



## A STUDY ON THE BACTERIOLOGICAL PROFILE OF URINARY TRACT INFECTION AND ANTIBIOTICS SENSITIVITY PATTERN IN A TERTIARY CARE HOSPITAL, JAMNAGAR, GUJARAT (INDIA)

**Dr. Saurabh Chhotatal Gamit**

MD Microbiology, Senior Resident, Department of Microbiology, M.P.Shah Govt. Medical College, Jamnagar.

**Dr. Krunal Mehta**

MD Microbiology, Assistant professor, Department of Microbiology, M.P.Shah Govt. Medical College, Jamnagar.

**Dr. Summaiya Mullan**

MD Microbiology, Professor and Head, Department of Microbiology, M.P.Shah Govt. Medical College, Jamnagar.

**ABSTRACT** Urinary tract infection (UTI) is defined as a disease caused by microbial invasion of the urinary tract that extends from the renal cortex of kidney to the urethral meatus. Urinary tract infections (UTIs) are among most common bacterial infections that need medical care; accounting for second most common infection after respiratory tract infections in community. Whereas in hospitals, they are the most common hospital acquired infections (HAIs) accounting for 35% of total HAIs. Approximately 1 in 3 women will require antimicrobial treatment for a Urinary Tract Infection (UTI) before age 24, and 50% of women will have a UTI during their lifetime. *Escherichia coli* are the most common cause of UTIs. Clean-Catch midstream urine was collected of the patients with history of fever, abdominal pain, dysuria, urgency and frequency. During study 343 urine samples received in microbiology laboratory for culture were processed according to standard protocol. Isolates were identified by conventional phenotypic methods and antibiotic sensitivity determined by standard Kirby Bauer disc diffusion method and follow Clinical and Laboratory Standards Institute (CLSI) guidelines. In this study 86 (25.07%) patients out of 343 were shown to be urine culture positive out of them 54 (62.79%) females and 32 (37.21%) males. The most isolated bacterium was *E. coli* with frequency rate of 54 (62.79%). The other bacteria were *Klebsiella* spp. 20 (23.26%), *Pseudomonas* spp. 07 (8.14%), and other gram negative bacteria 05 (5.81%). It is concluded that Gram-negative bacilli were responsible for UTI infections in our patients. The most common isolated bacteria from urinary tract infections were *E. coli* followed by *Klebsiella pneumoniae*. The most effective antimicrobial agents were Imipenem and Piperacillin-tazobactam and the least effective one was cephalexin.

### KEYWORDS

Female, Urinary Tract Infection, Antimicrobial susceptibility, *E. coli*

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\*Corresponding Author Dr. Krunal Mehta

MD Microbiology, Assistant professor, Department of Microbiology, M.P.Shah Govt. Medical College, Jamnagar. dr.saurabh999gamiy@gmail.com

### INTRODUCTION:

Urinary Tract Infections (UTIs) have been proven to be the most encountered bacterial infection in humans [1, 2], affecting all age groups and gender in both the community and hospital settings [3, 4]. About 50% of all females will experience at least an episode of UTI during their lifetime [5]. Asymptomatic bacteriuria and urinary tract infection (UTI) are common among adult men and women; although the incidence is higher among women due to their anatomy [6, 7]. They also have a higher prevalence among women during pregnancy and in very sexually active females [8]. Asymptomatic bacteriuria denotes significant bacteriuria ( $> 10^5$  CFU/mL of urine) without clinical symptoms of urinary tract infections (such as frequent urination, painful urination or fever) or other abnormal findings. The bacteriuria should not be due to contamination from urine sample collection.

UTI is an infection that affects any part of the urinary tract from the bladder to the kidney. It is not classified as a sexually transmitted infection [9] although sexual activity is known to be a risk factor [10]. Symptoms include frequent and/or painful urination, a feeling to urinate despite having an empty bladder, fever and flank pain. At times, the urine may contain pus and/or appear bloody. UTI is a risk factor for pyelonephritis, preterm delivery and miscarriages among pregnant women, and is associated with impaired renal function and end-stage renal disease among pediatric patients [11].

Antibiotic resistance in the treatment of UTI and other bacterial infections constitute a major public health problem especially in the developing countries. Irrational and indiscriminate use of antibiotics as well as fake and substandard drugs, including antibiotics is common in these countries [12, 13]. In view of these and attendant tendency for changes in bacteriological profile, it is worthwhile that the degree of susceptibility and resistance of these uropathogens to various antibiotics be known to clinicians for effective treatment of infections they cause and to avoid antibiotic miss-use. This study is aimed at determining the type and level of drug susceptibility of bacterial uropathogens isolated from female patients with symptomatic UTI and attending a tertiary health care institution in south-east Nigeria. This will help reduce irrational use of antibiotics and development of resistance.

### MATERIAL AND METHOD:

This study was carried out at tertiary care hospital, Jamnagar (Gujarat) between from 1st January to 31st March-2019. Total 343 patients with clinical manifestation of UTI were included in the study.

Clean catch mid-stream urine was collected from each patient in sterile screw capped container which were distributed to patients. Each specimen was appropriately labelled, transported to the microbiology laboratory of Shri M. P. Shah Medical College, Jamnagar as early as possible.

After receiving samples to laboratory, Mac Conkey agar, Blood agar were prepared per their manufacturing specification and sterilized in the autoclave by heating at 121°C for 15 minutes. The sterilized media were poured aseptically into petri dish and allowed to solidify. Each urine sample inoculated on it by using sterile calibrated loop and then agar plate incubated at 37°C for 24 hours in incubator with proper labelling. On next day, identification of bacterial isolates was done on basis of their culture, gram staining and biochemical characteristics.

The antibiotics susceptibility of pure culture was performed on Muller Hinton agar using the standard Kirby bauer disk diffusion method. Standard inoculum suspension prepared of each isolate into peptone water in test tube by adjusting to match 0.5 McFarland turbidity standard which was approx.  $1.5 \times 10^8$  CFU/ml bacterial suspension. This bacterial suspension was lawn culture on Muller Hinton plates by using sterile wooden cotton swab then allow to dry for 5 minutes. The antibiotics disks Ampicillin-Sulbactam(AS), Cephalexin(PR), Norfloxacin(NX), Ceftriazone(CI), Ciprofloxacin(RC), Tetracycline(TE), Gatifloxacin(GF), Nitrofurantoin(FD), Chloramphenicol(CH), Piperacillin-tazobactam(PT) & Imipenem(IPM) were placed aseptically on agar plate, then Muller Hinton plates incubated at 37°C for 24 hours in incubator with proper labelling. Next day the zone of inhibition measured of all antibiotics and recorded in millimetre. Susceptibility/Resistance was interpreted according to clinical and laboratory standard institute (CLSI) guidelines.<sup>[14]</sup>

### RESULT AND ANALYSIS:

This study was carried out at tertiary care hospital, Jamnagar (Gujarat) between from 1<sup>st</sup> January to 31<sup>st</sup> March-2019. Total 343 patient's urine samples with clinical manifestation of UTI were received. Out of these, only 86(25.07%) samples found positive microorganism growth. Out of them 54(62.79%) samples were from female patients and 32(37.21%) samples were from male patients. (Table-01)

This study show that maximum cases of UTIs were found in old age groups which were 39 (45.35%) (Table-02). Out of 86 isolated organisms, 54 (62.79%) were *E. coli*, 20 (23.26%) were *Klebsiella pneumoniae*, and 07 (8.14%) were *Pseudomonas aeruginosa* (Table-03).

**Table-01**

Total	Positive	Male	Female
343	86 (25.07%)	32 (37.21%)	54 (62.79%)

**Table-02: Age group wise distribution of UTIs positive cases**

Age groups (Years)	Total (n=86)	Male(n=32)	Female(n=54)
<10	09 (10.46%)	02	07
11-30	20 (23.26%)	09	11
31-50	18 (20.93%)	06	12
51-80	39 (45.35%)	15	24

**Table-03: Frequency of bacterial agent isolated from urine samples**

Organism	No. of isolation (%) (n=86)
<i>Escherichia coli</i>	54 (62.79%)
<i>Klebsiella pneumoniae</i>	20 (23.26%)
<i>Pseudomonas aeruginosa</i>	07 (8.14%)
Others ( <i>Acinetobacter</i> & <i>Proteus</i> )	05 (5.81%)

**Table-04: Antibiotics sensitivity pattern of isolated organisms**

Antibiotics	Sensitivity (%) (n=86)
Imipenem (IPM)	82 (95.35%)
Piperacillin-tazobactam (PT)	79 (91.86%)
Chloramphenicol (CH)	61 (70.93%)
Nitrofurantoin (FD)	51 (59.30%)
Gatifloxacin (GF)	32 (37.20%)
Tetracycline (TE)	28 (32.56%)
Ciprofloxacin (RC)	14 (16.28%)
Ceftriazone (CI)	11 (12.79%)
Norfloxacin (NX)	10 (11.63%)

Cephalexin (PR)	09 (10.47%)
Ampicillin-Sulbactam (AS)	08 (9.30%)

### DISCUSSION:

This study revealed that out of 343 UTIs patients 25.07% found positive bacterial growth which much similar to Angoti et al. [15] and Solanki et al. [16] study. Similar finding regarding the sex distribution of positive urine samples have reported in a study by Angoti et al. [15], Solanki et al. [16] and Bency et al. [18] (Table-05).

In our study, *E. coli* (62.79%) was predominant organism isolated which were similar to study of Angoti et al. [15] and Solanki et al. [16]. The present study also revealed that maximum positivity found in old age group which can compared with Bency et al. [18] study (Table-05).

**Table-05: Comparison of other studies**

Different Studies	Positivity (%)	Female	<i>E.coli</i>	50-80 Years
Angoti et al. [15]	24.96%	62.47%	55.38%	-
Solanki et al. [16]	21.68%	63.87%	65.97%	-
Singh VP et al. [17]	33.30%	45.40%	33.30%	-
Bency et al. [18]	-	63.30%	74.26%	59.78%
Present study	25.07%	62.79%	62.79%	45.34%

### CONCLUSION:

The study revealed that urinary tract infection is much more common in female gender due to their differing anatomy. *E. coli* is the predominant isolated pathogen in UTIs patients and study shows that bacterial isolates were resistant to the commonly prescribed antimicrobial drugs. The antimicrobial resistance pattern suggests that Nitrofurantoin(FD), Chloramphenicol(CH), Piperacillin-tazobactam(PT) & Imipenem(IPM) are more appropriate to treat the UTIs than routinely prescribed antimicrobial drugs like Ampicillin-Sulbactam(AS), Cephalexin(PR), Norfloxacin(NX), Ceftriazone(CI), Ciprofloxacin(RC), Tetracycline(TE), Gatifloxacin(GF). Appropriate measure may help to reduce UTIs, we recommend routine UTIs screening of high risk group like female gender, pregnancy, hospitalised patients, indwelling catheter and married individual to prevention of UTI at lower cost.

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