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Original Research Article

Prevalence of UTI in Different Age Groups and Antimicrobial Susceptibility Pattern of Isolates

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Abstract

Background: *Urinary tract infection (UTI) has become major infection mainly caused by bacteria. It is second most common reason for empirical antibiotic treatment. About 150 million population is suffering from UTI worldwide annually. Distribution and susceptibility of uropathogens changes according to living conditions, hygiene status of affected people, morphology, place and sometimes environmental conditions.*

Aim: *This study aimed to find out occurrence of UTI in among age groups of rural population and to find out antimicrobial susceptibility pattern of isolates.*

Materials and Methods: *During this study total 422 patients of age ranging from 2- 86 years from different wards of the Rama medical college, Hospital and Research Center, Hapur, Uttar Pradesh, India, was observed from January to June 2021. Morphology, Staining, Motility, Biochemical test and antimicrobial susceptibility test were performed.*

Result: *It was observed that about 18.48% patients were found positive with UTI. The prevalence was observed high i.e. 71.79% in females while in males it was 28.20% with age group 20-40 and 40-60 respectively. There were 30.76% Gram positive cocci, 65.38% Gram negative bacilli and 3.84% Candida species were isolated. Major isolate was Escherichia coli (32.05%) and Klebsiella pneumoniae was found 20.51%. Escherichia coli was found susceptible to Fosfomycin and Meropenem and most resistant to Cefazolin.*

Conclusion: *The positivity rate of urine culture was found to be 18.48 %. The most common isolate was E. coli (32.05 %) and Klebsiella spp. (20.51%). E. coli was most susceptible to Meropenem and Fosfomycin and most resistance to Cefazolin.*

Keywords: *Urinary tract infection (UTI), Pathogens, Antibiotic susceptibility test (AST)*

1. Introduction

The human urinary tract is a collecting and an emptying system which comprises the kidney, ureters, bladder and urethra.

A urinary tract infection refers to colonization of urinary tract as well as tissue invasion of organs of the urinary system by pathogenic microbes [1]. Occurrence of bacteria in the urine is described as bacteriuria, which includes asymptomatic bacteriuria, symptomatic bacteriuria, lower and upper urinary tract infection and complicated urinary tract infection. It was estimated that about (20%) or more in female population was suffering forms of Urinary tract associated infections. There are different pathogenic microorganisms

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(bacteria, fungi, protozoans and viruses) which cause Urinary tract infection, in which bacteria are more prevalent and invasive [2].

Diagnosis depends on symptoms and further laboratory findings. Diagnosis was confirmed by urine analysis including pH, microscopy, white blood corpuscles, leukocytes, red blood corpuscles etc. Urine culture was considered positive if it showing a bacterial colony forming unit count of $>10^5$ CFU/ml of urinary tract organisms. Treatment of UTI depends on antimicrobial resistance pattern of uropathogens [3]. The antibiotics recommended for treatment of urinary tract infection includes - Nitrofurantoin, Ampicillin, Trimethoprim-sulfamethoxazole and Flouroquinolones. However, increased resistance of uropathogens to drugs is a major challenge in treating urinary tract infections [4].

2. Materials and methods

Present study was conducted at Rama Medical College, Hospital and Research Centre, Hapur from January to June, 2021. Total 422 samples were collected from both male and female patients 2-86 years of age. (Table 1). Patients present at the departments of Urology, General Medicine, female surgery, male surgery, female medicine, male medicine, Orthopedics, Cardiology, ENT, Obstetrics and Gynecology and Pediatrics. Midstream clean catch urine, Suprapubic aspirate, Catheterized urine were obtained as sample in a sterile container.

Urine samples were immediately taken to bacteriology lab and processed for cultivation on agar plates and incubated at 37°C for 24-48hr. The samples were considered positive for urinary tract infection if pure culture of 10^5 CFU/ml were obtained from without centrifuged urine sample and ≥5 pus cells were seen from urine sample per field under microscope.

Identification was confirmed through - Gram staining, Motility test and Biochemical tests including catalase, coagulate, citrate, methyl red, oxidase, indole, urease, triple sugar iron, etc. pure culture was maintained in nutrient agar media and stored at 4°C for further use.

Purified isolates were subjected to antibiotic susceptibility test using disc diffusion test. Each plate was inoculated with 0.5 McFarland and swabbed on Mueller-Hinton agar medium. Antibiotic discs were kept on bacterial lawn after 5 minute and was incubated at 37°C for 24 h.

Table 1: Total samples as per gender and age

Age groups	Male		Female	
	(n)	%	(n)	%
02-20	13	10.6	32	10.6
20-40	42	34.4	157	52.3
40-60	36	29.5	81	27.0
60-80	25	20.4	28	9.3
Above 80	06	4.91	02	0 .6
Total	122	28.9	300	71.0

Table 2: Culture result of collected samples

Result	No. of patients	Percentage (%)
Positive	78	18.48
Negative	344	81.51
Total	422	100

Table 3: Culture results according to sex

Gender	Positive sample	Negative sample
Male	22	100
Female	56	244
Total	78	344

3. Results and Discussion

After 24h, the inhibition zones were measured. In this study, among the total 422 samples, 78 (18.48%) were positive (shows significant bacteriuria) while 344 were negative (Table-2). Out of 78 positive 22 were male and 56 were female (Table-3). *Escherichia coli* was the common organisms resulting UTI in all age groups. Worldwide urinary tract infections are the most common infections which affect all age groups men, women and children.

Table 4: Distribution of isolates and percentage

Bacterial isolates	No. of isolates	Percentage (%)
Escherichia coli	25	32.05
Klebsiella pneumoniae	16	20.51
Enterococcus species	15	19.23
Staphylococcus aureus	09	11.53
Pseudomonas species	04	5.12
Acinetobacter species	03	3.84
Candida species	03	3.84
Citrobacter species	01	1.28
Proteus species	02	2.56
Total	78	100

In this study, 422 patients were assessed for urinary tract infections and 78 (18.48%) of sampled urine had significant bacterial growth, which correlates with the study of [5]. In similar studies from Karnataka state reported (26.01%) of UTI [6]. The prevalence of UTI was found to be (28.3%) by Taneja et. al. [7], and (17.1%) in the study done by Akarm et. al. [5]. Our study showed a high frequency of urinary tract infection in females (71.79%) than in males (28.20%), which correlates with the study by Orrett [8], which indicated UTI in females (73.5%) and in males (35.1%) respectively, that is due to morphological and structural differences in male and female urinary tract [9].

Table 5: Disc diffusion test of *Staphylococcus aureus*

Antibiotics used	Zone of inhibition (mm)	Concentration of antibiotics (µg)
Cefoxitin	≥22	30
Linezolid	≥21	30
Co-trimoxazole	NIL	25
Novobiocin	≥16	30

The occurrence of urinary tract infection observed in elderly (> 40 years, 53.84%), while in patients with age 20-40 years it was 41.02% and in children <18 years, it was 3.84%. Our findings show lesser percentage of UTI from studies done in Kuwait [10] and Nigeria [11] in which the highest incidence of Urinary tract infection was recorded among the age group (20-50) years 63.4% and 74.7% respectively and lowest among >50 years 13.3% and 10.3% respectively. In our study, it was found that the adult females (20-40) years had a higher incidence of urinary tract infection (32.05%) as compared to adult males (8.97%).

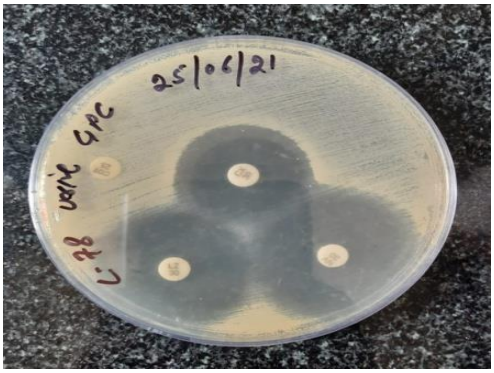

Fig 1. Antimicrobial sensitivity test of S*taphylococcus aureus.*

Majority of bacteria isolated in this study was Gram-negative bacteria including 65.38% of total bacterial isolates while Gram positive cocci constituted (30.76%). *Escherichia coli* was found major pathogen about 32.05% among Gram-negative isolates. Other isolated microorganisms were *Klebsiella pneumoniae* (20.51%), *Enterococcus species (*19.23%), *Staphylococcus aureus* (11.53%), *Pseudomonas aeruginosa* (5.12%), *Acinetobacter species* (3.84%), *Citrobacter species* (1.28%), *Proteus species* (2.56%) and *Candida species* (3.84%). Gram's negative isolates were found sensitive to Meropenem, Vancomycin, Nitrofurantoin, Fosfomycin, Linezolid used while these isolates were resistant to Amoxyclav, Cefepime, Ciprofloxacin, Ceftriazone, Cefazolin and Gentamicin used in this study. Gram's positive isolates were found resistant to Tetracycline, Ciprofloxacin, Erythromycin and Co-trimoxazole, which showed some similarities with the study of Singh et al. [12]. Most of the Gram's positive isolates were susceptible to Linezolid, Doxycycline, Vancomycin and Nitrofurantoin. Among Gram's positive isolates *Staphylococcus aureus* was more sensitive to Cefoxitin (Table-5) while Novobiocin was less effective as compared to Linezolid and Cefoxitin (Fig 1). Bioactive peptides are also effective for inhibition of resistant bacterial isolates (13).

4. Conclusion

The positivity rate of urine culture was found to be 18.48 %. The most common isolate was *E. coli* (32.05 %) and *Klebsiella spp*. (20.51 %). *E. coli* was most susceptible to Meropenem and Fosfomycin and most resistance to Cefazolin. This study is also pointed out towards the increasing prevalence of multidrug resistance pathogens. Most of the Gram- negative organisms were susceptible to Meropenem, Fosfomycin, Amikacin, Co-trimaxozole and Ertapenem. In Gram positive bacteria, they were highly sensitive to Fosfomycin, Linezolid, Doxycycline, Vancomycin and Nitrofurantoin.

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Competing interest

There is no conflict of interest.

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