AMERICAN JOURNAL OF PHARMTECH RESEARCH
Journal home page: http://www.ajptr.com/

Antibiotic Prescription in Acute Urinary Tract Infections in Women

Sikha Bharadwaj[1 *], U V S Teotia[1], Kishan Singh[1], Rajib Sharma[2], Yogendra Singh[2]
1 Shri Venkateshwara University, Gajraula, J.P. Nagar, Uttarpradesh, India
2 Alembic pharmaceutical Ltd, Baddi, Himachal Pradesh, India

ABSTRACT

The main objective of the study is to measure the appropriateness of antibiotic prescription for urinary tract infections in several general hospitals and to evaluate the quality of antibiotic prescription among these services. For this study a cross-sectional study was carried out in the various hospitals from different hospitals of north India. The patients were analyzed between the age group of 15-45 years. The main variables of the study were: type of urinary infection, hospital admission, antibiotic prescription, either the presence of one or more disorders and urine culture request. A panel of experts, established first-choice, second-choice and inappropriate antibiotic treatments for each type of urinary tract infection, based on the available scientific evidence. A total of 8500 patients were analyzed from acute urinary tract infected. Out of which 81-83% were lower urinary tract infected patients. The most commonly used antibiotics in hospitals were ciprofloxacin and Amoxicillin clavulinate. The percentages of first-choice, alternative-choice and inappropriate antibiotic prescriptions were: 43%, 44% and 14% respectively. This paper describes the first choice of drugs prescribed by the doctors. We observed a significant variability in appropriateness of antibiotic prescriptions among the participating centers ($p < 0.001$).

Keywords: Urinary tract infection, Antibiotic prescription, Ciprofloxacin and Amoxicillin clavulinate.

*Corresponding Author Email: sbharadwaj80@yahoo.com
Received 13 December 2013, Accepted 15 January 2014

Please cite this article in press as: Bharadwaj S *et al.*, Antibiotic prescription in acute urinary tract infections in women. American Journal of PharmTech Research 2014.

INTRODUCTION

A hospital acquired infection is an infection obtained during hospitalization of patient. The incidence has been reported as high as 45% in intensive care units (ICUs), and depends on the size of the hospital and the size of the clinical department. Urinary tract infections (UTIs) account for about 40 to 45% of hospital acquired infections.[1,2] A recent pan-European study on the incidence of microbiologically proven hospital acquired urinary tract infections in hospitals calculated the prevalence to 10.65 per 1000 patient days. If clinically diagnosed UTIs had been included, it is likely that the incidence of UTIs would be much higher than those reported, but such figures are not yet known.[3]

Recommendations on how to monitor hospital acquired urinary tract infections were worked out by an international group of experts sponsored by the World Health Organization (WHO) and the United States Centers for Disease Control and Prevention (CDC)[4,5]

UTI is the second most frequent community-acquired adult infection and the main cause for hospital acquired infection. Although the majority of UTI episodes are attended at primary-care settings, they are also a frequent cause of admission to our hospitals. UTI is much more common in women than in men, due to anatomic and physiological reasons.[6,7]

However, at the age group of 65 or more, genders have a similar frequency. Specific subpopulations at increased risk of UTI include infants, pregnant women and the elderly, as well as those with spinal cord injuries, using catheters, diabetes patients, multiple sclerosis, human immunodeficiency virus and underlying urologic abnormalities.[8,9]

UTI treatment places a high amount of cost, both directly as well as indirectly, on the health care system. According to one survey, in the United States of America, the estimated annual cost of community-acquired UTI is approximately $1.6 billion. Antibiotic treatment is initially based on clinical grounds, guided by the antibiotic susceptibility profile of pathogens causing UTIs, the status of the patient and the site of infection.[10,11]

Majority of UTIs are acute uncomplicated cystitis in women. The higher use and inappropriate choice of antibiotics in this population are considered the most important factors for the development of bacterial resistance to antimicrobial drugs. The current rate of *E coli* resistance to ciprofloxacin and trimethoprime sulfamethoxazole is very high in India.[10,12]

In order to evaluate the variability and appropriateness of antibiotic prescription for UTI, we reviewed a sample of UTIs attended in the emergency services of a series of hospitals in different areas of general hospitals of Uttar Pradesh, India. These services are an interface between

hospital and primary-care centers and, in a certain sense, a ‘‘watchtower’’ for the study of community problems.

MATERIALS AND METHOD

I carried out a cross-sectional study on the prescription of antibiotics in acute UTIs attended in hospital emergency services belonging to various regions of general hospitals of Uttar Pradesh over a period of April 2010 to October 2011. All the hospitals were public and had very similar authorisation requirements for expensive broad-spectrum antibiotics.

The study population was made up of greater than 15 years diagnosed with community-acquired acute UTI. We considered a UTI to be community-acquired if the patient had not been hospitalised or had undergone an invasive urinary tract procedure in hospital during the two weeks prior to the appearance of UTI symptoms. A UTI was classified as uncomplicated if it occurred in a female patient with a structurally and functionally normal urinary tract[13-17]

The main aim of this study is to analyzed the variability of the antimicrobial prescription and its appropriateness in relation to the recommendations by a group of experts doctors.

Table 1 Criteria of antibiotic prescription: [7,13,19]

S. No	Type of urinary tract infection	Choice of antibiotic
1.	Lower uncomplicated UTI in non-pregnant women	Ciprofloxacin (A), Ofloxacin (A) Norfloxacin (A), Fosfomycin (B)
2	Lower UTI in complicated lower UTI in non-pregnant women	Amoxicillineclavulanate (B) Third generation cephalosporin (A)
3	Lower UTI in pregnant women	Amoxicillineclavulanate (B) Cefuroxime (B), Fosfomycin (B)
4	Sepsis of urinary origin	Third generation cephalosporin aminoglycoside (B)
5	Prostatitis	Ciprofloxacin (B) Levofloxacin (B) Third generation cephalosporin aminoglycoside (B/C)
6	Pyelonephritis	
a	Non-pregnant women Outpatient.	Ciprofloxacin (A), Levofloxacin (A) Amoxicilline-clavulanate (B) Third generation cephalosporin (A)
b	Inpatient.	Third generation cephalosporin aminoglycoside (B)
c	Pregnant women	Third generation cephalosporin (B)

1. well-demonstrated scientific evidence based on controlled clinical trials.
2. Evidence based on uncontrolled studies or made in different populations; epidemiological information on microorganisms and resistance.
3. Recommendation based on the opinion of experts.

We examine national and international literature on UTI treatment, including efficacy based on clinical trials, cost, effectiveness and safety. The method of prescription of antibiotic was

composed of several doctors and physicians from different hospitals. [5,7,18] The group of experts of doctors issued recommendations on antibiotics which were to be considered as ‘‘treatment of choice’’, for each type of UTI in Table 1. The recommendations were classified according to a hierarchical system of scientific evidence, namely List A- well-demonstrated scientific evidence based on controlled clinical trials and List B- suggested by uncontrolled studies or made in different populations; epidemiological information on microorganisms and resistance or List C- based on the opinion of experts. The main criteria for the classification of antibiotic prescriptions were:

1. Scientific evidence of efficacy
2. Appropriateness to expected etiology and resistance
3. Tolerance and
4. Cost.

The team of expert doctors agreed not to recommend either broadspectrum antibiotics for e.g. levofloxacin and third-generation cephalosporins, for treating uncomplicated UTI in female patients.

RESULTS AND DISCUSSION:

During the study period 8500 cases of UTIs was analyzed in various general hospital. Out of which 3336 patients were lower uncomplicated UTI in non-pregnant women, 3587 patients were complicated lower UTI in non-pregnant women, 272 patients were lower UTI in pregnant women, 871 patients were pyelonephritis, 324 patients were prostatitis and 110 patients were infected from sepsis of urinary origin. The primary choice of antibiotics by the doctors are Ciprofloxacin, Amoxicilline-clavulanic acid, Fosfomycin, Norfloxacin, Cefuroxime, Levofloxacin, Trimethoprim-salfamethoxazole, Ofloxacin, Ceftriaxone, Others antibiotics prescribed were amoxicilline-clavulanate plus aminoglycoside, amoxicillin, cefuroxime plus gentamycin, ciprofloxacin plus gentamycin, cefotaxime etc.

Lower uncomplicated UTI in non-pregnant women:

Approximately 3336 Patients out of 8500 were suffering from lower uncomplicated UTIs which are mainly non-pregnant. Out of which 938 (28.11%) patients were treated with Ciprofloxacin, 887 (26.58%) with Amoxicilline-clavulanic acid, 543 (16.7%) with Fosfomycin, 314 (9.41%) with Norfloxacin, 196 (5.87%) with Cefuroxime, 131 (3.92%) with Levofloxacin, 144 (4.31%) Trimethoprim-salfamethoxazole, 58 (1.73%) Ofloxacin, non of the patients were treated with Ceftriaxone and 125 (3.74%) patients were treated with other antibiotics.

Complicated lower UTI in non-pregnant women:

Approximately 3587 Patients out of 8500 were suffering from lower complicated UTIs in non-pregnant women. Out of which 1280 (35.68%) patients were treated with Ciprofloxacin, 916 (25.53%) with Amoxicilline-clavulanic acid, 175 (4.88%) with Fosfomycin, 372 (10.37%) with Norfloxacin, 273 (7.61%) with Cefuroxime, 168 (4.68%) with Levofloxacin, 149 (4.15%) Trimethoprim-salfamethoxazole, 85 (2.37%) Ofloxacin, 23 (0.64%) with Ceftriaxone and 146 (4.07%) patients were treated with other antibiotics.

Lower UTI in pregnant women:

Approximately 272 Patients out of 8500 were suffering from lower UTIs which are pregnant. Pregnant women are treated by using few antibiotics. Out of which 60 (22.05%) patients were treated with Amoxicilline-clavulanic acid, 176 (64.71%) with Fosfomycin and 36 (13.24%) with Cefuroxime.

Pyelonephritis:

Approximately 871 Patients out of 8500 were suffering from pyelonephritis (inflammation of the kidney and its pelvis caused by bacterial infection). Out of which 298 (34.21%) patients were treated with Ciprofloxacin, 367 (42.13%) with Amoxicilline-clavulanic acid, 4 (0.46%) with Fosfomycin, 20 (2.30%) with Norfloxacin, 24 (2.76%) with Cefuroxime, 67 (7.69%) with Levofloxacin, 5 (0.57%) Trimethoprim-salfamethoxazole, 4 (0.46%) Ofloxacin, 29 (3.33%) were treated with Ceftriaxone and 53 (6.08%) patients were treated with other antibiotics.

Prostatitis

Approximately 324 Patients out of 8500 were suffering from prostatitis (inflammation of the prostate gland characterized by perineal pain and irregular urination and (if severe) chills and fever)**.** Out of which 172 (%) patients were treated with Ciprofloxacin, 14 (%) with Amoxicilline-clavulanic acid, 3 (%) with Fosfomycin, 17 (%) with Norfloxacin, 15 (%) with Cefuroxime, 42 (%) Trimethoprim-salfamethoxazole, 23 (%) Ofloxacin, 3 (%) with Ceftriaxone and 35 (%) patients were treated with other antibiotics.

Sepsis of urinary origin

Approximately 110 Patients out of 8500 were suffering from sepsis of urinary origin. Out of which 32 (%) patients were treated with Ciprofloxacin, 25 (%) with Amoxicilline-clavulanic acid, 17 (%) with Levofloxacin, 58 (%) Ofloxacin, 21 (%) with Ceftriaxone and 15 (%) patients were treated with other antibiotics such as: amoxicillin, amoxicilline-clavulanate + aminoglycoside, cefuroxime+gentamycin, ciprofloxacin+gentamicin, cefotaxime etc. (13)

Table 2 Antibiotic prescriptions according to type of urinary tract infection

Prescriptions	Total	Lower uncomplicated UTI in non-pregnant women	Complicated lower UTI in non-pregnant women	Lower UTI in pregnant women	Pyelonephritis	Prostatitis	Sepsis of urinary origin
Ciprofloxacin	2720	938	1280	--	298	172	32
Amoxicilline-clavulanic acid	2269	887	916	60	367	14	25
Fosfomycin	901	543	175	176	4	3	--
Norfloxacin	723	314	372	--	20	17	
Cefuroxime	544	196	273	36	24	15	--
Levofloxacin	383	131	168	--	67	--	17
Trimethoprim-salfamethoxazole	340	144	149	--	5	42	--
Ofloxacin	170	58	85	--	4	23	--
Ceftriaxone	76	--	23	--	29	3	21
Others	374	125	146	--	53	35	15
Total	8500	3336	3587	272	871	324	110

In this study the UTIs infected patient population was well defined with respect to disease state. The entire patients were monitored over both short and long term for clinical and bacteriologic efficacy during the treatment. The percentage of drugs prescribed during the study period were 32% Ciprofloxacin, 26.69% Amoxicilline-clavulanic acid, 10.6% Fosfomycin, 8.5% Norfloxacin, 6.4% Cefuroxime, 4.5% Levofloxacin, 4% Trimethoprim-salfamethoxazole, 2% Ofloxacin, 0.89% Ceftriaxone and 4.4% others representing in figure 1.

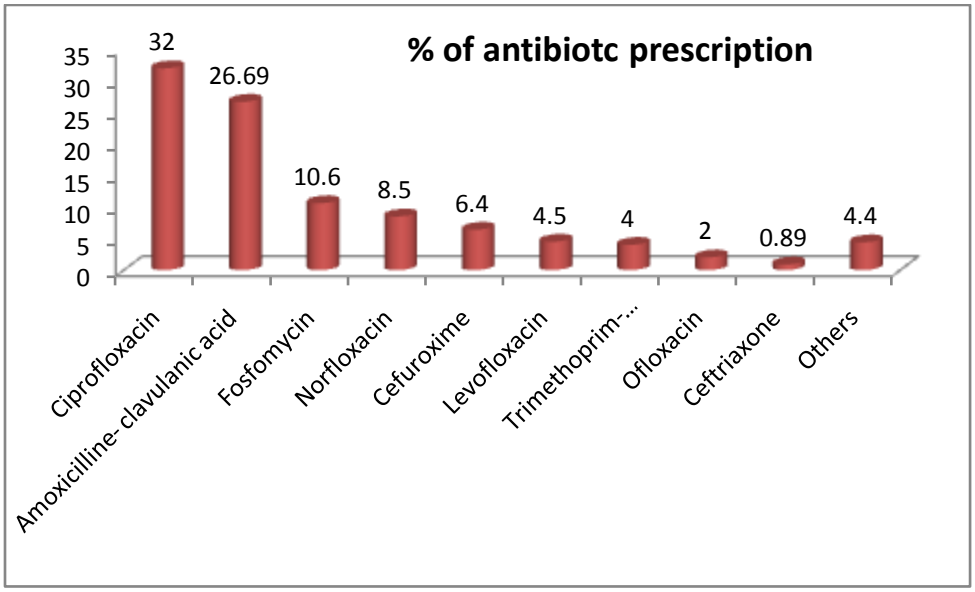

Figure 1 Antibiotic suitability figure by group of urinary tract infection

CONCLUSION:

The largest group suffering from UTIs was complicated lower UTI non-pregnant women patients followed by lower uncomplicated UTI non-pregnant women patients. A total of 39.24% patients were lower uncomplicated UTI non-pregnant women patients, 42.20% patients were complicated lower UTI non-pregnant women, 3.2% patients were lower UTIs pregnant women, 10.24% patients were pyelonephritis, 3.81% patients were prostatitis and 1.29% patients were infected from sepsis of urinary origin.

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