

**URINARY TRACT INFECTION: A STUDY OF DRUG USE EVALUATION IN A  
TERTIARY CARE TEACHING HOSPITAL**Shrishailgouda S. Patil\*, Anu P. Venu<sup>2</sup> and H. Doddappa<sup>1</sup><sup>1</sup>Department of Pharmaceutics, N.E.T. Pharmacy College, Raichur-584103.<sup>2</sup>Department of Pharmacy Practice, N.E.T. Pharmacy College, Raichur-584103.**\*Corresponding Author: Dr. Shrishailgouda S. Patil**

Department of Pharmaceutics, N.E.T. Pharmacy College, Raichur-584103.

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**ABSTRACT**

**Objective:** The objective of the present study is to carry out drug utilization evaluation in urinary tract infections with an aim to ensure appropriate, safe and effective use of antibiotics thereby reducing patient treatment costs and also to prevent antimicrobial resistance. **Materials & Methods:** A prospective observational study was carried out for a total of 105 in-patients diagnosed with UTI in the in-patient department of General medicine of Navodaya Medical College Hospital & Research Centre, Raichur. The drug therapy was reviewed and the relevant information was recorded in a structured proforma & data was evaluated by comparing with standard IDSA guidelines for Infectious diseases. **Results:** The results of the study revealed that the incidence of urinary tract infections was more in females (65.72%) compared to males (34.28%) and more common in the age group between 30-40 years (30.47%). Majority of the UTI cases were found to be uncomplicated (84.77%) than the complicated (15.23%). The rank order of antibiotics prescribed was as follows: fluoroquinolones > cephalosporins > nitrofurantoin > aminoglycosides > penicillin. Among 105 patients, deviation in the line of treatment has been observed in a total of 57 patients (54.28%) which accounts for both complicated and uncomplicated UTI patients. Higher incidence of deviation was observed for the uncomplicated UTI (n=50, 58.13%) compare to complicated UTI (n=07, 43.75%). **Conclusion:** The results of the study conclusively suggested the deviation in the line of treatment for more than 50% of the study population which necessitates the need to improve the awareness among the physicians to use the recommendations of IDSA guidelines in the treatment of UTI for the better therapeutic outcome and also to reduce the antibiotic resistance.

**KEYWORDS:** Drug utilization evaluation; Urinary tract infections; Antibiotics, IDSA guidelines; Antimicrobial resistance.

**INTRODUCTION**

The World Health Organization (WHO) in 1997 defined drug utilization as the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences.<sup>[1]</sup> Drug use evaluation (DUE) is an on-going, authorised and systematic quality improvement process, which is designed to review drug use and/or prescribing patterns, provide feedback of results to clinicians and other relevant groups, develop criteria and standards which describe optimal drug use and promote appropriate drug use through education and other interventions.<sup>[2]</sup> The use of drugs in appropriate, safe and effective manner would decrease the treatment cost for the patients.<sup>[3]</sup>

The global burden of UTIs is about 150 million people.<sup>[4]</sup> UTI is defined as the presence of microorganisms in the urinary tract that cannot be accounted by contamination; these organisms have the potentiality to invade into the tissues of urinary tract and adjacent structures. The

commonest organism isolated in most UTIs are *Escherichia coli* and *Klebsiella spp.*<sup>[5]</sup> Infection may be limited to the growth of bacteria in the urine, which frequently may not produce symptoms. UTIs are classified by several methods. Typically, they have been described by anatomic site of involvement. Lower tract infections include cystitis (bladder), urethritis (urethra), prostatitis (prostate gland), and epididymitis. Pyelonephritis is an infection involving the kidneys and represents upper tract infection. Also, UTIs are designated as uncomplicated or complicated. Uncomplicated infections occur in individuals who lack structural or functional abnormalities of the urinary tract that interfere with the normal flow of urine or voiding mechanism. These infections occur in females of child bearing age (15 to 45 years) who are otherwise normal, healthy individuals. Infections in males generally are not classified as uncomplicated because these infections are rare and most often represent a structural or neurologic abnormality. Complicated UTIs are the result of predisposing lesion of the urinary tract, such as a

congenital abnormality or distortion of the urinary tract, a stone, indwelling catheter, prostatic hypertrophy, obstruction, or neurologic deficit that interferes with the normal flow of urine and urinary tract defences.<sup>[6]</sup> The purpose of drug utilization evaluation in UTI is to ensure that antimicrobials are used appropriately, safely and effectively to improve patient health status.

Thus, by considering the higher prevalence of UTI and the antibiotic resistance, the present study has been undertaken to assess the drug utilization evaluation of UTI with an aim to ensure appropriate, safe and effective use of antibiotics thereby improving patient health status, reducing treatment costs and also to prevent microbial resistance.

#### MATERIALS AND METHODS

The study was carried out for a period of 6 months (September 2017 to February 2018) after the approval from Institutional Ethics Committee of Navodaya Medical College Hospital and Research Centre, Raichur.

#### Study Design

**Type of the Study:** Prospective observational study

**Sample Size:** 105

**Study period:** 6 months from September 2017 to February 2018.

#### Inclusion Criteria

- All in-patients of age groups 18-70 of either sex diagnosed with UTI
- UTI patients with other co-morbidities like diabetes, hypertension.

#### Exclusion Criteria

- Pediatric patients
- Out-patients
- Pregnant and lactating women
- Patients with other systemic infections

#### Data Collection

Data was collected from general medicine department using structured data entry format. A total of 105 prescriptions were collected, observed and recorded. The prescriptions of the selected patients were collected from the in-patient departments of general medicine wards from September 2017 to February 2018 paying due attention to inclusion and exclusion criteria and were evaluated prospectively for the presence and monitored for the following variables:

- Sex and age distribution of patients.
- Dose, Duration, Dosage form & Route of administration
- Co-morbidities associated with UTIs
- Antimicrobials Prescribed
- Drug-Drug interaction
- Appropriateness of Therapy

The data collected from all the prescriptions were evaluated for the appropriateness of therapy by using the IDSA guidelines for infectious diseases.<sup>[7]</sup> Data was analyzed using descriptive statistics namely total numbers, mean, standard deviation and percentage wherever applicable. Microsoft word and Excel have been used to generate graphs, tables etc.

#### RESULTS

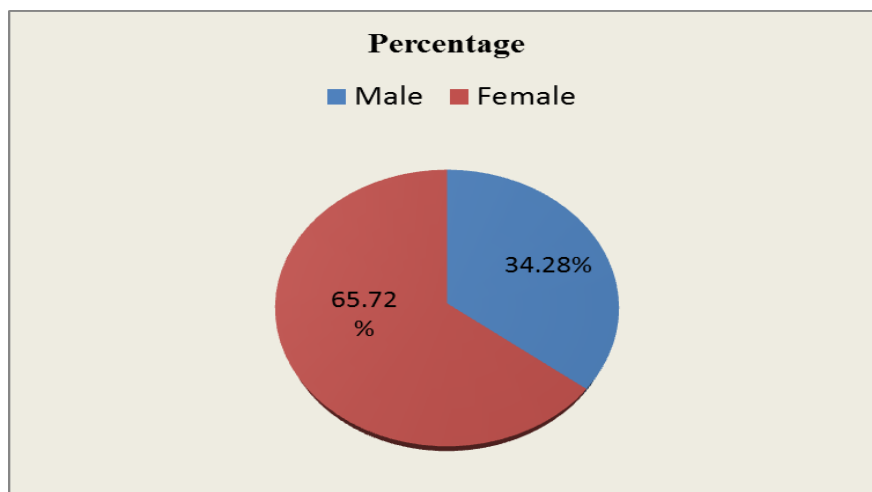


Fig. No. 1: Gender wise distribution of study population.

Table No 1: Types of UTI found in the study population.

Type	No. of cases (n=105)	Percentage
Complicated	16	15.23%
Uncomplicated	89	84.77%

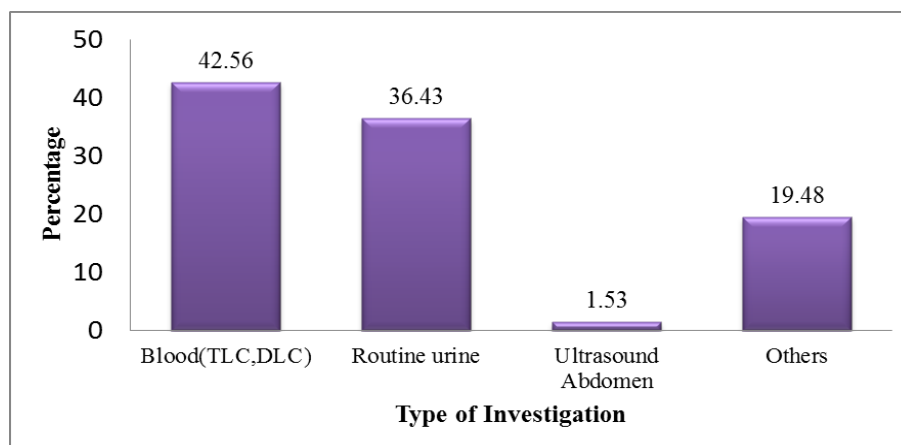


Fig. No. 2: Laboratory investigations carried out in the UTI patients.

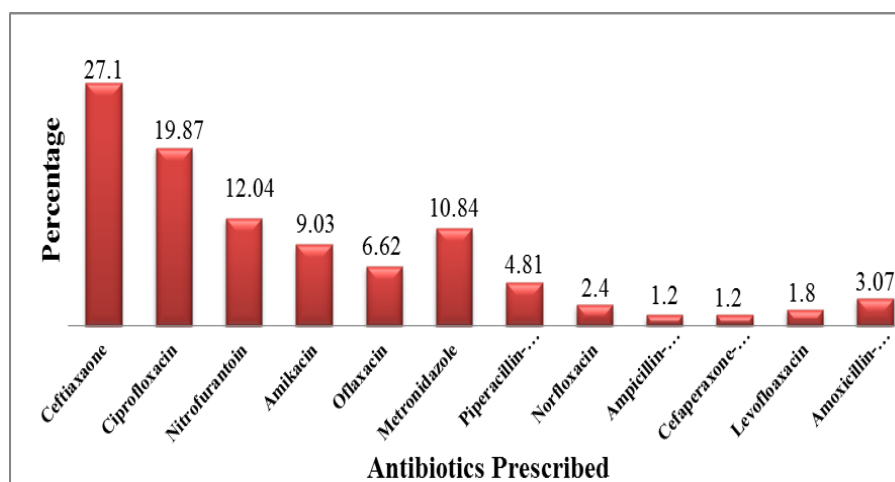


Fig. No. 3: Category of antibiotics prescribed in the UTI patients.

Table 2: Appropriateness of Therapy in The Study Population.

Types of UTI	No of patients with deviation in therapy (n=105)	Types of drugs prescribed	Therapy according to guidelines ( IDSA guidelines)	% deviation
Uncomplicated	50	Ceftriaxone Ofloxacin Metronidazole Ciprofloxacin Nitrofurantoin Amikacin FlavoxateHcl+ Ofloxacin Ampicillin+Clavulanate Levofloxacin Norfloxacin Ceftriaxone + Salbactam	<u>First Line:</u> Fosfomycin 3g single dose. Nitrofurantoin 100 mg BD/day for 5 days Trimethoprim-Sulfamethaxazole 160 mg/800 mg BD PO for 3 days. <u>Second Line:</u> Ciprofloxacin 250 mg BD for 3 days. Ciprofloxacin extended release 500 mg/day for 3 days. Levofloxacin 250 mg/day for 3 days. Ofloxacin 200mg/day 3 days or 400 mg single dose.	58.13%
Complicated	7	Metronidazole Doxycycline Cefotaxime Ceftriaxone Piperazillin-Tazobactam Ciprofloxacin Amoxicillin-Clavulanate Levofloxacin	<u>First Line:</u> Ciprofloxacin 500 mg PO BD for 7-14 days. Ciprofloxacin extended release 1 gm PO daily 7-14 days. Levofloxacin 750 mg PO daily 5 days. Cipro 400 mg IV q 12 hour Levofloxacin 750 mg IV daily. <u>Second Line:</u> Piperacillin- Tazobactam 3.375 mg q 6 hour. Ampicillin-Salbactam 375mg PO for 7 days. Gentamicin 3-5mg/kg/day divided every 6 hours IV.	43.75%

## DISCUSSION

Drug utilization evaluation plays a key role in helping the healthcare system to understand, interpret and improve the prescribing, administration and use of medications. The principal aim of Drug utilization evaluation is to facilitate rational use of drugs, which implies the prescription of a well-documented drug in an optimal dose on the right indication, with correct information and at an affordable price.<sup>[8]</sup> UTI is defined as the presence of microorganisms in the part of the urinary tract. Worldwide, about 150million people are diagnosed with UTI each year and account for more than 100,000 hospital admissions annually.<sup>[4]</sup> Antibiotic resistance pathogens have become more prevalent and UTI is not an exception. This in turn leads to an increased number of UTIs in outpatient as well as in inpatient settings. Thus, by considering the higher prevalence of UTI and the alarming antibiotic resistance, the present study has been under taken to assess the drug utilization evaluation of UTI in a tertiary care teaching hospital.

### Gender distribution and type of UTI

Urinary tract infections (UTIs) are considered to be the most common bacterial infection which occurs in both male and female, but due to the anatomical features such as shorter length of urethra and their closer proximity towards the anus, UTI is more prevalent in women.<sup>[9]</sup> Similarly, in our study also female patients have a higher incidence(65.72%) of having an UTI in comparison with men (34.28%). The results of gender distribution in the study population is given in Fig No.1.

UTIs are designated as uncomplicated or complicated. Uncomplicated infections occur in individuals who lack structural or functional abnormalities of the urinary tract that interfere with the normal flow of urine or voiding mechanism.<sup>[10]</sup> Majority of the cases in our study were diagnosed to have uncomplicated UTI (84.77%). Complicated UTI are found in patients with functional or anatomic abnormalities of the genitourinary tract and only fewpatients were diagnosed as complicated (15.23%). It has been observed that, the uncomplicated UTIs are more predominant in the female patients compared to male patients, the later having the more incidence of complicated UTI. The types of UTI observed in the present study are given in Table No 1.

### Laboratory Investigations

Normally, UTI are diagnosed solely based on the symptomatology described by patients but it should be confirmed with a laboratory test (e.g. urine analysis) whenever possible. Among 105 cases routine blood test was done in 42.36% of patients followed by Urine Analysis in 36.41%. Only 1.53% has done the ultrasound abdomen. Urine culture and antimicrobial testing should be performed in order to check the antibiotic resistant pattern of the microorganism present. Otherwise, it can lead to inaccurate prescription of the drugs that could cause decreased therapeutic effect and also recurrence of

the disease can happen. However, none of the patients have been suggested for urine culture and antimicrobial sensitivity testing. Hence causative organisms and their resistant pattern are unknown. The results of the laboratory investigations are given in Fig No 2.

### Category of antibiotics prescribed

In the present study majority of antibiotics prescribed were from cephalosporin's (27.1%), Fluroquinolones (30.09%) Nitro furans(13.85%) and amino glycoside (9.03%). However the IDSA recommend the use of Fluroquinolones, Trimethoprim-Sulfamethaxazole and Nitrofurantoin as the first line drugs in the treatment of UTI's and Cephalosporin as Empirical therapy for UTI. Among the cephalosporin's, 25.90% were prescribed with ceftriaxone and about 1.20% prescribed with Cefaperaxone-Sulbactam combination.

About 30.09% of the study population were prescribed with Fluroquinolones. The most common Fluroquinolones prescribed were Ciprofloxacin (19.27%), Ofloxacin (6.62%) and the least prescribed were Norfloxacin (2.40%). Among the study population, 9.03% patients were prescribed withamikacin which comes under amino glycoside antibiotic. However there is a lack of literature indicating the prescribing of amino glycosides in the treatment of UTI's. This might be due to the severe side effects like ototoxicity and nephrotoxicity of amino glycoside antibiotics. It can be used to treat the UTI's which are caused by extended spectrum beta lactamase producing *E.coli*.

Among Penicillin antibiotics (4.21%) Piperazillin-Tazobactam were prescribed, (1.20%) Amoxicillin-Clavulanate followed by (3.07%) Ampicillin-Clavulanate. Among the miscellaneous antibiotics/antimicrobials prescribed, common was the Metronidazole (10.84%). The category of antibiotics prescribed for the UTI patients is given in Fig No 3.

### Drug interactions

The interaction of the two drugs may also increase the risk of occurrence of side effects. The severity of drug interactions was evaluated and categorized into major, moderate and minor type interactions. The study revealed that the incidences of drug-drug interactions were observed in 48 prescriptions (45.72%) with drug-drug interactions (n=61) were found whereas the remaining 57 prescriptions had no drug interaction. The possible reason for high incidence of drug-drug interactions may be due to the poly pharmacy used in treatment of co-morbid conditions along with UTI. Majority of drug interactions were moderate (n=28) in severity, 8 major drug interactions were found and 25 minor interactions were found. Some of the interacting drugs that caused moderate and major interactions were amikacin ⇌ diclofenac, Ondasteron ⇌ levofloxacin and ciprofloxacin ⇌ tramadol.

### Appropriateness of therapy

Appropriateness of therapy in the study population was analysed with respect to the IDSA guidelines for the infectious diseases. Among the study population, in uncomplicated UTI patients (n= 89), 50 patients had deviation from the therapy mentioned as per the guidelines. The patients (n=89) were prescribed with Ceftriaxone, Ciprofloxacin, Amikacin, Ofloxacin, Metronidazole, Ciprofloxacin, Nitrofurantoin, Amikacin, Flavoxate HCl+Ofloxacin, Ampicillin+Clavulanate, Levofloxacin, Norfloxacin and more often it was found that approximately half the patients used only the empirical therapy with Ceftriaxone rather than specific antibiotic therapy. However, an important and worrisome finding was that some patients were prescribed with antibiotics which are not indicated for UTI and without knowing the causative organisms and their resistant pattern.

In patients with complicated UTI out of 16 cases 7 cases were found to be deviated from the guidelines. The patients were prescribed with Metronidazole, Doxycycline, Cefotaxime, Ceftriaxone, Piperacillin-Tazobactam, Ciprofloxacin, Amoxicillin-Clavulanate, Levofloxacin which are not the indicated antibiotics for the Complicated UTI's. The results of appropriateness of therapy is given in Table No 2.

Overall, the deviation in the line of treatment with antibiotics observed could be due to lack of awareness among the physicians about the established guidelines on the UTI treatment. In this regard, the physicians should be informed about the deviation in the prescribing of the antibiotics and also they have been explained about the IDSA for the infectious Diseases in the treatment of UTI.

### CONCLUSION

UTIs, especially the uncomplicated ones are more prevalent in women of the child bearing age compared to male. Fluroquinolones and cephalosporin were the most commonly prescribed antibiotics in this study. Culture sensitivity test was not carried out in any cases and hence causative organism and its resistance pattern are unknown. Thus, the present study conclusively suggests the deviation in the line of UTI treatment and the need to improve the awareness among the physicians to use the recommendations of IDSA guidelines or any other established guidelines in the treatment of UTI for the better therapeutic outcome and also to reduce the antibiotic resistance.

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### Conflict of Interest

No conflict of interest has been reported by the authors of the study and study has been concluded with no conflicts.

### REFERENCES

1. Pradeep RJ, Vijay VM, and YeshwantAD. (Drug Utilization Study in Ophthalmology Outpatients at a Tertiary Care Teaching Hospital). ISRN Pharmacology, 2013; Article ID76879.
2. Parthasarathi G, Hansen KN, Nahata MC. Textbook of Clinical Pharmacy Practice. Orient Blackswan Private Limited. Drug Utilisation evaluation<sup>2nd</sup> ed., 2012; 447-465.
3. Hoffmann RP. (A strategy to reduce drug expenditures with a drug utilization review program). Hosp Pharm, 1984; 19(1): 7-8.
4. Gonzalez C. (Treatment of urinary tract infection: what's old, what's new and what works). World J Urol., 1999; 17: 372-382.
5. Dipiro, Joseph T. Textbook of Pharmacotherapy: A Pathophysiologic Approach. 7<sup>th</sup> edition., New York: McGraw-Hill Medical, 2008.
6. Bahadin J. (Aetiology of community acquired urinary tract infection and antimicrobial susceptibility patterns of uropathogens isolated). Singapore Med J, 2011; 52(56): 415.
7. Infectious diseases society America available from [www.idsociety.org/Guidelines\\_Pocketcards/](http://www.idsociety.org/Guidelines_Pocketcards/) (Accessed on 2-10-2017).
8. Introduction to Drug Utilization Research. World Health Organization, Oslo Norway, Geneva. 2003.
9. Urinary Tract Infection. Available from <https://www.mayoclinic.org/diseases-conditions/urinary-tract-infection/symptoms-causes/syc-20353447>. (Accessed on 2-6-2018).
10. Badr Al A, Shaikh Al G. (Recurrent Urinary Tract Infections Management in Women). Sultan Qaboos Univ Med J, 2013 Aug.; 13(3): 359-367.