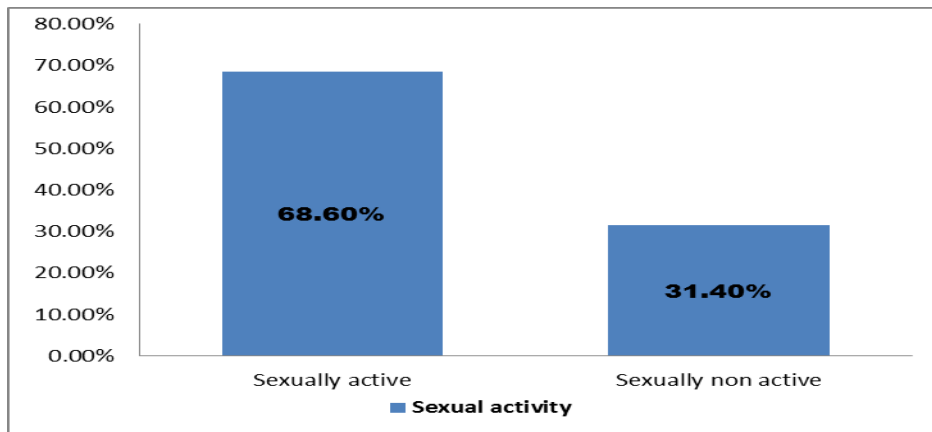

Fig. 2: Frequency of sexual activity in female UTI patients.

Gender Distribution and Growth of Uropathogen
Out of 102 urine samples from patients included in the study, 35 (34.3%) were male and 67 (65.7%) were female. From 102 urine samples a total of 73 (71.6%) bacterial growths were isolated. The frequency of prevalence of uropathogens in male and female was 68.57% and 73.13% respectively. Details on gender distribution and growth of uropathogen are listed in the below Table 3.

Table 3: Gender distribution and growth of uropathogens.

Sex	No. of sample	Growth	No Growth
Male	35(34.3%)	24 (68.57%)	11 (31.4%)
Female	67 (65.7%)	49 (73.13%)	18 (26.8%)
Total	102(100%)	73 (71.6%)	29 (28.4%)

Pattern of uropathogens from urine culture
Out of 73 bacterial isolates, *Escherichia coli* was the predominant isolates 53 (72.6%) followed by K*lebsiella* *pneumoniae* 10 (13.6%), *Pseudomonas aeruginosa* 6 (8.21%) and *Citrobacter* 4(5.47%).
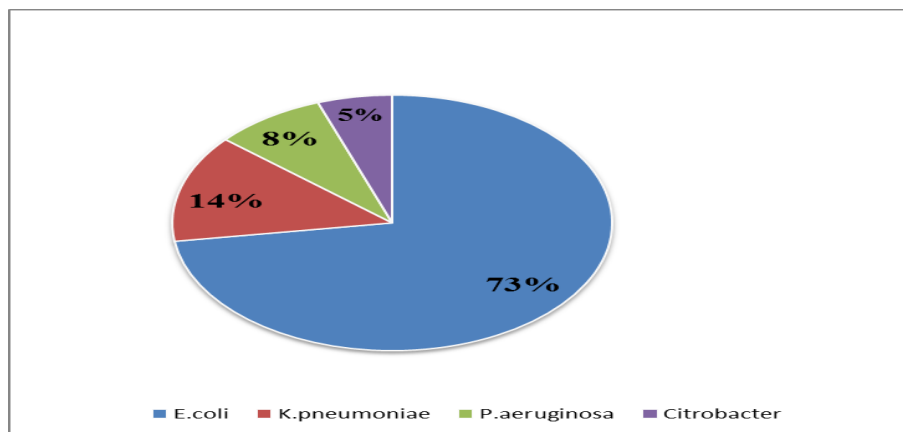

Fig. 3: Pattern of uropathogens from urine culture.

Antibiotic resistance pattern of uropathogens
Out of 73 bacterial isolate, 53 number of *E.coli* isolate showed high frequency of resistance to amoxicillin, cephalexin, chloramphenicol, tetracycline, nalidixic acid and moderate resistance to cotrimoxazole, gentamicin, cefuroxime, cefotaxime, ofloxacin, norfloxacin, ciprofloxacin and less resistance to ceftriaxone, amikacin and nitrofurantoin.

Out of 73 bacterial isolate,10 number of *K.pneumoniae* isolate showed high frequency of resistance to amoxicillin, cephalexin, chloramphenicol, tetracycline, nalidixic acid, cotrimoxazole and moderate resistance to gentamicin, cefuroxime, nitrofurantoin, ofloxacin, ceftriaxone, norfloxacin, ciprofloxacin and least resistance to amikacin and cefotaxime.

Table 4: Antibiotic resistance pattern among uropathogens.

Antimicrobial agents	*E.coli* N=53	*Klebsiella* N=10	*Pseudomonas* N=06	*Citrobacter* N=04
	R(%)	R(%)	R (%)	R (%)
Amoxicillin	47(89%)	7(70%)	1(17%)	3(75%)
Cephalexin	46(87%)	6(60%)	0	3(75%)
Chloramphenicol	47(89%)	6(60%)	0	3(75%)
Nalidixic acid	33(62%)	6(60%)	5(83%)	3(75%)
Tetracycline	44(83%)	6(60%)	0	4(100%)
Cotrimoxazole	22(42%)	7(70%)	5(83%)	0
Nitrofurantoin	0	4(40%)	0	0
Ciprofloxacin	11(21%)	2(20%)	5(83%)	1(25%)
Gentamicin	18(34%)	2(20%)	5(83%)	1(25%)
Ceftriaxone	9(16%)	2(20%)	0	0
Amikacin	7(13%)	1(10%)	0	1(25%)
Cefuroxime	18(34%)	3(30%)	1(17%)	0
Cefotaxime	15(28%)	1(10%)	0	0
Ofloxacin	14(26%)	2(20%)	5(83%)	2(50%)
Norfloxacin	12(23%)	4(40%)	5(83%)	0

DISCUSSION
The present study reviewed 102 UTI cases, out of which 67 were females and 35 were males. In our study we observed that the prevalence of UTI was high among females (65.7%) than males (34.3%) which may be due to differentiation in anatomical structure as adult women has shorter urethra as compared to men. These results are in accordance with a study by Smita S[9] et al., reporting UTI in 62.42% of females and 37.67% of males. The present study showed a high frequency of samples from age group 40-60 years over 41.2%. Mean age of females was 41 and mean age of males was 49.

In our study co morbid conditions identified among UTI patients were 50% of Diabetes Mellitus followed by 19.7% renal failure, 16% hypertension, 12.5% anaemia and 1.8% CVA. The study observed that diabetes mellitus is one of the risk factor of UTI due to impaired immune system and elevated glucose level in urine which provides a growth media for uropathogens. Similarly, Aswani MS[10] et al., reported a 30% prevalence rate of UTI among diabetic patients.

The present study observed an association of urinating habits like holding urine for more than 1 hr that accounts for 44.3% out of 102 samples, urinating less than 5 times per day (35.3%), urinating more than 5 times per day (18.6%) and hesitating to excuse oneself to urinate(2%) i.e. holding urine too long might cause multiplication of bacteria leading to UTI.

Out of 67 female UTI patients, we observed 27 (40.3%) were postmenopausal women and 40 (59.9%) were premenopausal women which was different from a study conducted by Raul Raz who reported higher incidence of UTI in postmenopausal women.[11]

Among 67 female patients, we observed 46 (68.6%) were sexually active and 21(31.4%) were sexually non active. Thus, in the present study sexual intercourse contribute to the risk factor for UTI. Similarly, a study conducted by Hooton TM[12] et al., reported that sexual intercourse may promote the entry of uropathogen into the urethra and bladder which changes the normal vaginal flora.

Out of 73 culture positive samples, 72.6% was *E.coli* followed by 13.6% *K. pneumoniae*, 8.2% *P. aeruginosa* and 5.47% *Citrobacter*. Among these organisms *E.coli* was common pathogen in our study as similar to study reported by Yasir S H G[13] et al., observed *E.coli* being commonest organism comprised 65.3% and *Klebsiella* 12% out of 75 isolates. Study conducted by Guido S[14] et al., reported that E. coli was found to be causative pathogen in 72.8% samples.

The overall resistance of *E. coli* to amoxicillin, chloramphenicol, tetracycline, cephalexin and nalidixic acid showed 60- 80% and had less resistance to amikacin, ciprofloxacin, ceftriaxone and 100% sensitive to nitrofurantoin. Similar results were observed in a

study conducted by Kothari A[15] et al., reported that *E.coli* showed high resistance to amoxicillin, cotrimoxazole and least resistance to amikacin and nitrofurantoin. Out of 73 bacterial isolate, 10 number of *K.pneumoniae* isolate showed high frequency of resistance to antibiotics like amoxicillin, cephalexin, chloramphenicol, nalidixicacid, tetracycline and cotrimoxazole. A similar report was observed in a study conducted by Nishat H A[16] which showed high resistance of *K.pneumoniae* to amoxicillin and cotrimoxazole.

Out of 73 bacterial isolate,6 number of *P.aeruginosa* isolate showed resistance to antibiotics like amoxicillin, nalidixic acid, cotrimoxazole, cefuroxime, ciprofloxacin and gentamicin. Similarly a study conducted by Dania A S[17] reported high resistance of *P.aeruginosa* to nalidixic acid, cotrimoxazole, cefuroxime and amoxicillin.

Out of 73 bacterial isolate, 4 number of *Citrobacter* isolate showed high resistance to antibiotics like amoxicillin, tetracycline, cephalexin, chloramphenicol and nalidixic acid.

CONCLUSION
In this study *E.coli*, *K. pneumoniae, P.aeruginosa* and *Citrobacter* were the four commonly isolated uropathogens, among which Escherichia coli is the most common causative agent of urinary tract infections in UTI infected patients, as evidenced from the samples taken from wide range of patients. Taking into account the resistance pattern of *E.coli* and other isolates, they showed more sensitivity to nitrofurantoin, amikacin, and ceftriaxone. Nitrofurantoin remains the most active agent and can be administered orally as it is highly concentrated in urine. Ceftriaxone and amikacin can be given as injectables. Therefore nitrofurantoin, ceftriaxone and amikacin maybe the most appropriate agents for empirical therapy for UTI.

ACKNOWLEDGEMENT

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