

Analysis of prescribing pattern of antibiotics and susceptibility patterns of uropathogens among patients with urinary tract infections

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ABSTRACT

Aim and Objective: The aim of the study was to determine the incidence, prescription pattern of antibiotics, response to various antibiotics, and culture sensitivity status and other therapeutics considerations in patients of complicated urinary tract infections (UTI). **Materials and Methods:** Patients who are diagnosed with UTI are included in this study. The prescribing pattern of these UTI patients and occurrence of UTI in both men and women is also evaluated. The study has been carried out for the period of 6 months in Employer State Insurance Hospital, Tertiary Care Hospital, Chennai. **Results and Discussion:** A total of 95 patients with UTI were included in this study. It was found that *Escherichia coli* was the major susceptible organism to cause infection and it shows higher in the long course of treatment requirement. About 72.6% of UTI patients are treated with ceftriaxone and 62.1% of patients are treated with norfloxacin. **Conclusion:** Norfloxacin and ceftriaxone are found to be most commonly and majorly prescribed drug among the UTI patients and *E. coli* was found to be major organism to cause UTI.

KEYWORDS: Ceftriaxone, *Escherichia coli*, Norfloxacin, Urinary tract infections

INTRODUCTION

Urinary tract infections (UTIs) are the most common infections affecting peoples throughout their lifetime. It occurs in all age groups from neonates to geriatric and in both male and female.^[1] UTI is more prone to female and renal transplant patients and anyone with functional or structural abnormalities. UTIs are defined as an infection that occurs in urethra, bladder, and kidneys by bacteria, viruses, and fungi and other infectious agents that colonize the urinary tract.^[2] The UTI is diagnosed by the presence of bacteria in the urine and various clinical symptoms.^[3] UTI can be symptomatic or asymptomatic infection. In symptomatic infection, the symptoms occur with the presence of bacteria. In asymptomatic infection absence of bacteria in the urine without causing any symptoms UTI is the second most common bacterial infection in

the world and it is especially common among the female population.^[4] UTI can be classified into upper tract infections, the main cause of upper tract infection is kidneys (pyelonephritis) and in lower tract infections, which involve the bladder (cystitis), urethra (urethritis), and prostate. Mostly the cause for cystitis and pyelonephritis is by bacteria both Gram-positive and Gram-negative. Fungi (usually *Candida* species), mycobacteria, viruses, and parasites are the most and less common nonbacterial pathogens. Women are more susceptible to UTI than men. In women, bacterial infection is the most common cause.^[5] In a year, up to 10% of women are prompt to UTI and rationally half of women will have at least one infection in their lives. UTI frequently occurs between the ages of 16 and 35 years. In India, 1% neonates affected by bacteriuria; it occurs in male infants in 2–4 times higher in frequency and it can lead to congenital disorder of kidney and urinary tract. The 1.2% of girls gets affected by UTI until the age of 10 years but most of the infections are asymptomatic. In school girls, there is a rise in UTI, and 80% of schoolgirls gets affected by UTI and

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8% of these infections are recurrences and failure of empirical therapy.^[6,7]

The UTI is diagnosed by analyzing a urine sample and growth of bacteria in a urine sample collected from the patient using urine culture method to identify which organism causes infection. The imaging and various types of scanning methods used to create images of your urinary tract. The various method used in diagnosis UTI is^[8,9] urine microscopy,^[10] dipstick test,^[11] imaging computed tomography scan, and micturition cystourethrogram cystoscopy.

Treatment^[11-13]

Acute uncomplicated cystitis

Acute cystitis is an infection occurs in the urinary bladder, this infection is most common in sexually active women and young women. It is categorized into complicated or uncomplicated based on the symptoms and response to antibiotic therapy. Acute uncomplicated cystitis is a mild bacterial infection and its symptoms will be reduced without active antibiotic treatment.

Drug Recommendation

Acute complicated cystitis^[11,12,14]

A complicated UTI is an infection associated with a structural or functional abnormality of the genitourinary tract or with the presence of an underlying disease that increases the risk of a more serious outcome or of failing therapy. Empiric therapy on the basis of local antibiotic resistance patterns, then, streamlines on the basis of cultures and treats for 5–7 days.

Drug Recommendation

Acute pyelonephritis

Acute pyelonephritis is a bacterial infection of the kidney and it is common in young women. The diagnosis is made based on history and physical examination. Most patients have a fever, although it may be absent early in the illness. Flank pain is a universal symptom of pyelonephritis. A urinalysis is important to confirm the diagnosis of pyelonephritis. Urine culture should be obtained in all patients receiving antibiotic therapy to find the efficacy of administered antibiotics. *Escherichia coli* is the most common pathogen in acute pyelonephritis, but there is increasing *E. coli* resistance to extended-spectrum beta-lactam antibiotics.

Drug Recommendation

- Outpatient management
- Ciprofloxacin 500 mg PO BID 7 days
- Levofloxacin 750 mg PO daily 5 days.

Commonly used drugs and Dosage Recommendation.

Drugs	Dose	Roa	Frequency	No. of days
Ciprofloxacin	400 mg	IV	Q12 h	7 days
Levofloxacin	500 mg	IV	Q24 h	7 days
Ceftriaxone	1 g	IV	Q24 h	14 days
Cefepime	1–2 g	IV	Q12 h	7 days
Piperacillin/ tazobactam	4.5 g	IV	BD	5 days

If fluoroquinolones resistance is high use ceftriaxone or aminoglycoside, before culture result is obtained.

Recurrent UTIs

- Nitrofurantoin 50 mg PO qhs
- Trimethoprim/sulfamethoxazole 40/200 mg PO daily.

MATERIALS AND METHODS

Sample Size

The sample size includes 95 patients, both male and female, of the urology department in a tertiary care hospital.

Sample size: $z^2p(1-p)/d^2$

$(1.96)^2 \cdot 0.5(1-0.5)/(0.10)^2 = 95$ patients

Study Design

It is a prospective observational study and the project work was planned for a period of 6 months. The study instrument used in this study is the patient case sheet, medication chart, lab reports, and questionnaires.

Complete Study Procedure

The project work was planned for a period of 6 months and the design of research work is completely prospective observational studies which will include a sample size of 95 patients. The methodology includes the collection of data of patients through case reports form. Prescribing the medication pattern of antibiotics for UTI patients will be evaluated and calculated, occurrence of UTI in both women and men, and also the usage of antibiotics and their secondary complication will be evaluated.

Patient Selection

Inclusion criteria

- Both in and outpatients diagnosed with UTI
- Patients underwent urinary catheterization
- The group of people involves both men and women aged between 18 and 80 years were included in the study.

Exclusion criteria

- The patient underwent abdominal/reproductive surgery
- The patient who dint do urine culture test by bag specimen

- Pregnant and lactating women were excluded from the study.

RESULTS

Based on the pattern of antibiotics, the most prescribed antibiotic was studied and documented. Among the drugs, the most prescribed four types of antibiotics were: Ceftriaxone (72.6%) was the most prescribed drug, norfloxacin (62.1%) was the second most prescribed drug, amikacin (40%), and ciprofloxacin (44.2%) and the data are shown in Tables 1-4.

DISCUSSION

UTI is mostly caused by Gram-negative bacteria and nearly 75% of cases are accounted.^[8] About 53%

of cases were mostly accounted for *E. coli* which is Gram-negative bacteria. In India, the incidence of *E. coli* shows from 48% to 65% was reported by various studies done earlier.^[4] The second most common uropathogen was *Klebsiella* and 10% of cases were accounted. The incidence of *Klebsiella* as uropathogen shows 8–26% in UTI cases.^[5] Other bacterial uropathogens account for 15–20% of cases,^[5] whereas *Candida* species growth is nearly 7%. This cause may be due to high prevalence of HIV/AIDS and diabetes, and with the improper use of broad-spectrum antibiotics. In our study, we concluded that around 86% of *E. coli* isolates were found to be resistant to drug ampicillin.^[7] From various studies, we accounted that resistance to ampicillin was found to be high and presented in Figures 1-2. A study done in northern part of India reported that the resistance of ampicillin was 76% and also Theresa increased resistance pattern of *E. coli* to fluoroquinolones. The similar observations were documented from many studies in other parts of India, which shows the widespread use of fluoroquinolones as a first-line empirical therapy for UTI. Moderate sensitivity was found with cephalosporins and newer fluoroquinolones.^[13,14] Based on the pattern of antibiotics, the most prescribed antibiotic was documented and studied in both inpatients and outpatients. Among the drugs, the most prescribed four types of antibiotics were: Ceftriaxone (72.6%) was the most prescribed drug, norfloxacin (62.1%) was the second most prescribed drug, ciprofloxacin (44.2%), and amikacin (40%) and shown in Figure 3.

Table 1: Patient with UTI *ceftriaxone crosstabulation

	Ceftriaxone		Total
	N	Y	
Patient with UTI	1	0	1
N	0	1	2
Y	0	24	92
Total	1	25	95

UTI: Urinary tract infections

Table 2: Patient with UTI *amikacin crosstabulation

	Amikacin		Total
	X	Y	
Patient with UTI	1	0	1
N	0	1	2
Y	0	55	92
Total	1	56	95

UTI: Urinary tract infections

Table 3: Patient with UTI *norfloxacin crosstabulation

	Norfloxacin		Total
	X	Y	
Patient with UTI	1	0	1
N	0	2	2
Y	0	33	92
Total	1	35	95

UTI: Urinary tract infections

Table 4: Patient with UTI *ciprofloxacin crosstabulation

	Ciprofloxacin		Total
	X	Y	
Patient with UTI	1	0	1
N	0	0	2
Y	2	50	92
Total	3	50	95

UTI: Urinary tract infections

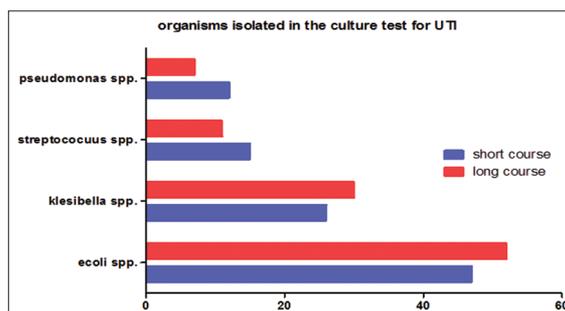


Figure 1: Organisms isolated in the culture test for UTI

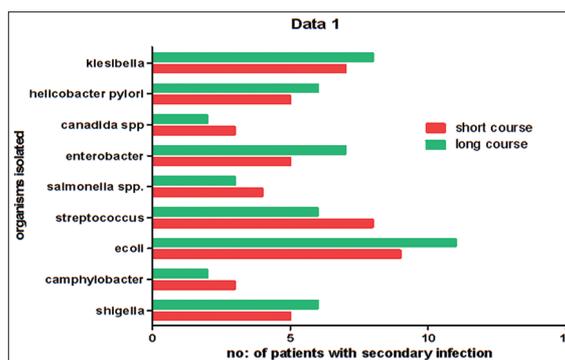


Figure 2: Number of patients with secondary Infection

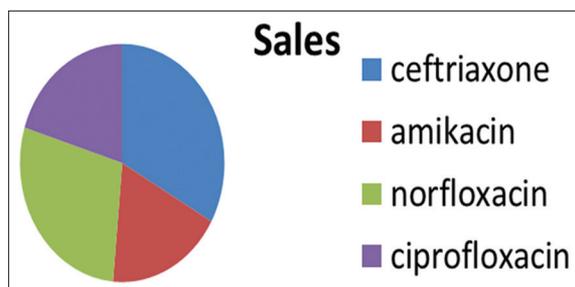


Figure 3: Distribution pattern of prescribed antibiotics for the treatment of UTI

In this study, we mentioned that the resistance pattern to another organism in our study is similar to other studies from the different places of India. From all the studies, it is patient that the uropathogens are least resistant to amikacin and imipenem. This may be due to the less common use of these injectable antibiotics.^[13] In cephalosporins and third-generation fluoroquinolones, moderate resistance was noted. From the above resistant patterns, the more resistance was seen with ampicillin, amoxiclav, cotrimoxazole, and the first- and second-generation fluoroquinolones.^[15] This may be due to the wide use of these antibiotics as initial empirical therapy for the treatment of UTI. Our study results corroborate with the study of Chem *et al.* who have also found *E. coli* to be the most commonly isolated organism in urine culture and with Bay and Anacleto who had observed that cephalosporins were the most common antimicrobial used in UTI.^[7,8] According to Mahadevammal, norfloxacin is a well-tolerated drug and has good efficacy when given twice daily for 5 days, and it has a low propensity for ecological adverse effects.^[16] The study result may be limited by the fact that initial antibiotic treatment received by the UTI patients before coming this hospital and its effect on urine culture sensitivity test was not taken into consideration.^[17,18] Since this is a tertiary care hospital dealing with patients mostly referred from primary and secondary health centers; prescribers may be preferring second and third-line drugs over first-line drugs, which may be one of the reasons behind low use of nitrofurantoin and cotrimoxazole.^[18]

CONCLUSION

In this study, we found that the drug norfloxacin and ceftriaxone was most commonly and majorly prescribed drug. From the present, findings with together ones are suggestive of need of periodic of monitoring of antibiotic sensitivity pattern of the bacterial isolates to provide effective treatment

and thereby to make it more most cost-effective, particularly in developing countries like India. However, in the case of inpatient, we cannot prescribe with drugs like ceftriaxone because it needs IV cannula and special catheterisation.

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