Section: Pharmacology

Original Research Article

DRUG UTILIZATION PATTERN AND COST ANALYSIS FOR THE TREATMENT OF URINARY TRACT INFECTIONS (UTI) IN A TERTIARY CARE TEACHING HOSPITAL. A PROSPECTIVE, OBSERVATIONAL, CROSS SECTIONAL STUDY

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Received : 20/03/2026
Received in revised form : 12/05/2026
Accepted : 29/05/2026

Keywords:
Urinary tract infection, Drug utilization study, Antibiotic prescribing, Pharmacoeconomics, Prescription pattern, Cost analysis, Antimicrobial stewardship.

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DOI: 10.47009/jamp.2026.8.3.140

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (3); 771-779

ABSTRACT

Background: Urinary tract infections (UTIs) are one of the most frequently encountered bacterial infections and are responsible for substantial antibiotic consumption in healthcare settings. Inappropriate and excessive antimicrobial use can contribute to antimicrobial resistance, unwanted adverse effects, and increased financial burden on patients and healthcare systems. Drug utilization and pharmacoeconomic evaluations are useful tools for understanding prescribing practices and encouraging the rational use of medicines. The aim and objective is to assess the drug utilization pattern and analyze the cost of therapy among patients receiving treatment for urinary tract infections in a tertiary care teaching hospital. **Materials and Methods:** This observational, cross-sectional study was carried out in the outpatient and inpatient departments of Government Medical College Jammu, among 180 patients diagnosed with urinary tract infection, over a duration of six months. Information related to patient demographics, antibiotic prescribing pattern, route of drug administration, supportive medications, WHO prescribing indicators, and treatment costs was collected and evaluated. **Result:** Female patients represented the majority of the study population (67.8%), with the highest number of cases occurring in the 21–40 years age group. Ceftriaxone (33.9%) was the most commonly utilized antibiotic, followed by nitrofurantoin (23.3%). Most patients received monotherapy (71.7%), while oral formulations accounted for 53.9% of prescribed treatments. The mean number of drugs prescribed per prescription was 4.3. Injectable antibiotics were used in 46.1% of patients. The average overall treatment expenditure per patient was INR 1845 ± 620, and higher treatment costs were observed among hospitalized patients and those receiving injectable or combination antibiotic therapy. **Conclusion:** Third-generation cephalosporins were the most frequently prescribed antimicrobial agents for the treatment of urinary tract infections. The findings emphasize the need for rational antibiotic prescribing practices, greater utilization of generic medicines, and implementation of antimicrobial stewardship measures to reduce treatment expenses and improve cost-effective patient care.

INTRODUCTION

Urinary tract infections (UTIs) are among the most common bacterial infections encountered in clinical practice and constitute a major public health problem worldwide. UTIs affect individuals across all age groups and are responsible for substantial morbidity, healthcare expenditure, and antimicrobial utilization. They account for a significant proportion of outpatient visits, emergency consultations, and hospital admissions, particularly among women, elderly individuals, diabetic patients, catheterized patients, pregnant women, and immunocompromised individuals. Recent global estimates suggest that UTIs contribute to nearly 400 million infections annually, leading to considerable socioeconomic burden, absenteeism from work, and reduced quality of life.[1,2]

Urinary tract infections may involve the lower urinary tract (cystitis, urethritis) or upper urinary tract

(pyelonephritis). Clinically, UTIs are classified into uncomplicated and complicated infections depending upon the presence of structural or functional abnormalities of the urinary tract. Uncomplicated UTIs commonly occur in otherwise healthy individuals, whereas complicated UTIs are associated with urinary tract obstruction, catheterization, diabetes mellitus, renal calculi, pregnancy, neurogenic bladder, or immunosuppression. If inadequately treated, UTIs may progress to severe complications such as renal scarring, septicemia, recurrent infections, and chronic kidney disease.[3,4]

Women are more predisposed to UTIs because of shorter urethral length, proximity of the urethra to the anal region, sexual activity, use of spermicidal agents, and hormonal influences. Nearly 50–60% of women experience at least one episode of UTI during their lifetime, and recurrence is commonly observed among sexually active females and postmenopausal women. Elderly patients and hospitalized individuals with indwelling urinary catheters are also at significantly higher risk of acquiring infections. Catheter-associated urinary tract infections (CAUTIs) remain one of the most common healthcare-associated infections worldwide.[4,5]

The majority of UTIs are caused by Gram-negative organisms, particularly Escherichia coli, which accounts for approximately 70–90% of community-acquired infections. Other commonly isolated pathogens include Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Enterococcus species, Acinetobacter species, and Staphylococcus saprophyticus. The increasing prevalence of multidrug-resistant uropathogens has become a major therapeutic challenge globally. Resistance to commonly prescribed antibiotics such as fluoroquinolones, cotrimoxazole, ampicillin, and third-generation cephalosporins has increased substantially over recent years, resulting in frequent treatment failures, prolonged hospitalization, increased healthcare costs, and higher mortality rates. Extended-spectrum beta-lactamase (ESBL)-producing organisms and carbapenem-resistant Enterobacteriaceae are increasingly being reported from both community and hospital settings.[6-8]

Antibiotics remain the cornerstone of UTI management; however, irrational prescribing practices such as inappropriate antibiotic selection, empirical overuse of broad-spectrum antimicrobials, prolonged duration of therapy, unnecessary polypharmacy, self-medication, and poor adherence to treatment guidelines have contributed significantly to the emergence of antimicrobial resistance (AMR). The World Health Organization (WHO) has recognized AMR as one of the most serious global health threats of the 21st century. Recent WHO surveillance data have highlighted alarming resistance rates among common uropathogens, emphasizing the urgent need for rational antibiotic prescribing and antimicrobial stewardship programs. In developing countries like India, unrestricted availability of antibiotics and lack of antimicrobial stewardship further aggravate the resistance problem.[9-11]

Drug utilization research, as defined by the WHO, involves the study of marketing, distribution, prescription, and use of drugs with special emphasis on their medical, social, and economic consequences. Such studies are essential for evaluating prescribing patterns, identifying irrational drug use, monitoring adherence to standard treatment guidelines, and promoting rational pharmacotherapy. Evaluation of prescribing trends using WHO prescribing indicators provides valuable information regarding antibiotic usage, polypharmacy, generic prescribing, utilization of essential medicines, and prescription errors. Drug utilization studies also help healthcare policymakers formulate evidence-based interventions for improving patient care and minimizing unnecessary healthcare expenditure.[12,13]

In addition to rational prescribing, pharmacoeconomic evaluation has gained increasing importance in modern healthcare systems. The cost of UTI management has risen considerably because of increasing antimicrobial resistance, frequent recurrence, diagnostic investigations, use of newer broad-spectrum antibiotics, and prolonged hospital stay. Economic burden is especially significant in low- and middle-income countries where healthcare resources are limited. Cost analysis studies help identify economical treatment approaches and optimize healthcare resource utilization without compromising therapeutic outcomes. Pharmacoeconomic assessments also assist clinicians and hospital administrators in selecting cost-effective therapies and improving overall healthcare efficiency.[6,14]

Limited data are available regarding drug utilization patterns and pharmacoeconomic burden associated with UTI management in tertiary care hospitals of North India, particularly in the Jammu region. Regional variations in antimicrobial susceptibility patterns and prescribing practices necessitate periodic evaluation of antibiotic use in healthcare institutions. Therefore, the present study was undertaken at Government Medical College and Associated Hospitals to evaluate the prescribing pattern of drugs used in UTI management and analyze the cost of therapy among patients attending OPD and IPD services.

MATERIALS AND METHODS

Study Design: The present study was designed as a prospective, observational, cross-sectional study conducted to evaluate the drug utilization pattern and cost analysis in patients diagnosed with urinary tract infection (UTI).

Study Setting: The study was carried out in the Outpatient Departments (OPD) and Inpatient Departments (IPD) of Government Medical College and Associated Hospitals, Jammu, which is a tertiary

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care teaching hospital catering to patients from urban as well as rural areas of Jammu and adjoining regions.

Study Duration: The study was conducted over a period of six months after obtaining approval from the Institutional Ethics Committee (IEC), Government Medical College Jammu.

Study Population: Patients diagnosed with urinary tract infection attending OPD or admitted in IPD during the study period were included in the study.

Sample Size: A total of 180 patients fulfilling the inclusion criteria were enrolled consecutively during the study period.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients diagnosed clinically or microbiologically with urinary tract infection.
- Patients attending OPD or admitted in IPD.
- Patients willing to provide written informed consent.

Exclusion Criteria

- Pregnant women.
- Patients with severe renal failure or terminal illness.
- Patients with incomplete prescription records.
- Patients unwilling to participate in the study.

Data Collection Procedure: After obtaining informed consent, data were collected using a predesigned and pre-validated case record form. Confidentiality of patient information was strictly maintained throughout the study. Information was obtained from patient interviews, prescription slips, medical records, and laboratory reports.

The following parameters were recorded:

1) Demographic details including age and gender
2) Clinical presentation and diagnosis
3) Associated co morbidities
4) Details of prescribed drugs including:

- Name of antibiotic, Dose, Frequency, Duration of therapy, Route of administration, Use of supportive medications, Number of drugs prescribed per prescription, Generic versus brand name prescribing, Drugs prescribed from National List of Essential Medicines (NLEM), Cost of prescribed medications & Duration of hospital stay in admitted patients

Drug Utilization Evaluation

Drug utilization analysis was carried out using World Health Organization (WHO) prescribing indicators, which included:

- Average number of drugs prescribed per encounter
- Percentage of drugs prescribed by generic name
- Percentage of encounters with antibiotics prescribed
- Percentage of encounters with injections prescribed
- Percentage of drugs prescribed from National List of Essential Medicines (NLEM)
- Antibiotics were categorized according to their pharmacological class for assessment of prescribing trends.

Cost Analysis: Pharmaco-economic evaluation was performed by calculating the direct cost of therapy incurred during treatment. Cost analysis included: Cost of antibiotics, Cost of supportive medications, Cost of injectable formulations, Total treatment cost per patient & The average treatment cost was calculated separately for OPD and IPD patients and expressed in Indian Rupees (INR).

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using descriptive statistical methods. Results were expressed as number, percentage, mean, and standard deviation (SD). Data were later tabulated using tables and charts.

RESULTS

A total of 180 patients diagnosed with urinary tract infection (UTI) were included in the present study. Data regarding demographic profile, prescribing patterns, WHO prescribing indicators, and cost analysis were evaluated.

Gender & Age Distribution

Table 1: Gender & Age-wise Distribution of Study Population

S. no	Gender	Number of Patients (n=180)	Percentage (%)
1.	Male	58	32.2%
2.	Female	122	67.8%
	AGE GROUP (Years)		
1.	18-20	18	10%
2	21-40	76	42.2%
3	41-60	58	32.2%
4	>60	28	15.6%
	Total	180	100 %

Female patients constituted the majority of the study population (67.8%), while males accounted for 32.2%. This higher prevalence among females may be due to anatomical and physiological factors that increase susceptibility to urinary tract infections. Most patients belonged to the 21–40 years age group (42.2%), followed by 41–60 years (32.2%). This indicates that UTIs were more common among young and middle-aged adults [Table 1].

Distribution of Study Population According to Department

ISSN (O): 2687-5365; ISSN (P): 2753-6556

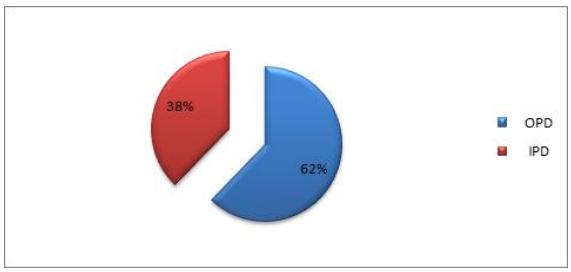

Figure 1: Distribution of the Study Population

The majority of the patients in the study, were managed on an outpatient basis, indicating that most UTI cases were uncomplicated and could be effectively treated without hospitalization as shown in [Figure 1]. Outpatient management reduces healthcare costs, minimizes hospital burden, and improves patient convenience. Only patients with severe symptoms, systemic involvement, recurrent infections, or significant co-morbidities required inpatient care and injectable therapy.

Clinical Presentation of study population

Table 2: The Most Common Presenting Complaints in the Study Population.

S.no	Symptom	Number of Patients (n=180)	Percentage (%)
1	Dysuria	142	78.9%
2	Increased Frequency of Micturition	126	70%
3	Fever	84	46.7%
4	Lower Abdominal Pain	79	43.9%
5	Burning Micturition	136	75.6%
6	Hematuria	22	12.2%

Dysuria (78.9%) and burning micturition (75.6%) were the most common presenting complaints among patients, reflecting the typical irritative symptoms associated with urinary tract infections. Increased frequency of micturition was also highly prevalent (70%), indicating inflammation and irritation of the urinary bladder. Fever was reported in 46.7% of patients, suggesting possible upper urinary tract involvement or systemic infection in a considerable proportion of cases. Lower abdominal pain was observed in 43.9% of patients and may be related to bladder inflammation and suprapubic tenderness. Hematuria was relatively less common (12.2%) and is generally associated with severe inflammation, mucosal irritation, or complicated urinary tract infections, as shown in table no 2. Overall, the symptom pattern observed in the study was consistent with classical clinical manifestations of UTI.

Associated Co-morbidities in the study population

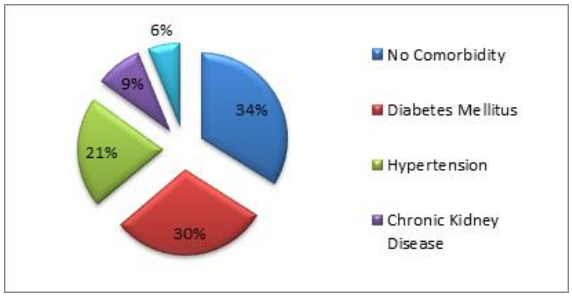

Figure 2: Comorbidities in the Study Population.

Diabetes mellitus was the most common comorbidity (30%), followed by hypertension (21.1%). Chronic kidney disease and benign prostatic hyperplasia were observed in smaller proportions. About one-third of patients had no associated comorbidity. Diabetes increases susceptibility to UTIs due to impaired immunity and poor glycemic control [Figure 2].

Antibiotics Prescribed in the Study Population

Table 3: Pattern of Antibiotic Prescribed in the Study Population

S.no	Antibiotic	Number Of Prescriptions	Percentage
1	Ceftriaxone	61	33.9%
2	Nitrofurantoin	42	23.3%
3	Ciprofloxacin	30	16.7%
4	Amoxicillin-Clavulanic acid	18	10%
5	Piperacillin-Tazobactam	14	7.8%
6	Amikacin	09	5%
7	Others	06	3.3%

Ceftriaxone was the most frequently prescribed antibiotic (33.9%), likely due to its broad-spectrum activity, good efficacy, and common use in moderate-to-severe infections and hospitalized patients. Nitrofurantoin was the second most commonly prescribed drug (23.3%), particularly for uncomplicated lower urinary tract infections because of its high urinary concentration and effectiveness against common uropathogens.

Ciprofloxacin accounted for 16.7% of prescriptions and remains widely used because of its good oral bioavailability and gram-negative coverage. Amoxicillin-clavulanic acid and piperacillin-tazobactam were prescribed in selected cases depending on infection severity and suspected bacterial resistance patterns.

Amikacin was used less frequently due to concerns regarding nephrotoxicity and the requirement for parenteral administration. Overall, the prescribing pattern indicated preference toward broad-spectrum antibiotics and empirical therapy [Table 3].

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Route of Drug Administration

Table 4: Route Of Administration Of Drugs in the Study Population

S. no	Route	Number of patients	Percentage
1.	Oral	97	53.9%
2.	Injectable	83	46.1%
	Total	180	100%

Oral administration was observed in 53.9% of patients, indicating that most infections were mild to moderate and could be managed effectively in outpatient settings as shown in table no:4. Oral antibiotics are generally preferred due to ease of administration, lower cost, and better patient compliance.

Injectable antibiotics were prescribed in 46.1% of patients, particularly among hospitalized individuals with severe infections, vomiting, systemic symptoms, or inability to tolerate oral medications. Injectable therapy provides rapid achievement of therapeutic drug concentrations and is often preferred in complicated UTIs.

Antibiotic Monotherapy versus Combination Therapy

Table 5: Pattern of Antibiotic Therapy in the Study Population

S. no	Type of Therapy	Number of Patients	Percentage
1.	Monotherapy	129	71.7%
2.	Combination Therapy	51	28.3%

Monotherapy was prescribed in the majority of patients (71.7%), suggesting that single-agent antibiotic therapy was adequate for most uncomplicated urinary tract infections. Monotherapy reduces treatment cost, adverse effects, and the risk of antimicrobial resistance associated with unnecessary multiple antibiotic use. Combination therapy was used in 28.3% of patients, likely in cases of severe infection, resistant organisms, recurrent UTIs, or associated systemic illness. Combination regimens may provide broader antimicrobial coverage and synergistic action in complicated cases [Table 5].

Supportive Medications Prescribed

Proton pump inhibitors (65.6%) were the most commonly prescribed supportive medications, possibly to prevent or manage gastritis and gastrointestinal irritation associated with antibiotic therapy and concurrent medications.

Analgesics and antipyretics were prescribed in 56.7% of patients for relief of pain, burning sensation, fever, and discomfort. Urinary alkalizers were used in 38.3% of cases to reduce urinary acidity and provide symptomatic relief from dysuria and burning micturition. Intravenous fluids were administered in 32.2% of patients, mainly among hospitalized individuals, to maintain hydration and facilitate urinary flushing. Antiemetics were prescribed less frequently (22.8%), mainly in patients with nausea or vomiting associated with infection or medication use, as shown in [Figure 3].

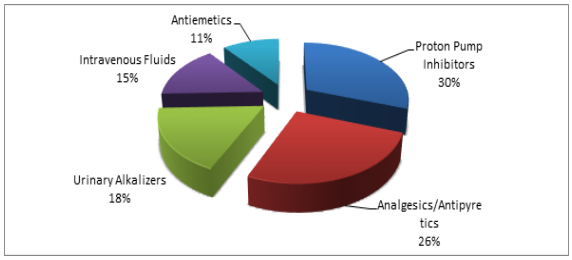

Figure 3: Common Supportive Drugs prescribed in the Study Population

WHO Prescribing Indicators

Table 6: WHO Prescribing Indicators

S.NO	Indicator	Observation
1.	Average number of drugs per prescription	4.3
2.	Drugs prescribed by generic name	41%
3.	Encounters with antibiotics prescribed	100%
4.	Encounters with injections prescribed	46%
5.	Drugs prescribed from NLEM	78%

The average number of drugs per prescription was 4.3, indicating moderate polypharmacy. Although multiple medications may be necessary for symptomatic management and treatment of comorbidities, excessive polypharmacy can increase the risk of adverse drug reactions and drug interactions. Only 41% of drugs were prescribed by generic name, suggesting a preference for brand-name prescribing. Improved generic prescribing practices could help reduce treatment costs and promote rational drug use.

Antibiotics were prescribed in 100% of encounters because the study specifically involved UTI patients requiring antimicrobial therapy. Injectable drugs were used in 46% of encounters, reflecting the proportion of hospitalized and severe cases. About 78% of drugs were prescribed from the National List of Essential Medicines (NLEM), indicating relatively

ISSN (O): 2687-5365; ISSN (P): 2753-6556

good adherence to essential medicine prescribing practices. However, there remains scope for improvement in promoting rational prescribing and generic utilization [Table 6].

Average Duration of Therapy

Most patients, 101 (56.1%) received antibiotic therapy for 5–7 days, which aligns with standard treatment guidelines for uncomplicated urinary tract infections. Short-course therapy is effective, improves compliance, and reduces the risk of antibiotic resistance. About 51 (28.3%) of patients received treatment for more than 7 days, likely due to complicated infections, recurrent UTIs, associated comorbidities, or severe clinical presentation. A smaller proportion of patients received therapy for less than 5 days, probably in mild infections responding rapidly to treatment [Figure 4].

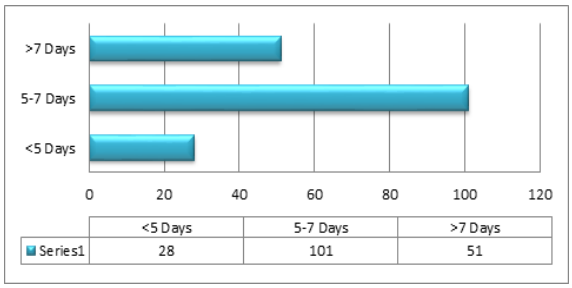

Figure 4: Duration of Antibiotic Therapy in the Study Population

Cost Analysis

Table: no 7: Average Cost of Therapy in the Study Population

S.no	Treatment Type	Mean Cost (INR)
1	OPD Treatment	865 ± 220
2	IPD Treatment	3475 ± 840
	Overall Average Cost	1845 ± 620

The mean treatment cost among hospitalized patients (₹3475 ± 840) was substantially higher than that of outpatients (₹865 ± 220), primarily due to prolonged hospital stay, injectable antibiotic use, laboratory investigations, and supportive care requirements. The difference in treatment cost between OPD and IPD patients was statistically significant ($p < 0.001$). The overall mean cost of therapy was ₹1845 ± 620, indicating a moderate economic burden associated with UTI management in tertiary care settings. Increased utilization of generic medications, adherence to standard treatment guidelines, and early outpatient management of uncomplicated cases may help reduce healthcare expenditure and improve cost-effectiveness [Table 7].

Table 8: Average Antibiotic Cost in the Study Population

S.no	Category	Mean Antibiotic Cost (INR)
1	Oral Antibiotics	₹520 ± 140
2	Injectable Antibiotics	₹1680 ± 410
3	Overall Average Antibiotic Cost	₹980 ± 260

The average antibiotic cost was considerably higher for injectable antibiotics (₹1680 ± 410) compared to oral antibiotics (₹520 ± 140). The higher cost associated with injectable therapy may be due to the use of broad-spectrum parenteral antibiotics, administration expenses, and hospitalization requirements. Oral antibiotics were comparatively economical and were mainly prescribed in uncomplicated urinary tract infections managed on an outpatient basis. The overall average antibiotic cost in the study population was ₹980 ± 260, reflecting the economic impact of antimicrobial therapy in UTI management [Table 8].

Table 10: Cost According to Route of Administration

S.no	Route of Administration	Mean Cost (INR)
1	Oral Therapy	₹1045 ± 280
2	Injectable Therapy	₹3210 ± 790

The mean treatment cost associated with injectable therapy (₹3210 ± 790) was substantially higher than oral therapy (₹1045 ± 280). Injectable therapy was predominantly used in hospitalized patients with severe or complicated urinary tract infections, systemic symptoms, or inability to tolerate oral medications. The increased expenditure may be attributed to parenteral drug administration, hospitalization charges, supportive care, and additional monitoring requirements. In contrast, oral therapy was more cost-effective and commonly prescribed for uncomplicated infections managed in outpatient settings as shown in [Table 10].

In conclusion, the study highlighted the prevailing prescribing patterns, utilization of antibiotics, and economic burden associated with urinary tract infection management in a tertiary care teaching hospital. The findings emphasize the need for rational antimicrobial use, increased generic prescribing, and cost-effective treatment strategies to optimize patient care and minimize healthcare expenditure.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

DISCUSSION

Drug utilisation studies are crucial for understanding prescribing practices, promoting the rational use of medications, and identifying gaps that may necessitate corrective measures to improve patient care.[1] The current study evaluated the prescribing trends, WHO prescribing indicators, and the pharmacoeconomic impact of treatment strategies used for urinary tract infections (UTIs) in a tertiary care teaching hospital in North India.

In the present study, females constituted 67.8% of total cases, while males accounted for 32.2%. The higher prevalence of UTIs among females is well established and has been consistently reported in both national and international studies. Anatomical factors such as shorter urethral length, proximity of the urethra to the anal region, sexual activity, and hormonal influences predispose females to urinary tract infections. Similar findings were reported by Flores-Mireles et al., Foxman, and Gupta et al., where females represented the majority of UTI cases.[15,16] Indian studies conducted by Sharma et al. and Tiwari et al. also demonstrated female predominance among patients diagnosed with UTIs.[17–19]

In the present study, most patients were within the 21–40 years age group (42.2%), while the 41–60 years age group constituted the second largest proportion (32.2%). These findings are comparable to the studies conducted in different regions of India and abroad, where young and middle-aged adults were more commonly affected. Increased sexual activity, occupational stress, dehydration, and poor hygienic practices may contribute to increased incidence in this age group. Similar age distribution patterns were observed in studies by Medina and Castillo-Pino, Akram et al., and Biswas et al.[20–22]

Most patients in the present study were treated on an outpatient basis (62.2%), while 37.8% required hospitalisation. This finding indicates that uncomplicated UTIs constitute a major proportion of cases and can generally be managed effectively in outpatient settings. Hospitalisation was mainly required in patients with severe infection, associated comorbidities, pyelonephritis, recurrent UTI, or poor general condition. Dysuria (78.9%), burning micturition (75.6%), and increased frequency of micturition (70%) were the most common presenting complaints observed in the present study. Similar symptom profiles have been reported in earlier epidemiological studies where dysuria and urinary frequency were the predominant manifestations of uncomplicated UTI. Foxman and Stamm et al. also identified dysuria, urgency, and increased urinary frequency as the characteristic symptoms associated with lower urinary tract infections.[16,23]

Diabetes mellitus was the most common associated comorbidity observed in the present study, affecting 30% of patients. Diabetes predisposes patients to UTIs because of impaired immune response, autonomic bladder dysfunction, glycosuria, and increased bacterial colonization. Similar findings were reported by Geerlings and Boyko, who demonstrated higher incidence and recurrence of UTIs among diabetic individuals.[24,25] Hypertension and chronic kidney disease were also commonly associated conditions in the present study, particularly among elderly hospitalized patients.

Ceftriaxone was the most frequently prescribed antibiotic (33.9%), followed by nitrofurantoin and ciprofloxacin. Increased use of third-generation cephalosporins may be attributed to empirical prescribing practices and rising resistance against commonly used oral antibiotics. Similar prescribing trends have been reported in tertiary care hospitals across India by Biswas et al., Kumar et al., and Patel et al., where cephalosporins constituted the most commonly prescribed antimicrobial agents for UTIs.[22,26,27] Nitrofurantoin was commonly prescribed for uncomplicated UTIs because of its excellent urinary concentration, favorable safety profile, and relatively low resistance rates. Recent recommendations from the Infectious Diseases Society of America (IDSA) and the European Association of Urology (EAU) identify nitrofurantoin as a preferred first-line treatment option for uncomplicated cystitis.[17,28] However, increasing resistance to fluoroquinolones observed globally has led to reduced empirical use of ciprofloxacin in many healthcare settings.

Injectable antibiotics were prescribed in 46.1% of patients, predominantly among hospitalized individuals. Injectable therapy is usually indicated in severe infections, pyelonephritis, vomiting, septicemia, or inability to tolerate oral medications. However, excessive use of injectable formulations may increase treatment costs, risk of hospital-acquired infections, and patient discomfort. WHO prescribing indicators recommend minimizing unnecessary use of injections to promote rational drug use.[29]

Single-drug therapy was administered to 71.7% of patients, while 28.3% received combination treatment regimens. Preference for monotherapy indicates relatively rational prescribing practices because unnecessary combination therapy may increase adverse drug reactions, antimicrobial resistance, and healthcare expenditure. Combination therapy was mainly observed among complicated UTI cases and hospitalized patients with associated comorbidities. Proton pump inhibitors (65.6%) and analgesics/antipyretics (56.7%) were the most commonly prescribed supportive medications. Similar trends have been reported in antimicrobial utilization studies where supportive therapy is frequently used to relieve symptoms and prevent gastrointestinal adverse effects associated with antibiotics.[26]

The mean number of medications prescribed per prescription was 4.3, reflecting a moderate degree of polypharmacy in the study population. Similar findings have been reported in WHO prescribing indicator studies conducted in Indian tertiary care

ISSN (O): 2687-5365; ISSN (P): 2753-6556

hospitals. Polypharmacy may increase the risk of drug interactions, adverse drug reactions, medication errors, and poor patient compliance.[29,30] Prescribing by generic name was noted in 41% of prescriptions, which remained below the standards recommended by the WHO. Low generic prescribing significantly increases the overall cost of therapy and reflects inadequate adherence to rational prescribing principles. Similar findings were reported by Kumar et al. and Shankar et al. in studies evaluating antimicrobial prescribing practices in Indian hospitals.[26,31]

The present study also demonstrated that 78% of drugs were prescribed from the National List of Essential Medicines (NLEM), indicating moderate adherence to essential medicine prescribing practices. Prescribing from NLEM promotes rational drug use, improves affordability, and ensures accessibility of essential medicines. Most patients received antibiotic therapy for 5–7 days (56.1%), which is consistent with current treatment recommendations for uncomplicated and moderately severe UTIs. Prolonged antibiotic therapy was mainly observed among hospitalized patients and complicated infections.

Pharmacoeconomic evaluation revealed that the average cost of treatment was substantially higher among IPD patients compared to OPD patients. Increased expenditure among hospitalized patients was mainly due to injectable antibiotics, prolonged hospital stay, intravenous fluids, laboratory investigations, and supportive medications. Similar observations were reported in pharmacoeconomic studies conducted by Tandogdu and Wagenlehner, who highlighted the significant economic burden associated with antimicrobial resistance and hospitalization in UTI management.[32]

Overall, the findings of the present study emphasize the need for periodic prescription audits, antimicrobial stewardship programs, culture sensitivity-guided therapy, increased generic prescribing, and strict adherence to standard treatment guidelines. Such interventions may help reduce antimicrobial resistance, minimize treatment costs, and improve overall patient outcomes.

CONCLUSION

The present study evaluated the drug utilization pattern and cost analysis in patients diagnosed with urinary tract infection attending OPD and IPD services at Government Medical College and Associated Hospitals, Jammu. The study demonstrated that UTIs were more prevalent among females and young adults, particularly in the age group of 21–40 years. This observation correlates with the known epidemiological trend of increased susceptibility among females due to anatomical and physiological factors.

Ceftriaxone was found to be the most commonly prescribed antibiotic, followed by nitrofurantoin and ciprofloxacin. The frequent use of third-generation cephalosporins reflects the widespread empirical prescribing practices prevalent in tertiary care hospitals. Nitrofurantoin was commonly prescribed for uncomplicated urinary tract infections because of its favorable efficacy and lower resistance profile. Injectable antibiotics were more commonly used among hospitalized patients, contributing substantially to increased treatment costs.

The study also revealed moderate polypharmacy, with an average of 4.3 drugs prescribed per encounter. Although most drugs prescribed were from the National List of Essential Medicines (NLEM), the percentage of generic prescribing was relatively low, indicating the need for improved adherence to rational prescribing practices and WHO prescribing indicators.

The pharmacoeconomic evaluation demonstrated significantly higher treatment costs among IPD patients compared to OPD patients, mainly due to use of injectable antibiotics, supportive medications, investigations, and prolonged hospital stay. This emphasizes the growing economic burden associated with antimicrobial therapy and irrational drug utilization.

Overall, the findings of the present study highlight the importance of regular prescription audits, antimicrobial stewardship programs, culture sensitivity-guided therapy, and rational antibiotic prescribing practices. Continuous monitoring of drug utilization patterns is essential to minimize antimicrobial resistance, optimize patient outcomes, reduce unnecessary healthcare expenditure, and promote evidence-based treatment strategies in tertiary care settings.

Limitations of the study

The present study was conducted in a single tertiary care teaching hospital, which may limit the generalizability of the findings. The relatively short study duration may not reflect seasonal variations in urinary tract infections and prescribing trends. Culture and sensitivity reports were not available for all patients, and empirical therapy was commonly initiated. The study mainly focused on prescription patterns and direct treatment costs, while indirect costs were not assessed. In addition, follow-up regarding clinical outcomes, recurrence, antimicrobial resistance, and adverse drug reactions was not performed in detail.

Recommendations

Regular antimicrobial stewardship programs and prescription audits should be implemented to encourage rational antibiotic use and reduce antimicrobial resistance. Culture and sensitivity testing should be promoted before initiating antibiotics whenever feasible. Generic prescribing and the use of essential medicines should be encouraged to reduce healthcare costs. Hospital antibiotic policies should be periodically updated according to local resistance patterns. Unnecessary injectable antibiotics and polypharmacy should be minimized, and continuous medical education

ISSN (O): 2687-5365; ISSN (P): 2753-6556

programs should be conducted to promote rational prescribing practices. Patient awareness regarding treatment adherence, hygiene, and prevention of recurrent UTIs should also be improved. Further multicentric studies with larger sample sizes and longer duration are recommended for better evaluation of prescribing and resistance patterns.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556