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The burden of recurrent urinary tract infections in patients attending a tertiary care hospital in Northern India

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ABSTRACT

Background

Recurrent urinary tract infections (UTIs) are primarily caused by reinfection by the same pathogen. The use of various antibiotics has been the mainstay in remodelling the rate of UTIs, but recurrent UTIs continue to affect people. The various antibiotics prescribed for the treatment of UTIs are imipenem, fosfomycin, ceftriaxone, quinolones, gentamicin, tetracycline, amikacin and nitrofurantoin. Studying the aetiology and antibiotic sensitivity pattern of uropathogens helps clinicians understand the resistance patterns among these microbes. Given the extensive economic and healthcare burden of UTIs and alarming antibiotic resistance, there is a crucial need to better understand the tendency of relapse and recurrence associated with UTIs. This study aims to assess the microbial aetiology and antibiotic sensitivity of isolates in UTIs, which may ultimately help clinicians formulate an empirical treatment.

Methods

Urine samples from all the patients presenting with clinical suspicion of urinary tract infections were sent for urine culture. Samples were collected by clean-catch midstream technique. After performing microscopic examinations of the urine samples, the samples were cultured on UTI CHROMagar.

Result

A total of 1,685 urine samples of patients with suspected urinary tract infections were processed for urine culture and sensitivity. Total culture-positives obtained were 474. The most common uropathogen isolated was *Escherichia coli* (41.2%) followed by *Enterococcus spp* (24.87%), *Klebsiella spp* (14.28%), *Staphylococcus aureus* (7.94%), *Pseudomonas spp* (5.29%), *Acinetobacter spp* (3.97%), *Citrobacter spp* (1.32%) and *Proteus spp* (1.05%) respectively. The isolated uropathogens showed maximum sensitivity to antibiotic imipenem and fosfomycin.

Conclusion

Urinary tract infection is one of the most commonly encountered infections in general practice. Females are affected more than males. *Escherichia coli* was the predominant bacterial isolate obtained from patients with urinary tract infections. The isolated uropathogens showed maximum sensitivity to antibiotics imipenem and fosfomycin. Studying the microbiological profile and the antibiotic susceptibility pattern of uropathogens helps to formulate antibiotic treatment in the hospital.

Keywords: Urinary Tract Infection, Uropathogen, UTI CHROMagar, Antimicrobial Resistance

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INTRODUCTION

Recurrent urinary tract infection is defined as three UTIs with three positive urine cultures during a single 12-month period, or two infections during the previous 6 months prior to a third diagnosis.[1-4] UTIs are a common infection among patients seeking medical assistance and are a matter of concern for clinicians across the world, with an estimated annual global incidence of at least 250 million cases.[5-6] Many different microorganisms are responsible for UTIs. Though usually caused by bacteria, other microbes such as fungi and viruses can also be the aetiological agents.[7] The most predominant bacteria causing UTIs is *Escherichia coli*, which accounts for 41% of all uropathogenic isolates, followed by *Enterococcus spp* (24.87%), *Klebsiella spp* (14.28%), *Staphylococcus aureus* (7.94%), *Pseudomonas spp* (5.29%), *Acinetobacter spp* (3.97%), *Citrobacter spp* (1.32%) and *Proteus spp* (1.05%) respectively. The prevalence of UTIs is higher in females, due to anatomical structure and lack of prostatic secretions, which have bactericidal properties.[8]

Since patients are often prescribed antibiotics before their clinicians receive the antibiotic sensitivity reports, there is a risk of increasing the growing global antimicrobial resistance crisis. This is a prime concern with UTIs, as they tend to recur. While there have been innovations in new treatments and vaccines, antibiotics remain the mainstay of treatment for UTIs. Even with treatment, up to 25% of women experience a relapse within six months.[9]

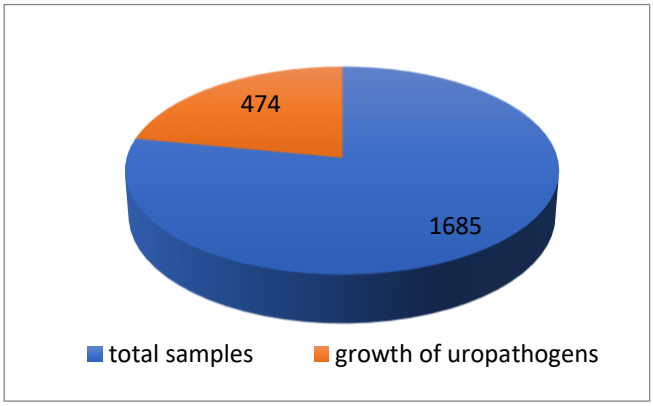

Fig 1: Prevalence of UTIs

UTIs are often treated empirically, with therapy based on the report of the antimicrobial resistance pattern of uropathogens[10]. However, due to unrestrained antibiotic usage, there is an emergence of resistant bacterial infections,[11-14] resulting in an increased prevalence of AMR among uropathogens worldwide. Recurrent UTIs contribute to an increased economic and healthcare burden. Some patients develop recurrent UTIs for years, demanding prophylactic antibiotics thus increasing the risk of antimicrobial resistance.[9] To develop new treatment policies for UTIs, clinicians must understand their aetiology and uropathogen resistance patterns.

METHODS AND MATERIALS

The current study was conducted in the department of microbiology, Government Medical College (GMC), Jammu, India. 1,685 urine samples were tested. The samples were collected from the patients by clean-catch midstream technique in a wide-mouth sterile container, and immediately transferred to the lab. Samples were cultured on CHROMagar™. The presence of >5 WBCs per HPF in wet mounts of centrifuged urine was considered as an indicator of significant pyuria. On gram staining, the presence of even a single bacteria per HPF of uncentrifuged urine was considered significant. The uropathogens were isolated and tested for antimicrobial sensitivity. All isolates were subjected to biochemical tests for identification. Quality controls were also used.

RESULTS

Out of the 1,685 urine samples cultured, 474 were culture positive for uropathogens (Fig 1). *Escherichia coli* (41.2%) was the most prevalent organism followed by *Enterococcus spp* (24.87%), *Klebsiella spp* (14.28%), *Staphylococcus aureus* (7.94%), *Pseudomonas spp* (5.29%), *Acinetobacter spp* (3.97%), *Citrobacter spp* (1.32%) and *Proteus spp* (1.05%). The isolated uropathogens showed maximum sensitivity to imipenem and fosfomycin. The antibiogram of bacterial isolates of UTI was also studied. Most of the isolates were highly sensitive to imipenem (90%), fosfomycin (78%), ceftriaxone (52.3%), quinolones (68%), gentamicin (43.7%) and tetracycline (18.1%).

Table 1 Gender distribution of patients from whom uropathogens were isolated

Gender	Number	Percentage
Male	66	13.9%
Female	408	86%
Total	474	100%

Table 2 Frequency of specific bacteria isolated from patients with UTI

Isolates	Number	Percentage
Escherichia coli	156	41.2%
Enterococcus spp	94	24.87%
Pseudomonas spp	20	5.29%
Klebsiella spp	54	14.28%
Staphylococcus aureus	30	7.94%
Proteus spp	4	1.05%
Citrobacter spp	5	1.32%
Acinetobacter spp	15	3.97%
Total	**378**	100%

Table 3 Antibiogram of isolates from urine samples of patients with UTI

Antibiotics	Sensitivity
Imipenem	90%
Fosfomycin	78%
Ceftriaxone	52.3%
Quinolones	68%
Gentamicin	43.7%
Tetracycline	18.1%

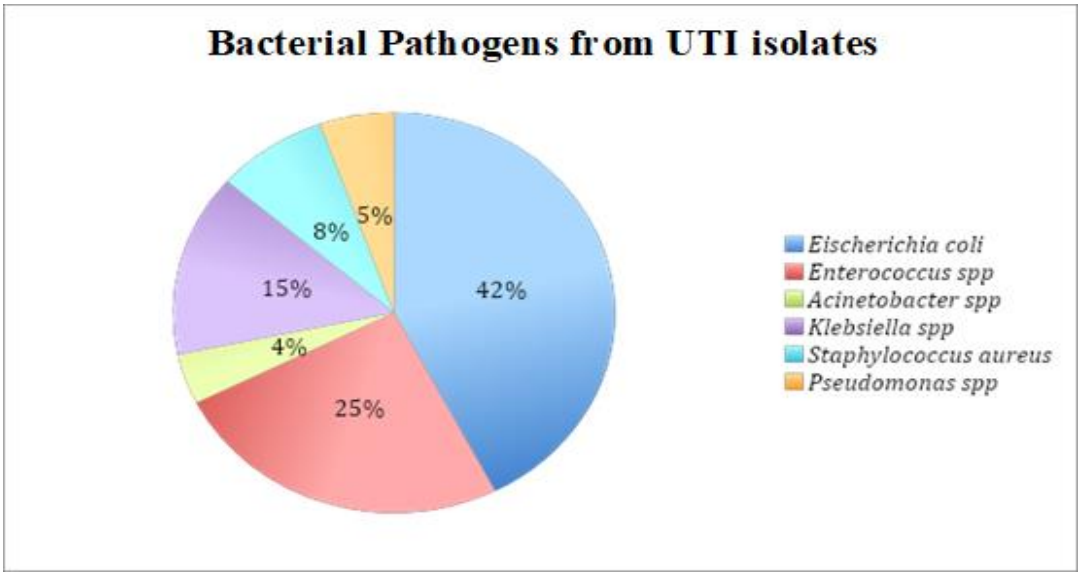

Fig 2 Bacterial pathogens from UTI isolates

DISCUSSION

In the present study, a total of 1,685 urine samples were collected from patients with suspected urinary tract infections. Out of 1,685 samples, 474 cultures showed growth of uropathogens. Bacterial infection of the urinary tract is one of the common causes of conditions in the community that lead to sufferers seeking medical attention.[15] Effective management of patients suffering from bacterial UTIs depends on detecting the type of organisms causing the disease and the choice of antibiotic agent used.[16]

In this study, the prevalence of gram-negative organisms was higher than gram-positive organisms. Out of the 474 isolates, *Escherichia coli* was the most common isolate followed by *Enterococcus spp*. Among gram-negative organisms, *Escherichia coli* was the most common organism followed by *Klebsiella spp*, *Pseudomonas spp, Acinetobacter spp, Citrobacter spp* and *Proteus spp*. Among gram-positive organisms, the most common isolate was *Enterococcus spp* followed by *Staphylococcus spp*.

Escherichia coli is the most prevalent aetiological agent causing UTI, accounting for 90% of the cases globally.[17] In this study, we also found *Escherichia coli* to be the most common bacteria isolated from urine samples, which is consistent with findings in other studies.[18-21] In contrast to other studies, where the second most common isolate has been found to be *Staphylococcus spp*,[19,21], in this study, it was instead *Enterococcus spp*.

The prevalence rate of UTIs in females globally is significantly higher in comparison to males. In the present study, female patients accounted for 86% positive culture isolates, similar to incidence recorded in other previous studies.[22]

CONCLUSION

Urinary tract infections are one of the most commonly encountered infections in general practice. Females are affected more than males. In our study, uropathogens show maximum sensitivity to antibiotics including imipenem and fosfomycin. The increasing antimicrobial resistance of uropathogens has become a great concern for clinicians. The prevalence of urinary tract infections is on the rise due to multidrug resistant organisms, which makes empirical treatment more difficult. One reason for high resistance to commonly prescribed antibiotics is the irrational use of antibiotics due to easy access to these drugs. Regular observation of microbial profile, antibiogram and sensitivity pattern of uropathogens is obligatory for effective treatment.

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