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Research Article

ANTIMICROBIAL UTILIZATION PATTERN OF URINARY TRACT INFECTION IN TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To study and analyze the pattern of antimicrobial utilization in urinary tract infection (UTI).

Methods: A descriptive retrospective study was conducted in tertiary care hospital for 6 months including both male and female patients of all age groups. Case sheets diagnosed with UTI based on ICD-10 disease coding were collected from medical records department. The demographic data and prescription pattern of each case sheet were evaluated in detail. Drug utilization pattern was compared among different age groups of patients.

Results: A total of 108 patients were included in the study, out of which 44.4% were males, and 55.6% were females. Most of the patients were in 40-60 years age group (40.7%). UTI confirmed by culture in 59.26% patients; in which *Escherichia coli* was isolated in 35.9% patients followed by *Klebsiella* species (14.06%) and *Pseudomonas aeruginosa* (7.8%). Cephalosporins (70.37%) were most commonly used antibiotic followed by fluoroquinolones (38.89%), penicillins (29.63%), azithromycin (17.59%), and aminoglycosides (15.74%). Among the cephalosporins, third generation parenteral was most commonly used. In penicillins, amoxicillin + clavulanic acid combination was used in 9 patients. Amikacin was most commonly used aminoglycoside followed by gentamicin. Mean duration of treatment was 6.28±3.02 days.

Conclusion: Third generation cephalosporins (ceftriaxone and cefixime) were used as first line drug in most of the cases irrespective of the causative organism. This group should be reserved for complicated UTIs.

Keywords: Urinary tract infections, *Escherichia coli*, Cephalosporins, Fluoroquinolones.

INTRODUCTION

Drug utilization has been defined as the marketing, distribution, prescription, and use of drugs on society with special emphasis on the resulting medical and social consequences [1]. For the past few decades, more attention is being given to rational prescribing. Drug utilization studies are playing a major role in detecting any faults in the therapy and also find out solutions to rectify the same.

Rational drug prescribing is defined as "the use of the least number of drugs to obtain the best possible effect in the shortest period and at a reasonable cost" [2-4]. Monitoring of prescription and drug utilization studies could identify the associated problems and provide feedback to the prescriber so as to create awareness about the irrational use of drugs [5-7]. It is necessary to define the prescribing pattern and to target the irrational prescribing habit for sending a remedial message [8].

Urinary tract infection (UTI) is defined as the presence of bacteria in urine along with symptoms of infection [9]. UTI is an extremely common condition that occurs in both male and female of all the ages. The prevalence and incidence of UTI is higher in women than in men due to several clinical factors including anatomic differences, hormonal effects, and behavioral pattern [10]. Etiology is influenced by factors such as age, diabetes, spinal cord injury, urinary catheterization, and other factors [11]. UTI is mostly caused by gram-negative aerobic bacilli found in the gastrointestinal tract. These are *Escherichia coli, Klebsiella, Enterobactor*, *Citrobacter,* and *Proteus*. Other common pathogens include *Staphylococcus epidermidis*, *Staphylococcus saprophyticus,* and *Enterococcus* species which presumably result in UTI following colonization of the vagina or perianal skin [12].

The goals of the management of UTI are: (i) Prompt diagnosis of concomitant bacteremia; (ii) prevention of progressive renal disease by prompt eradication of the bacterial pathogen, identification of abnormalities of the urinary tract and prevention of recurrent infections; and (iii) resolution of the acute symptoms of the infection. Delay in initiation of the antibacterial therapy is associated with an increased risk of renal scarring. The initial choice of antibacterial therapy is based on the knowledge of the predominant pathogens in the patient's age group, antibacterial sensitivity patterns in the practice area, the clinical status of the patient, and the opportunity for close follow-up. The patients with significant urinary tract abnormalities and/or frequent symptomatic UTI may benefit from prophylactic antibacterial therapy. The main long-term consequence of UTI is renal scarring which may lead to hypertension and end-stage renal disease. Prevention of recurrent UTI focuses on detection and correction if possible, of urinary tract abnormalities [13]. Empirical treatment goals should be based on accurate and up-to-date antimicrobial susceptibility. The objective was to study the distribution of UTI, to find out the antimicrobial sensitivity profile of microorganisms responsible for UTI, and to evaluate the antimicrobial utilization pattern in UTI in tertiary care hospital at Karad.

METHODS

The study was conducted in the Department of Pharmacology, Krishna Institute Medical Sciences, Karad, Maharashtra. This is the retrospective record based study of patients admitted to Krishna Hospital and Research Centre, Karad, Maharashtra with a diagnosis of UTI during the period of September 2012-February 2013. The case sheets were collected from the medical records department based on the ICD-10 disease coding. The demographic data and prescription pattern of

each case sheet were evaluated in detail. The relevant investigations (microbiological and hematological) were noted down along with the urine culture report wherever available with the antimicrobial sensitivity testing. Comorbid conditions were noted down. Dose, frequency and duration of treatment with antimicrobial used to treat the UTI were recorded. Antimicrobial utilization pattern was compared among different age groups (1-10; 10-20; 20-40; 40-60; >60 years) of patients. The condition of the patient at the time of discharge was also noted. Descriptive statistics were used to describe the antimicrobial utilization pattern.

Permission was obtained from the Ethics Committee of the institution for conducting the study. The purpose of the study was explained, and confidentiality was ensured.

RESULTS

The total of 108 patients were included in the study, out of which 44.4% (n=48) were males, and 55.6% (n=60) were females. The demographic data of patients is as shown in Table 1. UTI was more frequent in the age group of 40-60 years. UTI was equally frequent in both gender in <10 year age group; increased frequency in females from 10 to 60 years, but male had higher frequency after 60 years.

Comorbid conditions with UTI are shown in Table 2. Diabetes mellitus was most common comorbid condition followed by hypertension and renal or ureteric calculi. Some patients had more than one comorbid conditions; therefore, sum total was more than 100%.

Urine culture was done in 59.26% (n=64) patients, out of which culture was positive in 65.63% (n=42) patients, sterile in 26.56% (n=17) patients, and no significant growth in 7.81% (n=5) patients. In the remaining patients (n=44), the diagnosis was based on the clinical symptoms and microscopic examination of the urine which showed the presence of a significant number of bacteria or pus cells. Isolated organisms in urine culture are shown in Fig. 1. In 9 patients, 2 organisms were isolated and in 3 patients, 3 organisms were isolated; therefore, sum total of percentage was more than 100%.

Table 1: The demographic data of patients

Age group (years)	Gender	n (%)	
		Frequency	Total
<10	Male	1 (50)	2 (1.9)
	Female	1 (50)	
10-20	Male	1 (25)	4 (3.7)
	Female	3 (75)	
20-40	Male	6 (31.6)	19 (17.6)
	Female	13 (68.4)	
40-60	Male	15 (34.1)	44 (40.7)
	Female	29 (65.9)	
>60	Male	25 (64.1)	39 (36.1)
	Female	14 (35.9)	
Total	Male	48 (44.4)	108 (100)
	Female	60 (55.6)	

Table 2: Comorbid conditions with UTI

Associated diseases	Male	Female	Total
Diabetes mellitus	19	13	32
Hypertension	16	10	26
Renal/ureteric calculi	4	8	12
Renal Failure	9	1	10
Malaria	4	0	4
Prostatomegaly	6	-	6
Chronic kidney disease	2	2	4
Nephropathy	1	3	4
Total	61	37	98

UTI: Urinary tract infection

Since *E. coli* (n=23) was the most common isolated organism, so the antimicrobial sensitivity pattern of *E. coli* has shown in Figs. 2 and 3. *E. coli* was resistant to ampicillin in 86.96% (n=20) patients and to ceftriaxone in 82.61% (n=19) patients, and it was sensitive to amikacin in 91.3% (n=21) patients but to ceftriaxone only in 13.04% (n=3) patients.

Distribution of antimicrobial utilization is shown in Table 3 and Fig. 4. Cephalosporins (70.37%) were most commonly used antimicrobial followed by fluoroquinolones (38.89%), penicillins (29.63%), azithromycin (17.59%), and aminoglycosides (15.74%).

Among the cephalosporins, third generation parenteral cephalosporins (ceftriaxone, cefotaxime, cefoperazone) were used most commonly

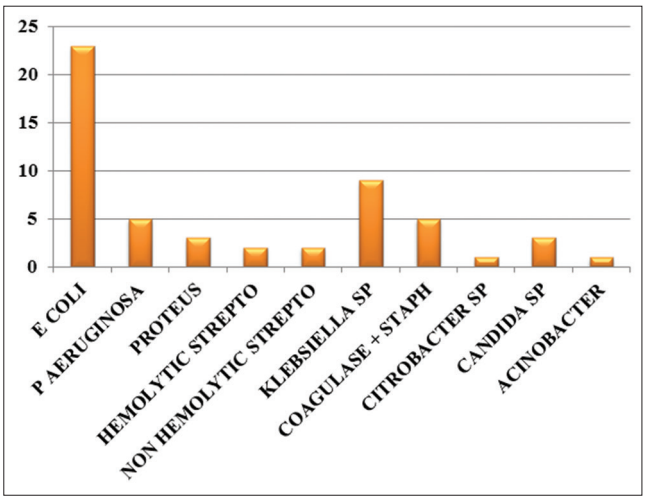

Fig. 1: Isolated organisms in urine culture

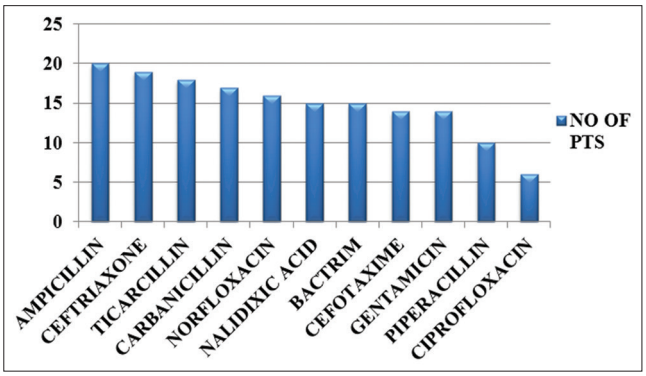

Fig. 2: Antimicrobials resistant to *Escherichia coli*

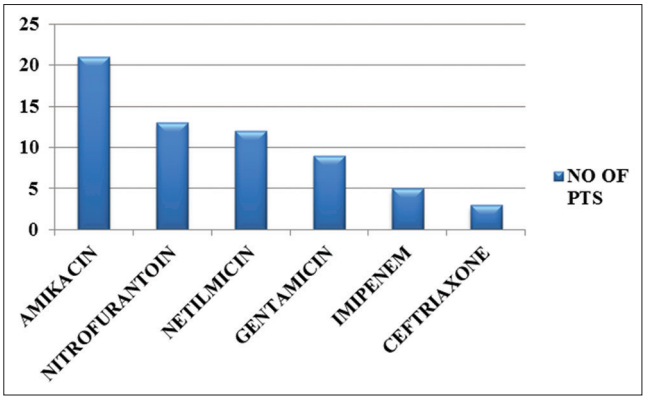

Fig. 3: Antimicrobials sensitive to *Escherichia coli*

Table 3: Distribution of antimicrobial class according to age group

S. No.	Antibiotic class	<10	10-20	20-40	40-60	>60	Total n (%)
1	Cephalosporins	1	2	15	31	27	76 (70.37)
2	Fluoroquinolones	0	2	4	23	13	42 (38.89)
3	Aminoglycosides	1	1	4	3	8	17 (15.74)
4	Penicillins	1	0	3	11	17	32 (29.63)
5	Azithromycin	0	1	3	7	8	19 (17.59)
6	Nitrofurantoin	0	0	2	3	7	12 (11.11)
7	Doxycycline	0	0	0	2	0	2 (1.85)
8	Cotrimoxazole	0	0	0	0	2	2 (1.85)

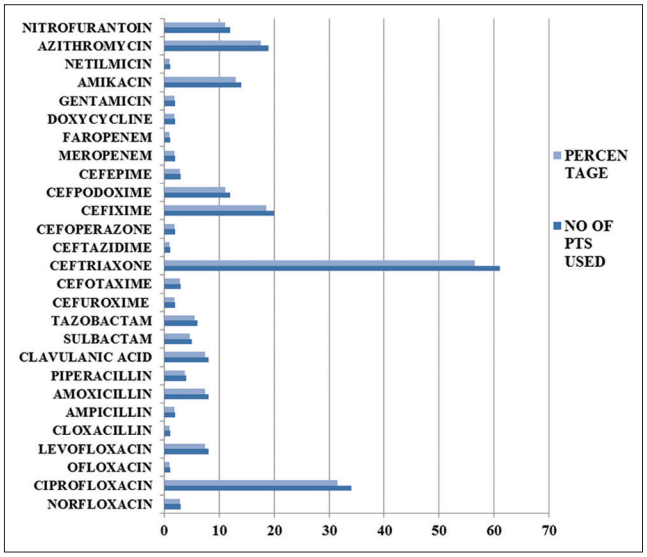

Fig. 4: Distribution of antimicrobial utilization

and were switched over to the third generation oral cephalosporin (cefixime) in 20 patients after the 4th or 5th day. Fourth generation cephalosporin cefepime was used in 3 patients. Ciprofloxacin (80.95%) was the most commonly used fluoroquinolone which was shifted from parenteral to oral after 4 days in 10 patients. Among penicillins, amoxicillin + clavulanic acid combination was used in 9 patients followed by piperacillin + tazobactam in 4 patients. Amikacin was the most commonly used aminoglycoside in 12.96% (n=14) patients followed by gentamicin and netilmicin.

Mean duration of treatment was 6.28±3.02 days with a minimum duration of 2 days and a maximum of 15 days. 83.33% (n=90) patients improved from disease and 16.67% (n=18) patients remained unchanged at the time of discharge. There was no mortality observed during the study period.

DISCUSSION

The objective was to study the distribution of UTI, to find out the antibiotic sensitivity profile of microorganisms responsible for UTI, and to evaluate the antibiotic utilization pattern in UTI in tertiary care hospital at Karad.

The present study has shown the prevalence of UTI has increased after the age of 40 years in both males and females. Higher frequency of UTI in females is in the age group of 40-60 years; whereas higher preponderance in males after 60 years of age (Table 1). Higher frequency in elderly patients may be due to increased incidence of diabetes mellitus which is more associated with male patients (Table 2). This is in accordance with the study Mahesh *et al.* [14] and Pargavi *et al.* [15] where the author states that UTI is more common in diabetic male patients with poor glycemic control. It is of equal frequency in both male and female children of <10 years age in this study. It is in contrary to the study Qureshi [16] where the author states that UTI is more frequent in boys in the first 3 months of life, with sex distribution of 5:1 (male predominance). By preschool age, the sex ratio is reversed, with the majority of UTI occurring in females.

E. coli was the most common organism isolated in urine culture in the present study followed by *Klebsiella* species (Fig. 1). This result is similar to the study by Pargavi *et al.* [15] and J. Mohan *et al.* [17]. *E. coli* was more sensitive to amikacin (91.3%) [18] but least sensitive to ceftriaxone (13.04%) (Figs. 2 and 3). This result is in agreement with Arul *et al.* [10].

The present study has shown that third generation cephalosporins were the most common prescribed antibiotic (Table 3 and Fig. 4). This is in agreement with earlier study Bay and Anacleto [19], whereas it is in contrary to the result of Mohan *et al.* [17] where amikacin is the most common prescribed antibiotic in the treatment of UTI.

This study is not intended to speak about the decision of appropriateness in the treatment with antimicrobials against any known guidelines. Rather, the purpose is to notice the antimicrobial prescription practices in tertiary care hospital with known incidence of culture sensitivity to microorganisms. So, present study throws light for the development of guidelines for the treatment of UTI in accordance with changing susceptibility of microorganisms to the antimicrobials and changes in the empirical treatment so to cut short the morbidity of the patient and the hospital stay.

CONCLUSION

Third generation cephalosporins were used most commonly as first line drug, irrespective of the causative organism. This group should be reserved for complicated UTIs. Periodic review of antimicrobial sensitivity should be done, so that change in empirical treatment can be updated. These results highlight the need for an education program for the health care system to improve the adherence toward the standard guidelines for treatment of UTI.

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