INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Research Article

TRENDS IN EMERGENCE OF ANTIBIOTIC RESISTANCE AND SENSITIVITY PATTERN OF COMMUNITY-ACQUIRED URINARY TRACT INFECTIONS IN TERTIARY CARE HOSPITALS OF SALEM DISTRICT, TAMIL NADU, INDIA

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Article Received on: 11/02/19 Approved for publication: 25/03/19

DOI: 10.7897/2230-8407.1005169

ABSTRACT

Background: To determine the trends in emergence of antibiotic resistance and sensitivity pattern and different types of organisms causing urinary tract infections. Methods: A retrospective study was conducted at tertiary care hospitals of Salem district, Tamil Nadu, during November 2017-Apri 2018 and consisted of 600 patients of either gender between ages of 01-80 years. Results: Out of 600 adults, males were 309 (51 %) and females were 291 (49 %). *E. coli* (48.68 %) was the most common organism, followed by *Klebsiella oxytoca* (12.67 %), *Enterococcus* species (10.67 %), *Klebsiella pneumoniae*. The incidence of UTI was more in patients in the age group of 01-15years. *E. coli* and *Klebsiella oxytoca* were sensitive to Amikacin, Ampicillin, and Ciprofloxacin. All these organisms were resistant to Ceftriaxone. Conclusions: In this study, males were mostly affected and the most common organisms were *E.Coli* and *Klebsiella oxytoca*. These organisms were most sensitive to Amikacin, Ampicillin, Ciprofloxacin, Imipenem and resistant predominantly to Ceftriaxone. The sensitivity and resistance pattern of uropathogens to common antimicrobial agents must be taken into account when selecting treatment plans for UTI.

Keywords: Antibiotic sensitivity, Urinary tract infection, Uropathogens, Antibiotic resistance

INTRODUCTION

Urinary Tract Infections (UTIs) are the most common bacterial infection encountered in tertiary care hospital settings[1]. A urinary tract infection is what happens when bacteria (germs) get into the urinary tract (the bladder) and multiply. The result is redness, swelling and pain in the urinary tract. Most UTIs stay in the bladder, the pouch-shaped organ where urine is stored before it passes out of the body. If a UTI is not treated promptly, the bacteria can travel up to the kidneys and cause a more serious type of infection, called pyelonephritis. Pyelonephritis is an actual infection of the kidney, where urine is produced. This may result in fever and back pain (NKF2016). Urinary tract infections (UTIs) can be divided into upper tract infections, which involve the +kidneys (pyelonephritis), and lower tract infections, which involve the bladder (cystitis), urethra (urethritis), and prostate (prostatitis)[2].

UTIs are a common problem encountered in health care. UTIs occur across the life span. As many as 10 % of women experience at least one episode of acute uncomplicated urinary infection in a year, and 60 % have at least one episode during their lifetime, the peak incidence of infection occurs in young, sexually active women ages 18 to 24. Recurrent episodes are experienced by as many as 5 % of women at some time during their life[3]. Etiological agents of UTI are variable and usually depend on time, geographical location and age of patients. However, *Escherichia coli, Proteus mirabilis, Enterobacter agglomerans, Citrobacter frreundii* and *Klebsiella pneumonia* account for over 70 % of cases[4].

There are three possible routes by which organisms might reach the urinary tract: the ascending, blood-borne and lymphatic routes. There is little evidence for the last route in humans. Blood-borne spread to the kidney can occur in bacteraemic illnesses, most notably *Staphylococcus aureus* septicaemia, but by far the most frequent route is the ascending route. In women, UTI is preceded by colonization of the vagina, perineum and periurethral area by the pathogen, which then ascends into the bladder via the urethra. Uropathogens colonize the urethral opening of men and women, that the urethra in women is shorter than in men and the urethral meatus is closer to the anus are probably important factors in explaining the preponderance of UTI in females. Further, sexual intercourse appears to be important in forcing bacteria into the female bladder, and this risk is increased by the use of diaphragms and spermicides, which have both been shown to increase *E. coli* growth in the vagina. Whether circumcision reduces the risk of infection in adult men is not known, but it markedly reduces the risk of UTI in male infants[5].

The introduction of antimicrobial therapy has contributed significantly to the management of UTIs[6]. The antimicrobial agents used in treatment of UTI include cell wall inhibitors like penicillin, third generation Cephalosporins (Cefotaxime, Cephradine, Ceftazidime and Cefaclor), DNA gyrase inhibiters like Floroquinolones (Ciprofloxacin, Ofloxacin, Sparfloxacin and Enoxacin) and Aminoglycosides (Amikacin, Gentamycin and Kanamycin) that are protein synthesis inhibitors. Inappropriate and extensive use of antibiotics has led to the development of multidrug resistance among the pathogens[7]. In patients with suspected UTI; antibiotic treatment is usually started empirically, before urine culture results are available. To ensure appropriate

treatment, knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory[8].

Aim of the study was to evaluate the trends in emergence of antibiotic resistance and antibiotic sensitivity patterns of community-acquired urinary tract infections in tertiary care hospitals of Salem district, Tamil Nadu.

MATERIALS AND METHODS

The study was conducted in tertiary care hospitals of Salem District, Tamil Nadu. All positive urine culture and antibiotic susceptibility reports of males and females of all age group except age group > 80, during the periods of November 2017-April 2018 were included in the study. Urine culture and sensitivity reports with more than one causative organism were excluded from the study. A total of 600 inpatients admitted in the general medicine department of tertiary care hospitals were studied. Study procedure involves collection of all relevant data from cases (age, sex, type of uropathogen, isolated by culture and sensitivity and their antibiotic susceptibility) from the general medicine department. In this study, a positive case of UTI was defined as significant bacterial growth.

Statistical analysis

Data entry was done using Microsoft Excel.

RESULTS AND DISCUSSION

A total of 600 positive urine culture cases aged between 1 to 80 were taken and out of 600 samples 309 (51 %) were males and 291 (49 %) were females (Figure 1).

E. coli (48.68 %) was the most common organism, followed by *Klebsiella oxytoca* (12.66 %) *Enterococcus* species and *Klebsiella pneumonia* (Table 1); gender-wise, males (51 %) were more affected than females (49 %). Gender-wise distribution of UTI by organism, Out of 309 males *E. coli* was isolated from (46.60 %) and *Enterococcus* species (12.96 %) and out of 291 females *E. coli* was isolated from (50.86 %) and *Klebsiella oxytoca* (13.40 %). The incidence of UTI was more in patients with age group of 1-15 years (Table 2).

There was a significant growth of *E. coli*, *Klebsiella oxytoca* and *Enterococcus* species were most common organisms. *E.coli* was sensitive to antibiotics Amikacin, Ampicillin and imipenem and resistance to cotrimoxazole and ceftriaxone (Figure 2). The sensitive antibiotics to *Klebsiella oxytoca* were Amikacin, Ampicillin, imipenem and ciprofloxacin and resistance to Cefixime and Ceftriaxone (Figure 3). *Enterococcus* was sensitive to Ampicillin, Amikacin and Norfloxacin. And resistance to Ofloxacin and Ceftriaxone (Figure 4)

The most commonly prescribed drug for UTI were Amikacin (50.50 %), Cefixime (18.33 %), Norfloxacin (9.50 %) and Ciprofloxacin (8.33 %) (Figure 5)

Table 1: Distribution of Uropathogens that cause UTI

Name of Uropathogens	Number of patients	Percentage (%)
Klebsiella oxytoca	76	12.67
E. coli	292	48.68
Proteus vulgaris	17	02.83
Pseudomonas aeruginosa	26	04.33
Klebsiella pneumoniae	59	09.83
Enterococcus spp	64	10.67
Candida albicans	7	01.16
Acinetobacter sp	2	00.33
Staphylococcus aureus	12	2.00
Morganellamorganii	40	06.67
Pseudomonas fluorescens	5	00.83
Total	**600**	**100**

Table 2: Gender Wise Distribution of UTI by Organism

Uropathogens	Number of Male Patients (%)	Number of Female Patients (%)
Klebsiella oxytoca	37 (11.98%)	39 (13.40%)
E. coli	144 (46.60%)	148 (50.86%)
Proteus vulgaris	7 (2.26%)	10 (3.43%)
Pseudomonas aeruginosa	16 (5.17%)	10 (3.43%)
Klebsiella pneumoniae	31 (10.03%)	28 (9.62%)
Enterococcus spp	40 (12.96%)	24 (8.24%)
Candida albicans	5 (1.61%)	2 (0.69%)
Acinetobacter sp	0	2 0.69%)
Staphylococcus aureus	8 (2.59%)	4 (1.37%)
Morganellamorganii	18 (5.82%)	22 (7.58%)
Pseudomonas fluorescens	3 (0.98%)	2 (0.69%)
Total	**309**	**291**

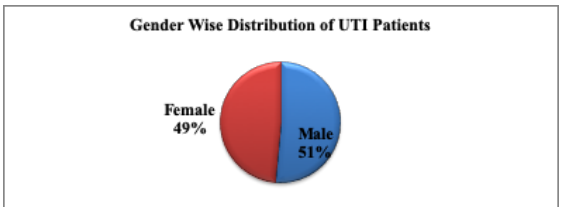

Figure 1: Gender Wise Distribution of UTI Patients

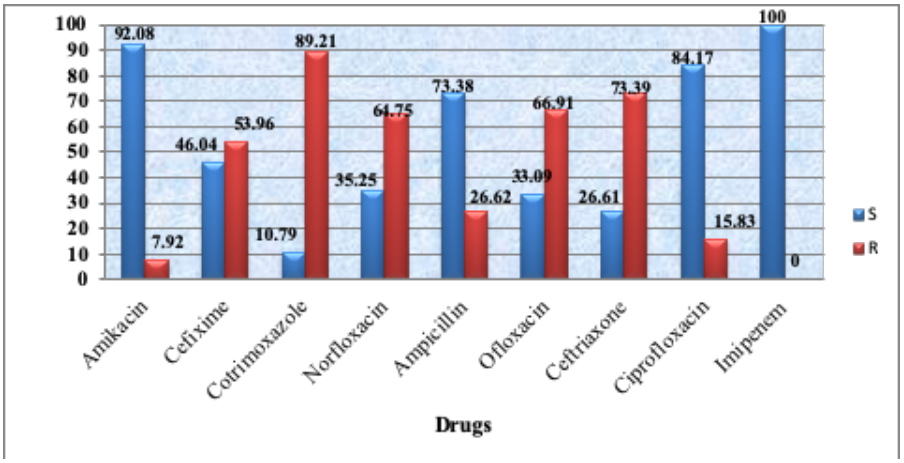

Figure 2: Antibiotic sensitivity and resistance pattern of *E. coli*

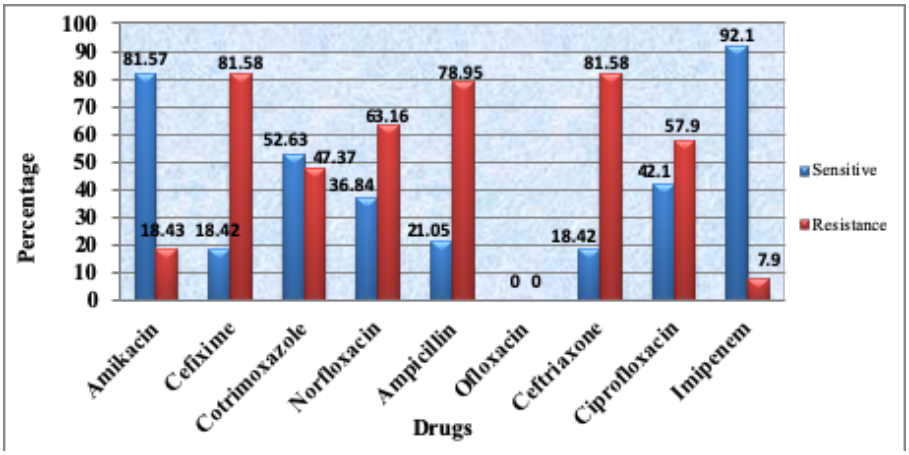

Figure 3: Antibiotic sensitivity and resistance pattern of *Klebsiella oxytoca*

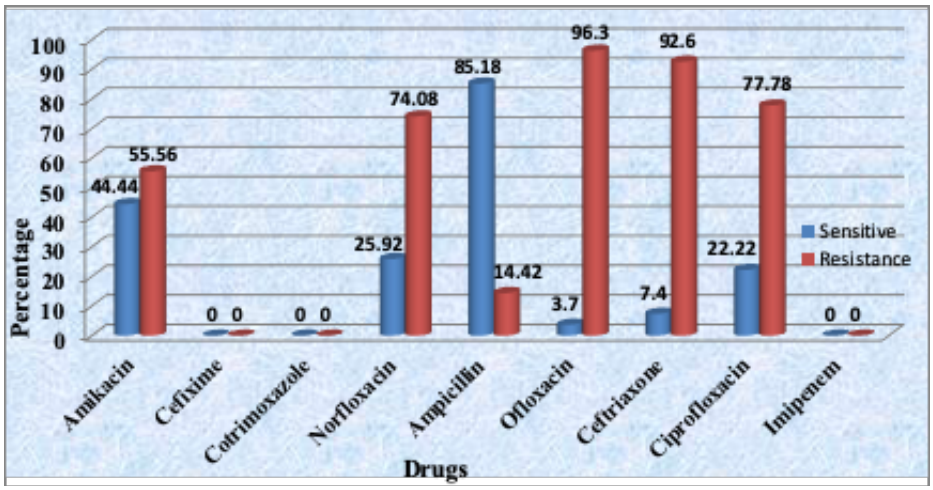

Figure 4: Antibiotic sensitivity and resistance pattern of *Enterococcus* sp

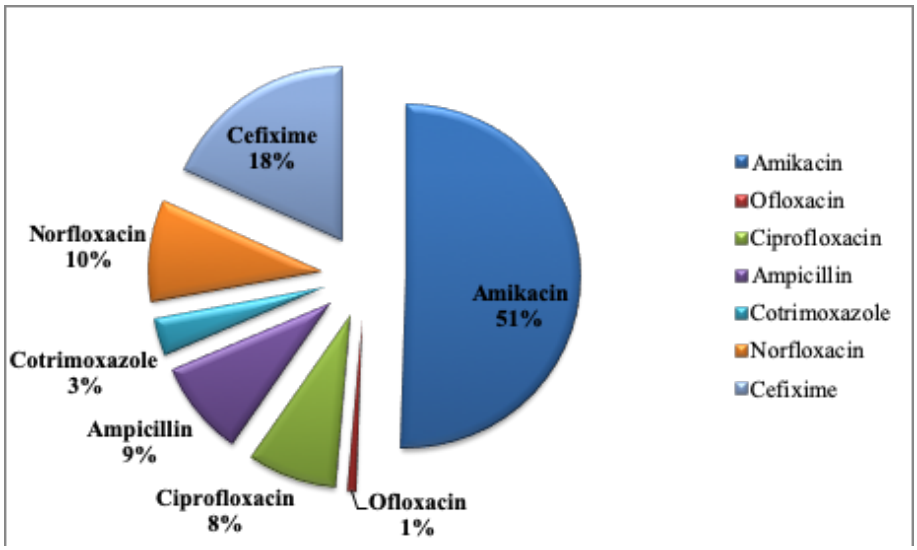

Figure 5: Prescribed Antibiotics for UTI

CONCLUSION

From this study we can conclude that males were most commonly affected with UTI in this region and the most common organism causing UTI was found to be *E. coli, Klebsiella oxytoca* and *Enterococcus* species. These organisms were mostly sensitive to Amikacin, Ampicillin, Ciprofloxacin, Norfloxacin, Ofloxacin, Imipenem. They were resistant predominantly to Cotrimoxazole, Ceftriaxone, Cefixime. The sensitivity and resistance pattern of uropathogens to common antimicrobial agents must be taken into account when selecting treatment plans for UTI.

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Cite this article as:

Mohamed Yasir Arafath *et al*. Trends in emergence of antibiotic resistance and sensitivity pattern of community-acquired urinary tract infections in tertiary care hospitals of Salem district, Tamil Nadu, India. Int. Res. J. Pharm. 2019; 10(5):89-92 http://dx.doi.org/10.7897/2230-8407.1005169

Source of support: Nil, Conflict of interest: None Declared