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A STUDY ON ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF UROPATHOGENS AT A TERTIARY CARE HOSPITAL

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Abstract

Background: Urinary tract infection (UTI) is one of the most prevalent diseases affecting neonate to geriatric age group. Widespread use of antibiotics has led to emergence of resistant microorganisms. As the antibiogram of the microorganisms are frequently changing the present study was done to analyze recent antibiotic sensitivity pattern of uropathogens. **Methods:** The present study is a retrospective analysis of antibiotic susceptibility patterns of uropathogens, conducted at Department of General medicine at a tertiary care hospital, Andhrapradesh, India. Age, Gender and Co morbidities of the patients were obtained from inpatient registers of General medicine . The organism isolated and antimicrobial susceptibility profiles were collected from the Department of Microbiology. **Results:** 100 urine samples were collected and sent for culture and sensitivity of which organisms were isolated from 74 samples, of which 67.56% were females and 32.44% were males. The overall prevalence of UTI was found to be high in diabetics (42%). High prevalence was observed in females as compared to males (2:1). Though the overall prevalence was high in >45 years age group patients, in females high prevalence was seen among middle-aged (31 to 45 years) patients and in male high prevalence was seen among >45 years age group patients. Escherichia coli (54.05%) was the commonest isolate causing UTI followed by Klebsiella pneumoniae (27.02%). The most effective antimicrobial agents in our study were Meropenem, Amikacin, Nitrofurantoin and Cotrimoxazole whereas higher resistance was observed among Fluoroquinolone, Amoxicillin, third generation Cephalosporins.

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Conclusion: As drug resistance among bacterial pathogens vary time to time and by region, regular surveillance and monitoring is necessary for giving updated information to physician for most effective empirical treatment of UTIs.
Key words: Culture, Sensitivity, Antibiotics.

Introduction

Urinary tract infections (UTIs) are one of the most common types of bacterial infections in humans, occurring both in the community and in healthcare settings. UTI refers to a wide range of clinical conditions, from the asymptomatic presence of bacteria in the urine to severe kidney infection with subsequent sepsis.[1]

Females are more prone to UTIs than males, a phenomenon explained by their short urethra and its anatomical proximity to the anal orifice.[2] UTI is commonly caused by bacteria mostly by Gram negative bacteria such as *Escherichia coli, Proteus* species, *Pseudomonas aeruginosa, Acinetobacter* species, *Klebsiella* species, *Enterobacter* species, *and Citrobacter* species. Among Gram positive bacteria, *Staphylococcus saprophyticus, Enterococcus* species, and *Coagulase N*egative *Staphylococcus (CONS)* are common predictable spectrum of bacteria which are responsible for causing UTIs.[3,4] The increasing incidence of drug resistance among uropathogens is a significant public health concern, necessitating constant antibiotic susceptibility screening for organisms causing UTI.[5] In addition, antimicrobial sensitivity for UTI causing bacteria varies with time and location.

Therefore, screening for susceptibility in each location is critical for producing up-to- date epidemiological data.[6,7]

The aim of this study is to determine the prevalence of UTI causing pathogens according to age and sex at a tertiary care hospital and their antibiotic susceptibility pattern to provide a database for reference. In the current scenario, where the antimicrobial resistance pattern is changing alarmingly and new Multi Drug Resistant (MDR) bacteria are emerging frequently leading to enhance morbidity and mortality. This study focuses on highlighting the guidelines for the usage of appropriate antibiotics which can be used in treating UTI. In addition, our study will assist concerned authorities in preparing antibiotic prescription policies and evaluating their antibiotic formulary guidelines. Increase awareness and annual reporting for these findings will help in preventing the immersed strains from spread within the community.

Materials And Methods

The present study is a retrospective observational study conducted in the Department of General Medicine at a tertiary care hospital. The duration of the study was three months, from October 2023, to December 2023. The study was conducted after obtaining approval from the Institutional Ethics Committee. A total of 100 patients with symptoms of UTI and aged more than 18 years were selected for the study. Patients who were already catheterised, immunocompromised, patients suffering from phimosis or paraphimosis, and patients who had taken antibiotics within the past 24 hours were excluded from the study. Age, Gender and Comorbidities of the patients were obtained from the inpatient registers of General medicine.

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The organism isolated and also the antimicrobial susceptibility profiles were collected from the antibiotic susceptibility report generated by Department of Microbiology.

Midstream urine samples were collected in sterile containers. The samples were cultured on blood agar and Mac Conkey media with a standard loop and were incubated at 37°C overnight. A growth of $\geq 10^5$ colony forming units/mL was considered as significant bacteriuria.

The isolates were identified by Gram-staining and conventional biochemical methods.[8] Antimicrobial susceptibility was done by Kirby–Bauer disc diffusion method on Mueller–Hinton agar and the interpretations were carried out according to the Clinical and Laboratory Standards Institute guidelines.[9] Antibiotics against which sensitivity was tested included Ampicillin, Amoxicillin & Clavulanicacid, Amikacin, Cefotaxime, Ceftazidime, Imipenem, Co-trimoxazole, Ciprofloxacin, Levofloxacin, Norfloxacin, and Ofloxacin. Data was tabulated and analyzed using Descriptive statistics and the results were expressed as frequency and percentage.

Microsoft Excel 2021 software was used to analyse

Results

Of 100 urine samples analysed, the culture was positive in 74 samples of which (67.6%) were from females and (32.4%) were from males. The age and gender distribution of UTI is as shown in Table 1.

TABLE 1: Age and Sex distribution of Urinary Tract Infection

AGE GROUP	FEMALE (%)	MALE (%)	TOTAL (%)
18-29	8 (10.8)	2 (2.7)	10 (13.5)
30-39	16 (21.6)	2 (2.7)	18 (24.3)
40-49	7 (9.0)	5 (6.7)	12 (16.2)
50-59	9 (12.0)	6 (8.1)	13 (17.5)
60	10 (13.0)	9 (12.1)	21 (28.3)
TOTAL	50 (67.6)	24 (32.4)	74 (100)

Escherichia coli (54.05%) was the most common organism followed by Klebsiella, and Staphylococcus aureus followed by Pseudomonas and CONS accounting only for 1.3% of the organisms isolated. Distribution of bacterial Uropathogens is as shown in Table 2.

TABLE 2: Distribution of bacterial Uropathogens

PATHOGEN	FEMALE (%)	MALE (%)	TOTAL (%)
Escherichia coli	25 (33.8)	15 (20.2)	40 (54.05)
Klebsiella spp.	15 (20.2)	5 (6.7)	20 (27.02)
Staphylococcus aureus	6 (8.1)	2 (2.7)	8 (10.08)
Enterococcus	2 (2.7)	1 (1.3)	3 (4.05)
Pseudomonas	1 (1.3)	1 (1.3)	2 (2.70)
CONS	1 (1.3)	0 (0)	1 (1.35)
Total	50 (67.6)	24 (32.4)	74 (100)

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In the present study E. Coli showed high sensitivity to Nitrofurantoin(92.50%), Fosfomycin (92.50%),Imipenem(77.27%). Low sensitivity to Ciprofloxacin (15.58%), Levofloxacin (11.68%) Ceftazidime (28.57%), Cefotaxime (24.67%). Klebsiella species is highly sensitive to Nitrofurantoin(92.5%), Amikacin (62.5%) and low sensitivity to Levofloxacin, Ciprofloxacin.

Pseudomonas species is highly sensitive to Piperacillin and Tazobactam (100%), amikacin (66.66%) and resistant to Levofloxacin, Ciprofloxacin. Antibiotic susceptibility pattern of gram negative organisms is shown in Table 3.

TABLE 3: Antibiotic susceptibility pattern of gram negative organisms

Antibiotic	***E. Coli(%)***	***Klebsiella species(%)***	***Pseudomon as species(%)***
Gentamicin	43.50	62.5	0
Ampicillin	38.90	-	0
Nitrofurantoin	92.50	92.50	-
Fosfomycin	92.50	-	-
Ciprofloxacin	15.58	6.4	0
Levofloxacin	11.68	4.2	0
Piperacillin Tazobactam	40.90	50	100
Amikacin	47.40	25	66.66
Ceftazidime	28.57	50	0
Cefotaxim	24.67	50	0
Imipenem	77.27	-	100
Cotrimoxazole	30.05	39.25	58.4
Amoxicillin clavulanic acid	55.00	52.5	0

Among gram positive organisms staphylococcus aureus has high sensitivity to Nitrofurantoin(100%), Linezolid(100%), Vancomycin (100%) and low sensitivity to ciprofloxacin (12.5%), levofloxacin (12.5%). Enterococcus species highly sensitive to nitrofurantoin(100%),linezolid (100%), vancomycin(100%) Coagulase Negative Staphylococcus was highly sensitive to Linezolid, Vancomycin, Nitrofurantoin, Cefoxitin and low sensitivity to Ciprofloxacin and Levofloxacin.

Antibiotic susceptibility pattern of gram positive organisms is shown in Table 4.

TABLE 4: Antibiotic susceptibility pattern of gram positive organisms

Antibiotic	***Staphylococcus aureus(%)***	***Enterococcus species. (%)***	***CONS(%)***
Linezolid	100	100	100
Vancomycin	100	100	100
Nitrofurantoin	100	100	100
Fosfomycin	100	100	100

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Erythromycin	33.33	-	0
Azithromycin	33.33	-	0
Clindamycin	27.083	-	0
Doxycyclin	72.9	72	100
Ciprofloxacin	12.5	32	0
Levofloxacin	12.5	36	0
Cotrimoxazole	66.66	-	100
Ampicillin	-	60	-
Gentamycin	47.9	60	100

Discussion

Females are more prone to UTI due to short and straight urethra and short distance between urethra and anus which contributes to easy colonisation of the urethral region with enteric bacteria. Adding to that UTIs may result following sexual intercourse, during which bacteria may introduce into the urethra making it more common in reproductive age group.

In the present study Escherichia coli is the most common organism isolated accounting for 54.05% of cases. In India incidence of E. coli is about 50-80% as reported by various studies. Klebsiella Species. was the second most common organism isolated accounting for 27.02% of cases similar to study done by Somshekhara *et al.* and Hassan *et al.*[10]

In the present study E. Coli is the most common gram negative isolate which showed high sensitivity for fosfomycin, nitrofurantoin. According to study done by ekadashi rajni sabharwal and rajni Sharma[11] 338(94.4%) isolates were found to be susceptible to fosfomycin.

Conclusion

Escherichia coli is the most common uropathogen causing UTI at our tertiary care hospital Andhra Pradesh, India. Nitrofurantoin and Fosfomycin were the most sensitive drugs for both gram positive and gram negative organisms. Routinely used antibiotic like Ciprofloxacin, ofloxacin, Levofloxacin were highly resistant. Most of the organisms showed multi drug resistance. This multidrug resistance is mainly because of biofilm formation and ESBL production[12]. There is need of continuous surveillance of frequency and antibiotic susceptibility pattern of microogranisms for effective empirical therapy. Judicious use of antibiotics for this common infection has broad implications for preserving antibiotic effectiveness into the future.

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