

Original Article

ANTI-MICROBIAL SPECTRUM FOR BACTERIAL UROPATHOGENS IN ADULT PATIENTS ASSOCIATED WITH URINARY TRACT INFECTIONS AT GOVERNMENT TEACHING HOSPITAL

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ABSTRACT

Objective: Urinary tract infection (UTI) is one of the most common bacterial infections, affecting 150 million people each year worldwide. UTI's are a significant cause of morbidity in females, infant boys and older men of all age groups. The most common causative agent for UTI is uropathogenic *Escherichia coli*. Patients suffering from symptomatic UTI are commonly treated with antibiotics. The present study was undertaken to find the etiology, risk factors, clinical pattern, isolated uropathogens and therapeutic profile of UTI.

Methods: It was a prospective, observational, descriptive, cross-sectional study conducted for a period of 6 mo from April 2022 to September 2022 at RIMS, Kadapa. A total of 35 UTI patients were recruited based on study criteria. The data was collected, analysed, summarised as averages. Graph pad prism software was applied for statistics by using Microsoft excel. Fig. represented through bar graphs, pie charts.

Results: In a total of 35 patients suffering from UTI, we found that 7 were males and 28 were females, based on age groups; 2 patients belong to 21-30 y and 18 patients belong to 31-40 y, 10 patients belong to 41-50 age group, 3 patients belong to 51-60 y. In a total of 82 risk factors 40% were diabetes mellitus, 20% were hypertension, 17% were renal calculi, 5% were cyanosis, 11% were BPH, 6% were ESRD. In a total of 95 clinical symptoms, we observed fever (32.5%) as a major symptom, followed by burning micturition (16.5%). Other signs like abdominal pain, urine urgency, hematuria were also reported. On assessing urine culture, uropathogens *Escherichia coli* (35%) was isolated in majority UTI cases followed by *Staphylococcus aureus* (17%), *Pseudomonas aeruginosa* (14%), *Candida species* (14%), *Enterococcus faecium* (11%), *Proteus species* (8%). Total drugs prescribed were 150. Fluoroquinolones (48 in number, 32%) were the most common prescribed antibiotic drug category, followed by Anti-mycobacterial (32 in number, 21%), Cephalosporins (25 in number, 17%), Penicillins (20 in number, 13%), Macrolides (14 in number, 10%), Combinational therapy (11 in number, 7%).

Conclusion: The UTI prevalence was more in females at GGH-RIMS, Kadapa. *E. coli* was the most common species isolated in UTI patients. At research site, physicians frequently prescribed medications were Ciprofloxacin (fluoroquinolones) and Nitrofurantoin (anti-mycobacterial) for UTI patients.

Keywords: Urinary tract infection, *E. coli*, Fever, Ciprofloxacin, Nitrofurantoin

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INTRODUCTION

After respiratory and gastrointestinal illnesses, urinary tract infections (UTI) are third on the list of infections that affect people. In fact, among patients admitted to hospitals in the United States, urinary tract infections caused by bacteria are the most frequent source of nosocomial and community-acquired illnesses. It is upsetting and occasionally dangerous to one's life. The location of the infection and risk factors, however, affect the prognosis and treatment of urinary tract infections. A UTI is a condition where bacteria have colonized and are growing inside the urinary tract. The presence of bacteriuria must be shown for diagnosis. Patients with pyogenic kidney or perinephric tissue abscesses, blocked pyonephrosis, or bacterial prostatitis are exceptions. Definitions are required because microbial infiltration of the tissues stretching from the urethral orifice to the renal cortex may produce an infection of the urinary tract. Although the illness and its symptoms may be localized, the presence of bacteria in urine increases the risk of invasion throughout the entire urinary system. The presence of 100,000 or more colony-forming units (CFU) per ml of urine is considered to be significant bacteriuria. The validity of Kass criteria has been called into question however, substantial evidence of urinary tract infection in young women with symptoms can be found in bacterial counts of 102 or more organisms per ml, especially when pyuria is present (>10WBC/mm³) [1, 2]. A more lenient consensus definition provided by the Infectious Disease Society of America (IDSA) called for 103 organisms per milliliter to diagnose cystitis and 104 per milliliter to identify pyelonephritis [3].

Although both men and women can contract the infection, UTIs are typically regarded of as a sickness affecting women, of whom 50% will have the condition at some point in their lifetime [4]. Each year, 150 million people worldwide are affected by urinary tract infections (UTIs), which are among the most prevalent bacterial illnesses [5, 6]. Around 25% of women who initially present with bacterial cystitis go on to experience recurrent UTI within 6 mo, with some experiencing 6 or more infections in the year that follows the original episode [7]. The prevalence of multidrug-resistant uropathogens is rising, and antibiotic treatment for acute infections does not prevent recurrences, making current therapies unsatisfactory [8]. Since mice mimic many aspects of the bladder epithelial milieu, the pathogenic cascade of UPEC cystitis has been widely researched in recent years, mostly in cell culture and mouse models [9]. Because of the structure of the female reproductive system, UTIs commonly affect the upper and lower urinary tracts.

One of the infections that primary care physicians treat the most frequently is an uncomplicated lower UTI. Children and infants frequently contract infections from the urinary system, which is also the most frequent bacterial infection in children under 2 y old in both the community and the hospital environment [10]. UTIs are more frequent in boys during the first six months of life [11]. The outcome is typically benign, but UTIs can proceed to renal scarring in the early years of life, particularly when linked to congenital urinary tract defects. Renal scarring can result in adult issues such as hypertension, proteinuria, renal damage, and chronic renal failure, which needs to be treated with dialysis [12]. In their lifetime, 40% of

women will experience a UTI. In Singapore, young adult women make about 4% of those affected, and the frequency rises to 7% by the time they reach 50. Nearly half of adult women will have at least one episode of a UTI in their lifetime, which is 30 times more probable than men [13]. According to statistics, one in three women experience their first UTI episode by the time they are 24 y old. Young women who are sexually active tend to have UTIs more frequently. The elderly and others who need urethral catheterization are other vulnerable adults. Statistics from Singapore's Ministry of Health show that from January 1 to December 31, 2015, 4,144 patients with UTIs were hospitalized to private and public hospitals in Singapore, with an average hospital stay of 2 to 4.8 d [14].

Recurrent UTIs are symptomatic UTIs that recur after an earlier episode has subsided, usually following effective treatment. Even though these women typically have urinary tracts that are physically and physiologically sound, they are frequently found in young, healthy women. Urine cultures are necessary for therapy, however, recurrent UTIs can be detected clinically without doing one. Imaging of the upper urinary tract and cystoscopy are not typically advised for examination in women who have recurrent UTIs. However, they need to be done right away in individuals who have unusual symptoms, like obstructive symptoms or the presence of haematuria after an infection has cleared up [15]. Asymptomatic bacteriuria (ABU) doesn't harm or injure the kidneys. Treatment for ABU is not advised except in diagnostic and therapeutic procedures involving entry to the urinary tract with a risk of mucosal damage, such as endoscopic urological surgery and transurethral resection of the prostate. This is because several studies involving women and the pediatric population have shown that treatment for ABU increases the risk of symptomatic UTIs in the future. According to studies conducted in the 1990s, many guidelines recommend screening and treating ABU in pregnant women to decrease the frequency of low-birth-weight infants and preterm deliveries. However, more recent studies have revealed conflicting results regarding the improvement of outcomes after ABU treatment in pregnant women [16].

MATERIALS AND METHODS

Study design

It was a prospective observational cross-sectional study conducted in the department of General Medicine, Rajiv Gandhi Institute of Medical Sciences (RIMS), Kadapa, Andhra Pradesh, South India, for a period of 6 mo i.e., from April 2022 to September 2022.

Ethical consideration

The institutional ethical committee of RIMS hospital and the clinical guide of General Medicine department gave their approval for the collection of patient data.

Inclusion criteria

- Patients who agreed to participate by signing informed consent form.

- Both male and female patients of age groups of 20 to 70 y.
- Patients undergone midstream urine culture for UTI diagnosis.
- Patients are prescribed with antimicrobial drug regimens.
- Patient suffering from previous co-morbid conditions.

Exclusion criteria

- Patients who were not willing to participate in the study.
- Pregnant, Breastfeeding women, Children, Geriatrics (>70 y)
- Patients were excluded if other diagnoses were considered to be likely, for example, women with vaginal symptoms.
- Patients with current severe mental problems (such as dementia).

Materials

- **Patient informed consent document (Annexure-I):** After obtaining the patient's informed consent, the patient's information and the laboratory's parameters were gathered.
- **Patient data collection form (Annexure-II):** In order to record patient information, a well-organized patient data collection sheet was created.
- **Patient information leaflet (Annexure-III):** Every medicine package has a patient information leaflet, a technical document that provides written information about the medication. Manufacturers supply patient information leaflets (PILs) that adhere to a standard format and include the same types of details for every medication.

Methodology

This was an observational prospective analytical study conducted in General medicine outpatient and inpatient departments, at GGH-RIMS Hospitals after obtaining Institutional Ethics Committee clearance. The study was conducted for a period of six months, from April 2022 to September 2022, during which 35 prescriptions were analyzed. The sample size selection was based on the WHO guidelines for conducting drug utilization studies and on the basis of other such studies conducted in the past. This study included patients of all age (>20 y) and sex suffering from UTI having comorbidities. Patients experiencing life-threatening conditions, immunocompromised condition, other infection besides UTI, past medication history of immunosuppressant drugs were excluded from the study. Whole data was documented in proper format.

Statistical analysis

Average statistical results are taken into account while analysing patient data. Frequencies and percentages were used to display the results. Software called Graph Pad Prism was used to examine the data. Excel was used to create bar graphs and pie charts. The complete data set was prepared and closely examined.

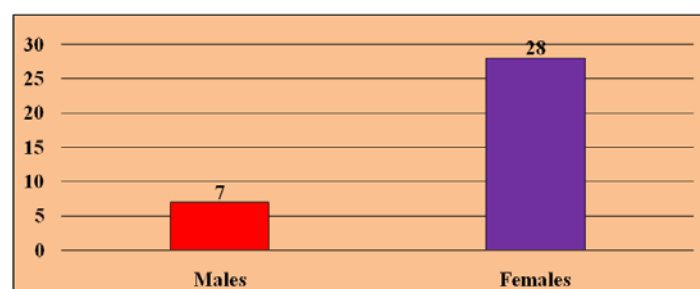


Fig. 1: Distribution of male patients and female patients suffering from UTI

RESULTS

A prospective observational descriptive cross-sectional study was conducted for a period of 6 mo i.e., from April 2022 to September 2022 in a South Indian tertiary care teaching Hospital RIMS, Kadapa. A total of

35 patients were recruited under inclusion criteria after taking informed consent form (ICF) from patients. Based on gender 28 patients were females (80%) and 7 were male patients (20%). We found that majority of patients belonged to 31-40 y' age group, contributing 51%. In a total of 35 patients, 82 risk factors have been noticed. Among all risk factors,

majorly 33 were diabetic (40%). Based on clinical profile 95 clinical signs were present. Among all, majorly i.e., 31 symptoms were found to be pyrexia (32.5%). In a total of 35 recruited patients, all of them have undergone urine culture test. Among them, 12 isolates were Escherichia coli (35%). In a total of 150 prescribed drugs, physicians prescribed 20 Penicillin category drugs constituted for 13%, Cephalosporins

prescribed were 25 constituted for 16.5%, Fluoroquinolones prescribed were 48 constituted for 32%, Anti-mycobacterial agents prescribed were 32 constituted for 21%, Macrolides prescribed were 14 constituted for 9.5%, drug combinations prescribed were 11 constituted for 7%. On assessment, we found that majority of physicians prescribed Fluoroquinolones to UTI patients.

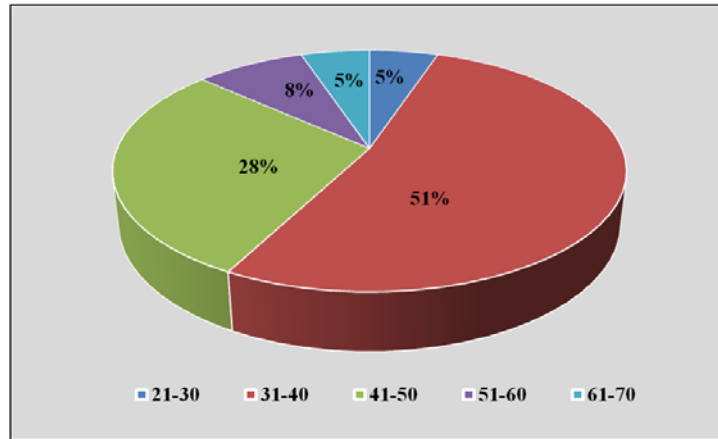


Fig. 2: Evaluation of UTI patients based on different age groups

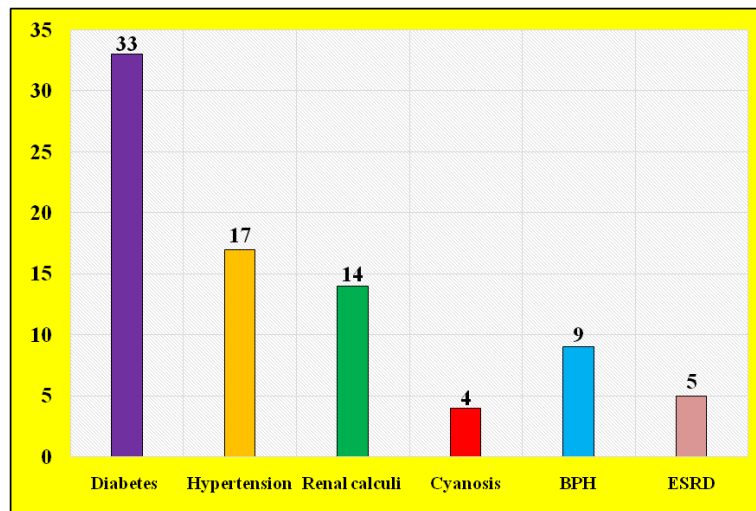


Fig. 3: Classification of UTI patients based on risk factors

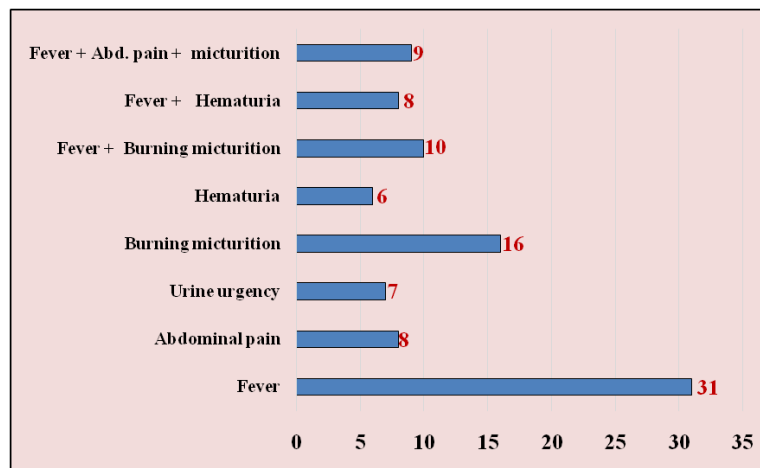


Fig. 4: Estimation of UTI patients based on clinical signs

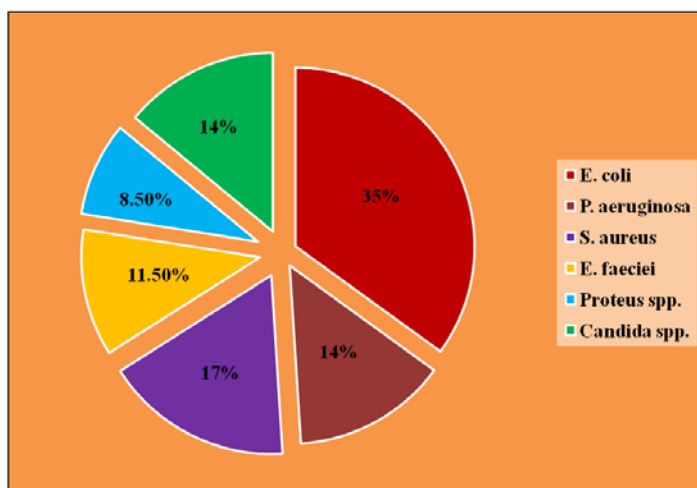


Fig. 5: Interpretation of UTI patients based on isolated uropathogens

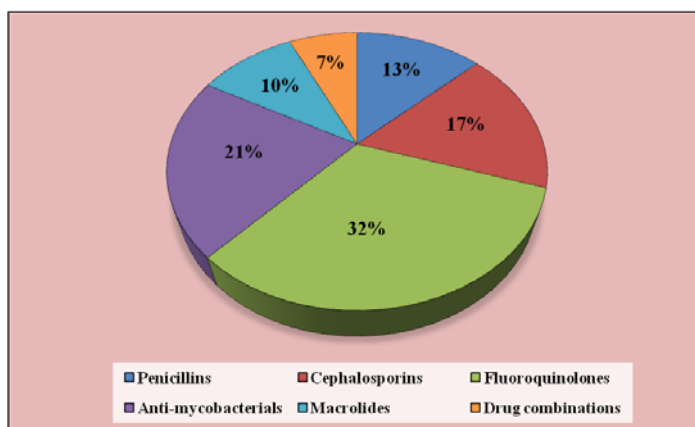


Fig. 6: Assessment of antimicrobials used in UTI patients

DISCUSSION

In both community and hospital settings, urinary tract infections are most prevalent and frequent bacterial illnesses in people, affecting all sexes and all age groups (Hooton *et al.*, 1995). Burning urination, lower abdominal pain, a fever, or chills are some of the warning signs and symptoms (Nkudic *et al.*, 2005). The goal of this study was to learn more about the microorganisms that cause UTI so that clinicians could select the best course of action. Following extensive research on-site, it was discovered that 80% of study subjects were female and 20% were male. We discovered that females are more likely than males to experience urinary tract infections. Our findings were compared to those of Mohamed Hayir *et al.*, who published a study in 2019 on "Bacterial uropathogens in UTI and antibiotic susceptibility patterns in Banadir hospital, Mogadishu-Somalia" and found that both groups had similar findings. The percentage of males and females was 86.4% and 13.6%, respectively. In our analysis, the age range affected most frequently 31 to 40 y had 18 instances (51%). Dinesh K. Dhodi *et al.*'s study from 2014 on the "Prescribing patterns of antibiotics among patients of UTI with pre-existing renal disorders" produced results that were closely comparable, showing that 55 patients (44%) belonged to the 31-45 y age range. Patients with hypertension (17 in number, 20%) and diabetic patients (33 in number, 40%) were the two groups most frequently impacted by UTI. This was in contrast to a 2012 study by Arul Prakasam *et al.* entitled "A cross-sectional study on distribution of urinary tract infection and their antibiotic utilization pattern in Kerala" which revealed that diabetes and smoking were the two most common risk factors. 35 patients in total had 95 clinical symptoms found. We discovered that the majority of patients, or 32.5%, had a fever at the

time of admission. It was compared to a study done in 2016 on "Clinical Study of UTI in Malla Reddy Institute of Medical Sciences, Hyderabad" by Rajashekar Rao *et al.*, and both studies found that fever was the most prevalent symptom in UTI patients. Escherichia coli was the most frequently identified causal agent in the current investigation, accounting for 35% of UTI cases. In a study by Shintu Shaji *et al.*, published in 2021, "A study on antibiotic sensitivity pattern for hospitalized UTI in south India" also accounted for the same, or 50% (the most common isolated species was E. coli).

Amoxicillin+Clavulanic acid was the medication that was prescribed the most frequently among a total of 20 Penicillins. The most often recommended medication in a total of 25 Cephalosporins was Cefixime. Nitrofurantoin was the most often recommended medicine out of a total of 32 anti-mycobacterial drugs. The most often given medication across all 14 Macrolides was azithromycin. All these results were contrast to study conducted by "Alavudeen *et al.*, in 2021 "Evaluation of antibiotic prescribing practices and antimicrobial sensitivity patterns in urinary tract related infectious diseases" in which Amikacin was highly prescribed drug in Penicillins category, Cefuroxime was highly prescribed drug in Cephalosporins category, Meropenem was highly prescribed drug in Anti-mycobacterial, Clindamycin was highly prescribed in Macrolides. As our research was ongoing, it was discovered that doctors were restricted to using hospital formularies to treat UTI. In a total of 150 prescribed antibiotics, fluoroquinolones (48, 32%), anti-mycobacterial agents (32, 21%), cephalosporins (25, 16%), penicillins (20, 13%), and macrolides (14, 9%) were the most frequently prescribed medication groups. In support of this, Arul Prakasam *et al.*'s 2012 study, "A cross-sectional study on

distribution of urinary tract infection and their antibiotic utilization pattern in Kerala" found that fluoroquinolones were the most often prescribed antibiotics for UTIs.

CONCLUSION

One of the most prevalent infectious diseases seen regularly at the GGH-RIMS, Kadapa, a tertiary care teaching hospital, is urinary tract infection. If not properly managed, complications may arise, raising the disease's morbidity and fatality rate. Urinary tract infection care depends heavily on antimicrobials. However, picking the right antibiotic is crucial in this age of antimicrobial resistance. We discovered that, compared to male patients, female patients at the research site experienced greater incidence rates of UTI. The majority of individuals with UTI diagnoses were between the ages of 31 and 40. Patients with Type 2 Diabetes Mellitus were most at risk for acquiring UTI, followed by those with hypertension. At the time of admission, UTI patients frequently complained of fever and stomach pain. The most typical isolated microbial species for UTI was *Escherichia coli*. Fluoroquinolones and anti-mycobacterial medicines were the most commonly recommended antimicrobials in our study. Ciprofloxacin was a fluoroquinolone antibiotic that was regularly administered. In order to provide the best care possible to patients with UTI, it is now crucial for a treating physician to be knowledgeable about the local pattern of antibiotic resistance and the uropathogens that are to blame.

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LIMITATIONS

The greatest obstacle to understanding superficial fungal infections is the variations in clinical presentation between the various species (SFI). Despite their limits for identifying the species, routine clinical diagnostic analysis is nevertheless frequently utilized for the identification and confirmation of fungal isolates. In our investigation, there was no patient follow-up to compare the antifungal susceptibility data with the clinical outcomes.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICTS OF INTERESTS

Declared none

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