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Bacteriological Profile and Antibiotics Sensitivity Pattern of Patients with Urinary Tract Infection in Tertiary Care Center, Pipariya, Vadodara, Gujarat

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Abstract

The urinary tract is divided into the upper urinary tract, composed of the kidneys, renal pelvis, and ureters, and the lower urinary tract, which consists of the urinary bladder and urethra. Upper urinary tract infections most commonly ascend in nature, originate in the urinary bladder, and ascend through the ureters to the kidneys. The cardinal clinical manifestations of upper urinary tract infections are flank pain and fever, which are often associated with chills, frequency, urgency, and dysuria, and are more suggestive of infection of the urinary bladder and urethra. However, symptoms consistent with lower tract infections develop first in some patients with pyelonephritis or other upper urinary tract infections, particularly ascending infections. Lower urinary tract infections typically involve the bladder and urethra. Urinary tract infections are one of the most common bacterial infections among community-acquired infections, and in-hospital setups, urinary tract infections are the most common hospital-acquired infections. At least half of women experience tracts infection once in their life. The majority of patients with UTIs are infected with *Escherichia coli.* Urine samples were collected by sampling the midstream flow using the clean-catch technique. A total of 135 urine samples were collected from suspected patients and sent to the microbiology laboratory for diagnosis using different methods, such as staining, bacteriological culture identification, and antibiotic sensitivity determined using the standard Kirby Bauer disc diffusion method, following the Clinical and Laboratory Standards Institute (CLSI) guidelines. Of the 135 patients, 43 (31.85%) showed positive growth on culture media, of which 29 (67.44%) were female, and 14 (32.55%) were male. *E. coli* was the most isolated organism, followed by *Klebsiella pneumoniae* and *Pseudomonas* spp., with a frequency rate of 20 (46.52%), 09 (20.93%), and 07(16.28%), respectively. Most organisms are sensitive to imipenem and piperacillin-tazobactam, and most organisms are resistant to cephalexin.

Keywords: Female, Urinary Tract Infection, Antibiotics Sensitivity Pattern, *Escherichia coli*

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INTRODUCTION

Urinary tract infections (UTIs), which lead to bacterial infection.[1,2] mostly occur in the community and hospital setups irrespective of their age and gender.[3,4] However, at least half of the women experience urinary tract infections once in their life[5] because of the anatomical structure of the female urogenital system; females have a short urethra and close proximity of the urethral meatus to the anus.[6,7] In addition, a higher prevalence is seen among women during the gestation period and women who are very sexually active.[8]

Asymptomatic bacteriuria refers to the presence of bacteria in the urine without clinical features of UTIs (such as frequency, urgency, dysuria, or fever) or other abnormal findings. Any part of the urinary system from the urethral meatus to the renal cortex of the kidney is involved in UTIs. Although UTIs are more common in sexually active females, they are not categorized as sexually transmitted diseases.[9,10] UTIs' clinical manifestations are flank pain and fever, often associated with chills, frequency, urgency, dysuria, pyuria, and hematuria may be seen.[11]

MATERIALS AND METHODS

This study was conducted at the central laboratory of the Department of Microbiology, Dhiraj Hospital, Vadodara (Gujarat), from September 21 to October 31, 2021. This study evaluated the bacteriological profile and antibiotic sensitivity pattern of 135 clinically suspected UTIs and instructed patients with clinical manifestations of UTI to collect midstream portions of their urine using the clean-catch technique in sterile wide-mouth screw-capped containers. Personal education and training were given to women on how to clean the periurethral area and perineum before sample collection. Each specimen was appropriately labelled and transported to the microbiology section of the central laboratory as early as possible with a properly maintained cold chain.

After receiving samples from the laboratory, both selective and non-selective media, such as MacConkey agar and blood agar, were prepared according to the manufacturer's specifications. Each urine specimen was completely streaked overall quadrants using a sterile calibrated loop, and the agar plate was incubated at 37°C for 24h in an incubator with proper labeling.

The next day, the results were interpreted based on the appearance of microbial growth on culture media and microscopic examination using the Gram staining method, and interpretation was performed using standard biochemical reaction tests. Several bacteria from the Enterobacteriaceae family have been identified using various biochemical tests such as indole, H2S production-based catalase, citrate utilization, hanging drop, urease, oxidase, and sugar fermentation tests. For gram-positive bacteria, coagulase, catalase, bacitracin, optochin disk, and other tests were performed. Antimicrobial susceptibility tests were performed on Muller Hilton agar (MHA) using the Kirby-Bauer disc diffusion antibiotic sensitivity test method in accordance with the Clinical Laboratory Standards Institute (CLSI) guidelines.[12] The following drugs were used for the disc diffusion antibiotic sensitivity test. Ampicillin-sulbactam (AS), cephalexin (PR) norfloxacin (NX), ceftriaxone (CI), ciprofloxacin (RC), nitrofurantoin (FD), chloramphenicol (CH), piperacillin-tazobactam (PT), and imipenem (IPM) were placed aseptically on agar plates.

RESULTS

This study was conducted at the central laboratory of the Department of Microbiology, Dhiraj Hospital, Vadodara (Gujarat), from September 21 to October 31, 2021. A total of 135 clinical manifestations of UTIs were identified in the urine samples of patients. Of these, only 43 (31.85%) samples showed positive microbial growth. During analysis, 71 and 64 samples were from females and males, respectively. Out of which 29 (67.44%) and 14 (32.55%) cases were found in females and males, respectively (Table1).

Table 1. Prevalence of urinary tract infection

	Total (n=135)	Positive (n=43)
Male	64	14 (32.55%)
Female	71	29 (67.44%)
Total	135	43 (31.85%)

Table 2. Age groups wise distribution of UTI positive cases

Age Groups (Year)	Positive Cases (n=43)
<10	07 (16.27%)
10–30	09 (20.93%)
31–50	06 (13.95%)
>50	21 (48.84%)

Table 3. Frequency of bacterial agent isolated from urine samples

Organism	No. of isolation (n-43)
Escherichia coli	20 (46.52%)
Klebsiella pneumonia	9 (20.93%)
Pseudomonas aeruginosa	7 (16.28%)
Enterococcus spp.	5 (11.62%)
Acinetobacter spp.	2 (4.65%)

In addition, this study shows that maximum cases of UTIs were found in the older age groups, which were 21 (48.84%) (Table 2). Of the 86 isolated organisms, 20 (46.52%) were *Escherichia coli*, 9 (20.93%) were *Klebsiella pneumoniae*, 7 (16.28%) were *Pseudomonas aeruginosa*, and 5 (11.62%) were *Enterococcus* (Table 3). In this study show that maximum organism sensitive to Imipenem (IPM) and Piperacillin-tazobactam (PT) (Table 4).

DISCUSSION

This study revealed that out of 135 patients with UTIs, 31.85% showed positive bacterial growth, similar to the findings of Singh et al.[15] study. The sex-wise distribution of patients with UTIs also provided a similar result, which was reported in a study by Angoti et al.,[13] Solanki et al.,[14] and Bency et al.[16] (Table 5). In our study, *E. coli* (62.79%) was the predominant organism isolated, similar to the findings of Angoti et al.,[13] and Solanki et al.[14] The study also revealed that the maximum positivity was found in the old age group, which can be compared with the results of the study by Bency et al.[16] study (Table 5).

The study revealed that females were most affected due to their differing anatomies. In addition, *E. coli* was the predominant pathogen isolated from patients with UTIs. Studies have shown that isolated bacteria are resistant to routinely used antimicrobial drugs.

Table 4. Antibiotic susceptibility of isolated organisms

Antibiotics	Sensitivity (%) (n=43)
Imipenem (IPM)	42 (97.67%)
Piperacillin-tazobactam (PT)	42 (97.67%)
Chloramphenicol (CH)	33 (76.74%)
Nitrofurantoin (FD)	31 (72.09%)
Ciprofloxacin (RC)	11 (25.58%)
Ceftriaxone (CI)	11 (25.58%)
Norfloxacin (NX)	9 (20.93%)
Cephalexin (PR)	4 (09.30%)
Ampicillin-Sulbactam (AS)	1 (02.32%)

Table 5. Comparison of other studies

Different Studies	Positivity (%)	Female	*E.coli*	>50 Years
Angoti et al.[13]	24.96%	62.47%	55.38%	-
Solanki et al.[14]	21.68%	63.87%	65.97%	-
Singh VP et al.[15]	33.30%	45.40%	33.30%	-
Bency et al.[16]	-	63.30%	74.26%	59.78%
Present study	31.85%	67.44%	46.52%	48.84%

CONCLUSION

The study revealed that UTIs are much more common in women due to their differing anatomies. *E. coli* is the predominant pathogen isolated from patients with UTIs, and studies have shown that isolated bacteria are resistant to routinely used antimicrobial drugs. Appropriate measures may help reduce UTIs, and we recommend routine UTIs screening of high-risk groups such as female, pregnant, hospitalized patients, indwelling catheters, and married individuals to prevent UTIs at a lower cost.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

All authors listed have made substantial, direct, and intellectual contributions to the work and approved it for publication.

FUNDING

None.

DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript.

ETHICS STATEMENT

This study was approved by the Institute's Ethics Committee, Sumandeep Vidhyapeeth University, Vadodara, India.

INFORMED CONSENT

Written informed consent was obtained from the participants before enrolling in the study.

REFERENCES

1. Demilie T, Beyene G, Melaku S, Tsegaye W. Urinary bacterial profile and antibiotic susceptibility pattern among pregnant women in north west ethiopia. *Ethiop J Health Sci.* 2012;22(2):121-128. PMID: 22876076.
2. Parveen SS, Reddy SV, Rama Rao MV, Rao RJ. Uropathogens and their drug susceptibility patterns among pregnant women in a teaching hospital. *Ann Biol Res.* 2011;2(5):516-521.
3. Ahmed E. Urinary tract bacterial pathogens and their sensitivity pattern. *Journal of Rawalpindi Medical College.* 2014;18(2):263-266.
4. Omigie O, Okoror L, Umolu P, Ikuuh G. Increasing resistance to quinolones: A four-year prospective study of urinary tract infection pathogens. *Int J Gen Med.* 2009;2:171-175. doi: 10.2147/IJGM.S2641
5. Al-Badr A, Al-Shaikh G. Recurrent urinary tract infections management in women: A review. *Sultan Qaboos Univ Med J.* 2013;13(3):359-367. doi: 10.12816/0003256
6. Rowe TA, Juthani-Mehta M. Urinary tract infection in older adults. Aging Health. 2013. doi: 10.2217/ahe.13.38
7. Vasudevan R. Emergence of UTI causing *Staphylococcus aureus* as a superbug: Has the pathogen reduced the options of antimicrobial agents for treatment. *EC Microbiol.* 2015;1:88-112.
8. Verstraelen H, Verhelst R, Vaneechoutte M, Temmerman M. The epidemiology of bacterial vaginosis in relation to sexual behaviour. *BMC Infect. Dis.* 2010;10:81. doi: 10.1186/1471-2334-10-81
9. Flores-Mireles AL, Walker JN, Caparon M, Hultgren SJ. Urinary tract infections: Epidemiology, mechanisms of infection and treatment options. *Nat Rev Microbiol* 2015;13(5):269-284. doi: 10.1038/nrmicro3432
10. Lee-Ellen C. Copstead-Kirkhorn, Jacquelyn L. Banasik. Study guide for pathophysiology. (5 ed.). Elsevier Health Sciences. 2013:272.
11. Foxman B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. *Am J Med.* 2002;113(Suppl 1A):5S-13S. doi: 10.1016/S0002-9343(02)01054-9
12. CLSI. Performance standards for antimicrobial disk tests; Approved Standards. 25th Edition. Clinical and Laboratory Standards Institute (CLSI) Document M2-A9. Wayne. 2016;26(1).
13. Angoti G, Goudarzi H, Hajizadeh M, Tabatabaii Z. Bacteria isolated from urinary tract infection among patients and determination of the antibiotic susceptibility patterns of the gram negative bacteria in iran. *Novelty in Biomrdicine*. 2016;4(1):1-4.
14. Solanki M, Surani C, Mehta K, Mullan S. Bacteria Isolated From Urinary Tract Infection among Patients and Determination of the Antibiotic Susceptibility Patterns of the Gram Negative Bacteria in Tertiary Care Hospital. *Saudi Journal of Pathology and Microbiology.* 2018;3(12):488-449. doi: 10.21276/sjpm.2018.3.12.3
15. Singh VP, Mehta A. Bacteriological profile of urinary tract infections at a tertiary care hospital in Western Uttar Pradesh, India. *Int J Res Med Sci.* 2017;5(5):2126-2129. doi: 10.18203/2320-6012.ijrms20171855
16. Bency JAT, Priyanka R, Jose P. A study on the bacteriological profile of urinary tract infection in adults and their antibiotic sensitivity pattern in a tertiary care hospital in central Kerala, India. *Int J Res Med Sci.* 2017;5(2):666-669. doi: 10.18203/2320-6012.ijrms20170171