Original Research Article

Evaluation of antibiotic prescription pattern in in-patients with urinary tract infection in a tertiary care centre

Tanya Mary Thomas[1*], Padmaja Udaykumar[2]

[1]Department of Pharmacology, Sree Narayana Institute of Medical Sciences, Kerala, INDIA.
[2]Department of Pharmacology, Father Muller Medical College, Mangalore, Karnataka, INDIA.
Email: tanimary42@gmail.com

Abstract

Background: Urinary tract infection is one of the most common bacterial infections worldwide. The primary focus of our study was to assess the prescription pattern of antimicrobials among in-patients admitted with urinary tract infection. **Materials and methodology:** This was a retrospective descriptive hospital-based study conducted on in-patients above 18 years of age admitted to Father Muller hospital, Mangalore with a diagnosis of urinary tract infection between August 2011 and July 2012. All relevant data were collected from the patient's case record files and then analysed using descriptive statistics. **Results:** The most frequently prescribed antimicrobials were cephalosporins (70.4%) and fluoroquinolones (54.6%). Among the cephalosporins, ceftriaxone was the most commonly prescribed antibiotic, accounting for 36.1% of prescriptions, followed by cefixime (16.5%) and cefoperazone (7.7%). Among the fluoroquinolones, ciprofloxacin was the most frequently prescribed, accounting for 40.8% of prescriptions. In pregnant women, the most common antibiotic prescribed was amoxicillin. **Conclusion:** In this era of antimicrobial resistance, choosing an appropriate antibiotic is of great importance. Treating physician should have the knowledge of causative uropathogens and local antibiotic resistance pattern; to optimize the care given to patients with urinary tract infection.

Keywords: Urinary Tract Infection, Antimicrobials, Prescription

[*]**Address for Correspondence:**
Dr Tanya Mary Thomas, Department of Pharmacology, Sree Narayana Institute of Medical Sciences, Kerala, INDIA.
Email: tanimary42@gmail.com

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INTRODUCTION

Urinary tract infection (UTI) can be defined as the microbial infiltration of the otherwise sterile urinary tract. It one of the most common bacterial infections worldwide.[1] Community acquired UTI is responsible for direct costs of $1.6 billion per annum to the health care system of United States.[2] In India, it is the 3rd most common infection presenting to our health care system.[3] Over one third of females experiences at least one episode of UTI during their lifetime.[4] UTIs can be challenging; not only in terms of the large number of cases it accounts to each year but also because its diagnosis need not be always straightforward.[5] Urinary tract infections include a wide range of clinical entities such as urethritis, cystitis, acute and chronic pyelonephritis.[6] They can present as complicated or uncomplicated symptomatic infection or as asymptomatic bacteriuria (ASB). Uncomplicated UTIs usually occur in a normal genitourinary tract with no obstruction or prior instrumentation. The most predominant uropathogen of acute uncomplicated UTI is *E.coli* (80% - 85%) followed by *Staphylococcus saprophyticus* (10% - 15%).[7] Factors like age, diabetes, spinal cord injury and catheterization further complicate UTI. Micro-organisms responsible for complicated UTI belong to a broader range when compared to uncomplicated UTI.[(8)] Therefore active management of

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UTI is imperative, because in certain circumstances it can cause permanent renal damage (renal scarring).The prevention of recurrent UTI warranties the need for further evaluation to detect the presence of any complicating factors.[9] The aetiology and susceptibility of the causative uropathogen is unpredictable in the settings of complicated UTI, therefore when complicated UTI is suspected patients should undergo urinalysis along with culture and sensitivity testing. Due to lack of well-designed clinical trials and increasing prevalence of antimicrobial resistance, treatment of complicated UTIs can be very challenging.[10] Antibiotics play a pivotal role in the management of UTI. However, the misuse of antimicrobials has led to an alarming increase in the number of bacterial resistant strains which in turn increases morbidity of the disease and cost related to the treatment.[11] Physicians should take into account factors such as in vitro susceptibility, cost-effectiveness, selection of resistant strains and adverse effects while selecting a treatment regimen. This is essential for maintaining the safety and efficacy of the treatment.[12] Thus, periodic review of pathogen frequency and pattern of antibiotic usage and its bacterial susceptibility will lead to a more effective prescription and henceforth a better treatment outcome.[13] Due to the rising antimicrobial resistance, there has been a compromise in the therapeutic management of uncomplicated UTI and also limitation to the therapeutic options for patients with complicated UTI. Currently, preventive strategies involving non-antimicrobial approaches are being explored.[14] In many countries high resistance to broad-spectrum antibiotics particularly to extended-spectrum β-lactams, carbapenems and fluoroquinolones among uropathogens have emerged as a critical problem.[15] The primary focus of this study was to determine the prescription pattern of antimicrobials among in-patients admitted with urinary tract infection.

METHODOLOGY

This was a retrospective descriptive hospital-based study conducted on patients admitted with UTI in Father Muller hospital, Mangalore. The study was conducted after getting an approval from the institutional ethics committee. The study included all in-patients of either gender above 18 years of age admitted to Father Muller medical college, Mangalore with a diagnosis of UTI between August 2011 and July 2012. Data was collected from the patient's case record files, which were retrieved from the medical records department of our hospital. All relevant data regarding the type of clinical presentation, demographic distribution, associated risk factors, co-morbid conditions, prescription pattern of antimicrobials and its duration of administration were documented into a proforma sheet prepared beforehand. Patients below 18 years of age, severely ill patients and those with inadequate case records were excluded from the study.

STATISTICAL ANALYSIS

The relevant data from the case record forms were tabulated in an excel spreadsheet and statistical analysis was done. Data were analysed using descriptive statistics; mean, frequency and percentage. Results were depicted in the form of graphs and tables. Microsoft excel was used to make graphs and tables.

RESULTS

Total number of case records analysed was 260. In our study, female patients (65%) were more prone to UTI compared to males (35%) as shown in figure 1. Among females, prevalence of UTI was seen more in 21-30 years age group and amongst males, 41- 50 years age group was affected more. (Table 1) The most common presenting symptom was fever followed by dysuria, nausea, vomiting and increased urinary frequency (table 2). Diabetes mellitus was the most common risk factor associated with complicated UTI in our study. Other risk factors include post-menopausal age group, benign prostatic hyperplasia, recurrence, calculi, pregnancy and catheterization (figure 2). Out of the 260 patients, culture sensitivity test was performed only in 218 of them. The most frequently prescribed antimicrobials were cephalosporins (n=183, 70.4%) and fluoroquinolones (n=142, 54.6%); followed by penicillins (n=47), nitrofurantoin (n=44), aminoglycosides (n=22) and cotrimoxazole (n=18). Among the cephalosporins, ceftriaxone was the most commonly prescribed antibiotic, accounting for 36.1% of prescriptions, followed by cefixime (16.5%) and cefoperazone (7.7%). Among the fluoroquinolones, ciprofloxacin was the most frequently prescribed, accounting for 40.8% of prescriptions. In pregnant women, the most common antibiotic prescribed was amoxicillin. The mean duration of antibiotic treatment was found to be 10.38 days.

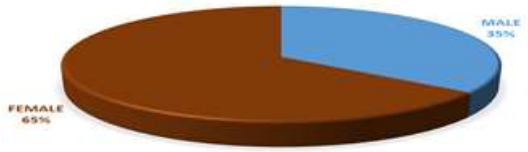

Figure 1: Pie chart depicting the distribution of study sample according to gender

Table 1: Distribution of males and females in specific age group

AGE GROUP	Female	Male
18-20 years	7 (4.1%)	3 (3.3%)
21-30 years	43 (25.4%)	12 (13.2%)
31-40 years	25(14.8%)	8 (8.8%)
41-50 years	22(13.0%)	20 (21.9%)
51-60 years	20(11.8%)	17 (18.7%)
61-70 years	30(17.8%)	11(12.1%)
71-80 years	16(9.5%)	11(12.1%)

81-90 years	6 (3.6%)	9 (9.9%)
Total	**169**	**91**

TABLE 2: CHIEF COMPLAINTS / PRESENTING SYMPTOMS

CHIEF COMPLAINTS	FREQUENCY(n)	PERCENT (%)
Dysuria	167	64.2%
Increased urinary frequency	89	34.2%
Fever	183	70.4%
Hematuria	3	1.2%
Urinary retention	9	3.5%
Nausea and vomiting	124	47.7%
Abdominal pain	68	26.2%
Urinary incontinence	10	3.8%
Generalised weakness	20	7.7%
Urgency	18	6.9%

Figure 2: Distribution of study sample based on risk factors

Table 3: Prescription pattern of antimicrobials in this study sample

ANTIMICROBIALS	FREQUENCY (n)	PERCENT (%)
Amikacin	22	8.5 %
Amoxicillin-clavulanate	6	2.3 %
Amoxicillin	6	2.3 %
Cefditoren	1	0.4 %
Cefixime	43	16.5 %
Cefixime + clavulanate	1	0.4 %
Cefoperazone + sulbactam	20	7.7 %
Cefotaxime	2	0.8 %
Cefpodoxime	6	2.3 %
Ceftazidime	1	0.4 %
Ceftriaxone	94	36.1 %
Ceftriaxone + sulbactam	2	0.8 %
Cefuroxime	10	3.9 %
Cephalexin	3	1.2 %
Ciprofloxacin	106	40.8 %
Cotrimoxazole	18	6.9 %
Crystalline penicillin	1	0.4 %
Doxycycline	8	3.1 %
Ertapenem	1	0.4 %
Faropenem	1	0.4 %
Imipenem	1	0.4 %
Levofloxacin	25	9.6 %
Linezolid	1	0.4 %
Meropenem	3	1.2 %
Metronidazole	13	5.0 %
Nitrofurantoin	44	16.9 %
Norfloxacin	7	2.7 %
Ofloxacin	2	0.8 %
Ornidazole	2	0.8 %
Piperacillin +tazobactam	34	13.1 %
Prulifloxacin	2	0.8 %
Tinidazole	3	1.2 %

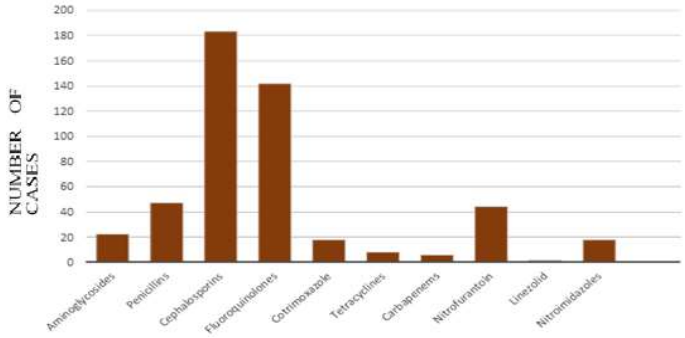

Figure 3: Bar diagram depicting the prescription pattern of antimicrobials in this study sample

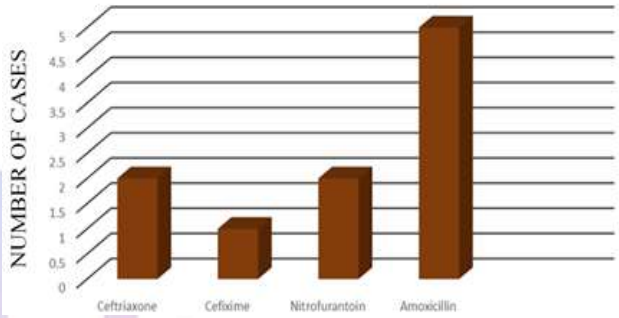

Figure 4: Bar diagram depicting prescription pattern of antimicrobials among pregnant women in this study sample

DISCUSSION

A total of 260 case records were analysed, among which 65% were females and 35 % were males. This female preponderance was also observed in a study conducted by Martínez *et al.*., where the frequency of UTI episodes were found to be twice in women than in men.[16] Shorter urethra, close proximity of urethral meatus to anus and behavioural characteristics predispose females to UTI.[17] In our study, majority of patients (n=55) belonged to the age group 21-30 years out of which 43 were females and 12 were males. Majority of UTI cases in males were seen in the age groups 41-50yrs (n=20) followed by 51-60yrs (n=17) as shown in table 1. UTI in men is mostly due to functional or anatomical abnormalities of genitourinary tract. Most frequent predisposing factors of UTI in men are prostatic hypertrophy and genitourinary instrumentation.[18] Increasing frequency of prostate disease in males and diabetes mellitus are responsible for increasing the incidence of UTI in elderly individuals.[19] Fever and dysuria were the predominant presenting symptoms accounting to 70.4% and 64.2% respectively. Other symptoms include nausea and vomiting (47.7%), increased urinary frequency (34.2%), abdominal pain (26.2%), generalised weakness (7.7%), urgency (6.9%), urinary

incontinence (3.8%), urinary retention (3.5%) and haematuria (1.2%). Similar observations was seen in studies conducted by Eshwarappa *et al.*.[20] and Prakasam *et al.*.[21] Complicated UTI is the infection of urinary tracts which are anatomically and or functionally altered. There are numerous conditions associated with complicated UTI.[9] In our study, the most common condition associated with complicated UTI was found to be diabetes mellitus as shown in figure 2. This observation was comparable to studies conducted by Muraraiah *et al.*.[22] and Prakasam *et al.*.[21] This increased frequency of UTIs observed in diabetic patients is due to several mechanisms like glycosuria, increased bacterial adherence to uroepithelial cells and neutrophils dysfunction.[23] Out of the 260 patients, culture sensitivity test was performed only in 218 of them. In the remaining patients, antimicrobials were started empirically. Table 3 and figure 3 shows the prescribing pattern of antimicrobials in our study sample. The most frequently prescribed antimicrobials were cephalosporins (n=183, 70.4%) and fluoroquinolones (n=142, 54.6%); followed by penicillins (n=47), nitrofurantoin (n=44), aminoglycosides (n=22) and cotrimoxazole (n=18). Among the cephalosporins, ceftriaxone was the most commonly prescribed antibiotic, accounting for 36.1% of prescriptions, followed by cefixime (16.5%) and cefoperazone (7.7%). Among the fluoroquinolones, ciprofloxacin was the most frequently prescribed, accounting for 40.8% of prescriptions. A study conducted by Ramanath *et al.*[24], reported ceftriaxone as the most frequently prescribed antibiotic followed by cefotaxime and ciprofloxacin among in-patients with UTI. Similar results were observed in a study conducted by Mahadevamma *et al.*..[25] According to the IDSA guidelines, fluoroquinolones are antimicrobials of choice in UTI provided its resistance does not exceed more than 10%.[26]. The first generation fluoroquinolones (particularly ciprofloxacin and norfloxacin) are currently the most popular drugs, because of their potent action against gram negative bacilli and low cost.[27] Excessive prescribing of fluoroquinolones however has increased the prevalence of resistance among uropathogens. Nitroimidazoles accounted for 6.9% of prescriptions. They were found to be prescribed in combination with beta lactam antibiotics with or without aminoglycosides. They are highly selective to anaerobic and microaerophilic micro-organisms. Most of these antimicrobials attain high concentration in urine. Therefore in lower UTIs, smaller than usual doses are required, because antimicrobial action in urine is sufficient enough to eradicate the infection.[27] The mean duration of antibiotic treatment was found to be 10.38 days. Drugs like carbapenems (n=6), linezolid (n=1) and tetracyclines (n=8) were the least prescribed drugs in our study. Our study also assessed the prescription pattern of antimicrobials in pregnancy. The most frequently prescribed antibiotic was amoxicillin (n=5) and the least prescribed was cefixime (n=1). Nitrofurantoin and ceftriaxone were prescribed in 2 pregnant women each. All antibiotics that were prescribed in pregnant women belonged to FDA category B and is considered to be safe. A similar study conducted in India observed nitrofurantoin as the most frequently prescribed antibiotic among pregnant women with UTI.[24] In majority of cases antimicrobial therapy was initiated prior to urine culture and sensitivity reports. However inappropriate selection and usage of antimicrobials will not only promote antibiotic resistance but will also result in treatment failure. This in turn will increase the morbidity of the disease and treatment related expenditures.[24] Increasing antibiotic resistance is a global and regional challenge. Henceforth, there is an urgent need to rationalize the usage of antibiotics in Indian hospitals.[(28)] Empirical therapy should therefore be always based on the knowledge of aetiology and antibiotic resistance pattern of uropathogens in the locality.

CONCLUSION

Urinary tract infection is a common infection presenting to our hospital on an everyday basis. If not adequately treated, may result in complications which in turn increases the morbidity of the disease. Antimicrobials play a crucial role in the management of urinary tract infection. However in this era of antimicrobial resistance, choosing an appropriate antibiotic is of great importance. In our study, the most frequently prescribed antimicrobials were cephalosporins and fluoroquinolones. Among fluoroquinolones, ciprofloxacin was the most frequently prescribed antibiotic. Irrational and widespread empirical usage of fluoroquinolones could have contributed to this antimicrobial resistance. Henceforth, it is important for a treating physician to have the knowledge of causative uropathogens and local antibiotic resistance pattern; to optimize the care given to patients with urinary tract infection.

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