Gulf Journal of Medical Sciences
FE Gulf Publishers
https://fegulf.com

Investigation of bacterial UTI in Lahore, Pakistan; Extent, causes, and demographic factors

Ahmad Abdul Basit[1]

[1]National Hospital, Lahore, Pakistan

Article Info

Volume No: 1 **Issue No:** 2 **Page No:** 47-52

Received: 08-07-25 **Accepted:** 09-11-25 **Published:** 22-12-25

Abstract

A urinary tract infection (UTI) is an infection that affects different parts of the urinary system, including both the upper and lower tracts. The upper urinary tract consists of the kidneys and ureters, whereas the lower tract includes the bladder, urethra, and, in males, the prostate. When the infection occurs in the upper tract, it is referred to as a kidney infection, while an infection in the lower tract is known as cystitis or a bladder infection. UTIs are primarily caused by bacteria or fungi. This study aimed to investigate the bacterial causes of UTIs in Pakistan, with a focus on identifying the appropriate antibiotics, assessing epidemiological patterns—particularly among high-risk groups—and analyzing the infection rate based on gender and age. The research methodology involved collecting urine samples in sterile containers for culture and sensitivity testing. Various biochemical tests were conducted to isolate the organisms, and antibiotic susceptibility testing (AST) was performed using the disk diffusion method. A total of 968 urine samples were collected and analyzed, revealing a UTI positivity rate of 25.10% (243 out of 968 patients). Escherichia coli (E. coli) was identified as the most common bacterial cause of UTIs, followed by Enterococcus, Proteus, Klebsiella, Staphylococcus, and Enterobacter species. The findings indicated that UTIs were more prevalent in females than in males. Furthermore, it was more prevalent in higher age groups including 50 to 60 and above 60 years. Among the tested antibiotics, tetracycline showed the highest resistance, while chloramphenicol was found to be the most effective.

Keywords: Urinary Tract Infection, Epidemiology, Etiology, Treatment.

INTRODUCTION

Urinary Tract Infection (UTI) is an infection affecting various parts of the urinary tract. Common symptoms include frequent urination, pain during urination, small urine volumes, discolored or cloudy urine, and pelvic pain in women. UTI is a long-recognized condition, with historical records tracing back to 1550 BC in the Ebers Papyrus (Nickel,

2005). Early treatments involved the use of herbs, while the introduction of antibiotics in the 20th century significantly improved management.

It is estimated that approximately 250 million people develop UTIs annually (Mackenzie, 2017). The infection is more common in women than in men (Harrington, 2000). This increased susceptibility in women is primarily due to anatomical differences, such as a shorter urethra, which allows bacteria to reach the bladder more easily. Additional risk factors include sexual activity with multiple partners, hormonal changes after menopause that affect the urinary tract, poor hygiene, catheter use, reduced immunity, and congenital abnormalities in the urinary tract. UTI-related complications can range from mild to severe (Mazzulli, 2012). Although the morbidity rate of UTIs is lower compared to other healthcare-associated infections, continued research is necessary to improve treatment outcomes and address the challenge of antibiotic resistance (Andrade & Fernandes, 2016).

MATERIALS AND METHODS

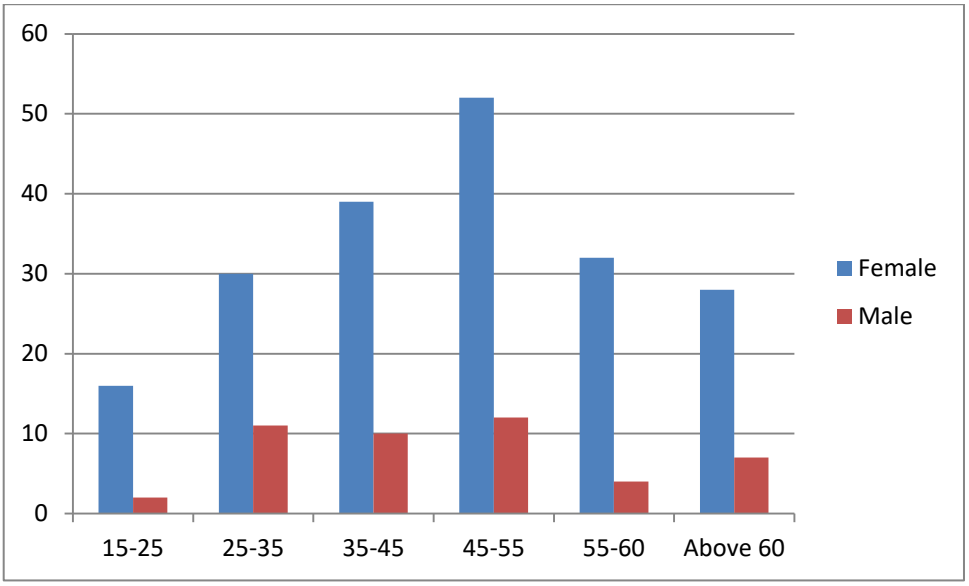
This study was carried out in a laboratory located in Lahore, Pakistan. Its primary objective was to identify the bacterial etiology, epidemiology, and antibiotic susceptibility testing (AST) of UTIs to determine appropriate treatment options for the local population. The research spanned one year, beginning in January 2024 and concluding in December 2024. Patients suspected of having a UTI were referred to the laboratory by their physicians for further analysis. Informed consent was obtained from all participants before including their samples in the study. Morning midstream urine samples were requested from patients before the administration of antibiotics. However, due to practical challenges, this was not feasible for all patients, in which case random urine samples were collected. For patients already on antibiotic treatment, they were instructed to delay urination until just before their next antibiotic dose. To ensure sample integrity, patients were advised to clean themselves thoroughly before providing a midstream urine sample. All collected samples were processed within 30 minutes of collection. Various culture media, including peptone water, UTI agar, nutrient agar, MacConkey agar, CLED agar, and Muller-Hinton agar, were used for bacterial isolation and sensitivity testing. Antibiotic susceptibility was evaluated following the Clinical and Laboratory Standards Institute (CLSI) guidelines, using antibiotic discs to classify bacteria as sensitive, resistant, or intermediate based on the size of the inhibition zones. To confirm the identity of the isolated bacteria, gram staining was performed. Biochemical tests were selected based on the organism's gram reaction and cell wall characteristics. For gram-positive organisms, tests such as the coagulase and catalase tests were conducted, while gram-negative bacteria were confirmed using the oxidase, indole, and methyl red tests. All media and broths used for bacterial isolation and sensitivity testing were manually prepared. Once the bacterial identification was confirmed, the data were analyzed for further interpretation.

RESULTS

Table 1

Age and Gender Comparison

	Female	Male
18-30	30 (15.22%)	8 (17.39%)
30-40	28 (14.21%)	9 (19.56%)
40-50	38 (19.28%)	11 (23.91%)
50-60	52 (26.39%)	12 (26.08%)
Above 60	49 (24.87%)	6 (13.04%)
Total	**197**	**46**



The results indicated that out of the total samples collected, 243 patient samples tested positive for bacterial UTI based on culture and sensitivity reports, representing a positivity rate of 25.10%. Among these UTI-positive patients, 197 were female, while only 46 were male, highlighting a significantly higher prevalence in women.

In the female category, UTI was common among female with higher age groups including 50 to 60 (26.39%) and above 60 (24.87%). In Male category, UTI was more common in male with age group of 50 to 60 (26.08%), and male with 40 to 50 years age category (23.91%). Overall, it shows that UTI was more common among the higher age group.

The bacterial strain analysis revealed that Escherichia coli was the most common pathogen identified among UTI patients, with a positivity rate of 50.3%. The majority of E. coli infections occurred in patients aged 30 years and above. Enterococci accounted for 24.23% of the positive cases, with the highest prevalence observed in the 20 to 30 years age group. Staphylococci infections were most common in patients aged 20 to 30 years, with an overall positivity rate of 17.17% across all age groups. Klebsiella was responsible for 5.52% of the UTI cases, with the highest occurrence also found in the 40 to 50 years age group. Proteus was isolated in 2.14% of the cases, predominantly affecting individuals aged 40 to 50 years. Lastly, Enterobacter was the least common pathogen, with a 0.61% positivity rate.

Table 2
Antibiotics Sensitivity and Resistant Patterns of UTI

Antibiotics list	**Sensitive (in%)**	**Resistant (in%)**
Chloramphenicol	78%	23%
Ceftriaxone	72.55%	24.39%
Amikacin	71.23%	29.27%
Nitrofurantoin	57%	31%
Co-trimoxazole	56%	28%
Ciprofloxacin	54.25%	41.25%

Amoxycillin	50.19%	40.42%
Levofloxacin	50.13%	40.35%
Cefazolin	48.23%	44.57%
Gentamicin	43.45%	39%
Norfloxacin	42.25%	45.37%
Cefuroxime	40.75%	39.85%
Clarithromycin	23.75%	56.55%
Ofloxacin	21.95%	52.25%
Erythromycin	20.87%	75.98%
Amoxyclave	19.25%	80.43%
Vancomycin	16.75%	75.23%
Tetracycline	13.75%	79.65%

The antibiotic sensitivity patterns indicated that Chloramphenicol was the most effective antibiotic, showing 78% sensitivity. Other antibiotics with high sensitivity rates included Ceftriaxone at 72.55%, Amikacin at 71.23%, Nitrofurantoin at 57%, Co-trimoxazole at 56%, Ciprofloxacin at 54.25%, Amoxicillin at 50.19%, Levofloxacin at 50.13%. Moderate sensitivity was observed with Cefazolin at 48.23%, Gentamicin at 43.45%, and Norfloxacin at 42.25%. Lower sensitivity rates were recorded for Clarithromycin (23.75%), and Ofloxacin (21.95%), Erythromycin at 20.87%, Amoxyclav at 19.25%, Vancomycin at 16.75%, and Tetracycline, which showed the lowest sensitivity at 13.75%.

Discussion

The primary focus of this study was to investigate urinary tract infections (UTIs) among residents of Lahore, Pakistan. Our analysis indicated that Escherichia coli was the most common cause of UTI in the collected samples. This finding aligns with other studies, such as one conducted in India, which also identified Escherichia coli as the leading cause of UTI (Mohan, Sarmah, & Hazarika, 2016). Additionally, previous research has reported Klebsiella as the second most common UTI-causing organism after Escherichia coli (Jadhav, Roushani, & HiCrome, 2016; Das, Borkotoki, Das, & Rajkhowa, 2016). Our study found that UTI was more prevalent among females compared to males, which is consistent with the findings of other research (Sen, Doley, Dutta, Das, & Gogoi, 2014; Angami, Jamir, Sarma, & Deka, 2015). This suggests that females are at a higher risk of developing UTIs than males. The most affected age group in our study was between 40 to 50 years, a trend that has also been observed in other studies (Thattil & Santhosh, 2018; Magliano, Grazioli, Deflorio, Leuci, & Mattina, 2012). Regarding antibiotic sensitivity, our findings indicated that Chloramphenicol, Ceftriaxone, Amikacin, Ciprofloxacin, Co-trimoxazole, and Nitrofurantoin were the most effective antibiotics. Similar antibiotic sensitivity patterns have also been reported by other researchers (Sharma & Paul, 2012; Mireles, Walker, Caparon, & Hultgren, 2015). Overall, our analysis confirms that UTIs are more common among females and are particularly prevalent within a specific age group.

CONCLUSION

Each geographical region exhibits distinct bacterial distribution and antibiogram patterns. Conducting studies to identify these patterns is essential for developing effective treatment strategies, optimizing antibiotic use, and addressing the growing concern of multi-drug resistance. Regular monitoring helps in understanding bacterial behavior and guiding appropriate antibiotic prescriptions. Furthermore, government authorities can play a vital role by implementing policies and initiatives to control or reduce the incidence of UTIs and other infectious diseases, ultimately improving public health outcomes.

Conflict of Interest

No conflict of interest was reported by the authors.

References

Andrade, V.L.F., Fernandes, F.A.V. (2016). Prevention of catheterassociated urinary tract infection: implementation strategies of international guidelines. *The Revista Latino-Americana de Enfermagem, 24*, e2678. http://dx.doi.org/10.1590/1518-8345.0963.267

Angami, S., Jamir, N., Sarma, P.C., Deka, A.C. (2015). Urinary tract infection, its causative microorganism and antibiotic susceptibility in Nagaland. *Archives of Medicine and Health Sciences, 3*(1), 40-43.

Das, M., Borkotoki, U., Das, A., Rajkhowa, P. (2016). Bacteriological profile of urinary tract infection in paediatric age group in a tertiary care hospital. *International Journal of Health Sciences and Research, 6*(4),146-152.

Harrington, R.D. (2000). Hooton TM. Urinary tract infection risk factors and gender. *The Journal of Gender-Specific Medicine, 3*(8), 27-34.

Jadhav, P.A., Roushani, S.B. HiCrome. (2016). UTI Agar: An alternative to conventional media for presumptive identification and isolation of uropathogens. *International Journal of Scientific Research, 5*(12), 20-23.

Mackenzie, D. (2017). UTIs could soon be life-threatening without new antibiotics. *New Scientist*, 3115.

Magliano, E., Grazioli, V., Deflorio, L., Leuci, A.I., Mattina, R. (2012). Gender and age-dependant etiology of community-acquired urinary tract infections. *The Scientific World Journal*, 1-6.

Mazzulli, T.M.D. (2012). Diagnosis and management of simple and complicated urinary tract infections (UTIs*). The Canadian Journal of Urology, 19(Supplement 1),* 42-48.

Mireles, A.L.F., Walker, J.N., Caparon, M., Hultgren, S.J. (2015). Urinary tract infections: epidemiology, mechanisms of treatment options. *Nat Rev Microbiol 13*(5), 269-284.

Mohan, D.G., Sarmah, A., Hazarika, N.K. (2016). A study in microbiological profile of complicated urinary tract infection (UTI) in a tertiary care hospital of NE region. I*nternational Journal of Medical and Health Research, 2*(1), 47-50.

Nickel, J.C. (2005). Management of urinary tract infections: Historical perspective and current strategies: Part1Before antibiotics. *The Journal of Urology,173*(1), 21-26.

Sen, A.K., Doley, R.M., Dutta, P.K., Das, D., Gogoi, R.R. (2014). Urinary tract infection in elderly-A clinical & microbiological study. *Assam Journal of Internal Medicine, 4*(2), 18-21.

Sharma, I., Laskar, A., Paul, D. (2014). Studies on Non-Cathethar related urinary tract infections from Assam, North-East India. *Online International Interdisciplinary Research Journal, 4*(2), 88-94.

Sharma, I., Paul, D. (2012). Prevalence of community acquired urinary tract infections in silchar medical college, Assam, India and its antimicrobial susceptibility profile. *Indian Journal of Medical Sciences, 66*(11), 273279.

Sneader, W. (2001). *History of Sulfonamides. Wiley Online Library 2001*. https://doi.org/10.1038/npg.els.0003625 3.

Thattil, S.J., Santhosh. S. (2018). Prevalence of UTI in different age groups in a tertiary care hospital and their antibiogram, *International Journal of Contemporary Medical Research, 5*(1), 3-6.