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Research Article

Prescribing trends of ceftriaxone in private sector tertiary care hospital in Lahore

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ABSTRACT

Drug use evaluation is method of performance improvement that focuses on evaluation and improvement of drug use processes to achieve optimal patient outcomes. Assessment of antimicrobials can be performed by evaluating their use. The quality of pharmaceuticals is a worldwide concern, poor quality and substandard medicines can cause harm in various ways. In developing countries including Pakistan there are number of cases reported showing high incidence of empirical use of drugs. Empirical use of antibiotics leads to antimicrobial resistance, which force the therapy to switch from 1st line drugs to 2nd line. Also increased use of antibiotics other than specified treatment results in increase patient stay at hospital and cost.

The objective of this study was to evaluate the drug use practices of Ceftriaxone in private sector tertiary care hospital. In this concurrent cross sectional study, medication orders of 50 patients who received Ceftriaxone were studied from August to October 2013. Data were collected randomly by using a structured format and evaluated against the standard criteria set from British National Formulary to evaluate drug use practices. It was observed that 42% of patients were prescribed with Ceftriaxone for UTI's. Majority of the patients (54%) were of age ranging from 20-30 years and from male gender (90%). A dose of 2gm/day was prescribed in 52% of the patients. The dose and frequency that we observed was same as that mentioned in standard (BNF). The prescribing practices were satisfactory according to our study but it can be enhanced further by adhering to national standard guidelines.

Keywords: Prescribing Trends, Ceftriaxone, Urinary Tract Infections, Antimicrobial, Empirical Use, Drug Utilization Review

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INTRODUCTION

In developing countries, infectious diseases are the most common causes of morbidity in human [1]. Antibiotics shows approximately 30% of expenditures in acute care hospitals and are prescribed for inpatient in 20 -50 % [2]. The infectious disease control is being threatened by increase in microorganism's number that are resistant to antimicrobial agents [3]. Cephalosporin are semisynthetic beta-lactam antibiotics that are structurally and pharmacologically related to penicillins, carbacephems and cephamycins. Cephalosporins generally are divided into 4 groups ("generations") based on their spectra of activity [4]. Ceftriaxone belongs to 3rd generation Cephalosporin. Third-generation Cephalosporin have a broad spectrum activity especially against Gram-negative organisms. They are more active against gram negative rods and are useful against hospital acquired pneumonia and bacteremia. They are particularly useful in treating hospital-acquired infections as well as they are able to penetrate the CNS and are useful against Meningitis caused by Pneumococci, Meningococcal, H. influenza, and susceptible E. coli, Klebsiella, and penicillin resistant species. Despite its wide spectrum use, there are trends showing the misuse of Ceftriaxone [5]. It is also a drug of choice for the treatment of bacterial Meningitis. Ceftriaxone is excreted unchanged in urine. It can cause hypersensitivity in patients who are atopic to Cephalosporin. It is used with reduced dose in patients of renal impairment and with caution in patients

who are allergic with cephalosporin. It can cause pain at injections site, rise in liver enzymes and blood urea. It is contraindicated in pregnancy, with a pregnancy category B. It is used in a dose of 1gm daily slow IV over 2-4min for adults, 20-50mg/kg in children IM and over 50mg via slow IV infusion for 30 min. [6]. The objective of our study was to examine the rationality of Ceftriaxone related to its prescribing trends in a private sector tertiary care hospital located in Lahore, as it was most frequently used drug in the tertiary care hospitals. The relative frequency of prescribing parameters such as indication, dose, frequency, and patient parameters such as age, gender were observed. The prescribing core indicators were used from WHO guidelines and compared with British National Formulary [7] as reference standard.

MATERIALS AND METHOD

In this concurrent cross sectional and observational study the criteria used for antibiotic selection was the most commonly prescribed drug in hospital. The study was conducted from August, 2013 to October, 2013 in a private sector tertiary care hospital of Lahore. Adult patients of both genders were included, while excluding children and pregnant women. Data were collected from medication profiles of 50 institutional patients' who received Ceftriaxone by using a structured data collection format

and then the results were evaluated against the standard compiled on the basis of British National Formulary as shown in Table 1. Parameters which were observed for Ceftriaxone use included, gender wise distribution, age groups distribution, indication, daily dose, frequency of use

RESULTS

A total of 50 cases were evaluated against reference standard in which Ceftriaxone was prescribed as shown in Table 1.

Table 1: Reference Standard used for evaluation of Ceftriaxone use in adult patients

Parameters to be evaluated	Standard (BNF)
Indications	UTI's, RTI's, Abdominal infections, meningitis, pneumonia, septicemia
Frequency	BD
Dose	1-2gm / day
IV diluents used for reconstitution	Dextrose water (D/W), ringer lactate(R/L), normal saline(N/S)

Majority of the patients who were prescribed with Ceftriaxone were male (90%) and are of age ranging from 20 – 30 years (58%) as shown in Table 2. The empirical frequency of Ceftriaxone prescribed is a major cause leading to its resistance. The standard reference frequency which should be prescribed is 1 gram twice a day, but the percentage frequency of Ceftriaxone prescribed in the prescriptions that we observed was 22% for 1 gram twice a day, and 26% of 2 gram twice a day, as shown in Table 3, which did not meet the standard criteria. The prescription of Ceftriaxone varies in different diseased conditions, but is majorly prescribed for urinary tract infections, respiratory tract infections, abdominal infections, meningitis and community acquired Pneumonia. 3 disease conditions were selected for our study, UTI's, RTI's and abdominal infections and the percentage distribution for indication of ceftriaxone according our study was 42% in UTI's, 36% in RTI's and 22% in abdominal infections, as shown in fig.1. The dilution of drugs require a major concentration, as improper dilution leads to significant incompatibilities, loss of drug and severe side effects leading to death. BNF mentions the dilutions of Ceftriaxone in Normal Saline or Dextrose Water while strictly prohibiting its dilution in solutions containing Calcium. The percentage frequency of solutions used for dilution of ceftriaxone were 38% in dextrose water, 22% in normal saline and 16% in ringer lactate which is a good practice, as shown in fig. 2.

Table 2: Gender and age group wise percentage distribution of patients receiving Ceftriaxone (n=50)

Gender	Age (years)		Total % age
	20-30	30-50	
Male	27(54%)	18(36%)	90%
Female	02(4%)	03(6%)	10%

Table 3: Percentage distribution of dose and the prescribed frequency of Ceftriaxone

Dose	Frequency		Total age n (%)
	OD	BD	
1gm	24 (48%)	11 (22%)	26(52%)
2gm	02 (4%)	13 (26%)	24(48%)

and IV diluents used for reconstitution of Ceftriaxone. The data was analyzed by using SPSS version 16 and presented descriptively in the form of different tables and bar charts and pie chart.

DISCUSSION

Prescribing to ambulatory patients is critical matter, and care must be taken regarding this, in order to select the appropriate dosage regimen to get maximum efficacy and least toxicity [8]. In case of antibiotics, this issue is more critical, as the empirical use of antibiotics leads to the resistant of drug and hence no therapeutic effect even by increasing the dose of drug. Ceftriaxone belongs to the class of cephalosporin, 3rd generation. The prescribing trends of Ceftriaxone includes its prescription for different indications, in different age groups and in different doses, in different frequencies and in both sex either male or female. The prescription of Ceftriaxone in different age groups depends on the disease prevalence in a specified area. A gender wise and age group distribution study was conducted at Ethiopia [9], according to which majority of patients who received Ceftriaxone were males 53.38% and average age of the patients who received Ceftriaxone was 34 years adults 73.31% [9]. Same pattern was also observed in a study at North East Ethiopia showed the major use of Ceftriaxone in males 52%. The average age of the patients who received Ceftriaxone was 34.3 years 85.8% [10]. Our study corroborates with the study conducted at Ethiopia, as the use of Ceftriaxone was more in male but in an age group of 20-30 years 58%, as shown in table 2. According to reference standard the frequency of Ceftriaxone should be BD, as shown in Table 3 with a dose of 1- 2gm per day.

Different doses and frequencies of Ceftriaxone prescribed have been observed worldwide. Dose and frequency of Ceftriaxone as studied at North East Ethiopia was observed 1gram twice a day in a percentage of 63.6% [10]. The same parameter was observed for treatment of gonorrhea by center for disease control and prevention and the recommended dose for Ceftriaxone was initially 250mg IM in a single dose, followed by 1 gram IM in a single dose [11]. Additionally in the study at Japan, 1 gram dose of Ceftriaxone was used for Urogenital and Pharyngeal Infections [12]. In a study conducted at Switzerland, Ceftriaxone was used 2 gram once daily for Endocarditis [13]. According to our study, 1 gram dose of Ceftriaxone was prescribed with twice a day frequency 22% and OD 48%, the dose of 2gm was given in frequency of BD 26% and OD 4% which was rational according to standard reference as shown in Table .3.

BNF recommends the use of Ceftriaxone in the indications like meningitis, urinary tract infections, respiratory tract infections, pneumonia, abdominal infections, endocarditis and septicemia. This indicated the disease prevalence in some particular area at a specified time period. In a Drug utilization evaluation at Ethiopia, Cephalosporin especially third generation were widely used to treat various urinary tract infections [9] (51.72% that correlates with our study, which indicated maximum use of Ceftriaxone in urinary tract infections in a percentage of 42%, as shown in fig.1

The standard reference (BNF) recommends reconstitution of Ceftriaxone in IV diluents like Dextrose water 5% and Normal saline 0.9% and not to be reconstituted in Ringer lactate or solutions containing calcium like TPN. This was also mentioned by Center for Drug Evaluation and Research, FDA alert Information for healthcare professionals. 2007 that deaths of neonates occurred who received IV Ceftriaxone concurrently with various IV solutions containing calcium. Ceftriaxone should not be mixed with solutions containing calcium nor should it be administered by either the same or different infusion lines or at the same or different sites within 48 hours of the infusion of any such solution, which could result in precipitates formation [14]. In a study at Japan, the use of Ceftriaxone sodium with calcium containing products was observed and it was found that if Ceftriaxone was reconstituted with solution containing calcium, and stored for a long time, resulted in increased number of insoluble micro particles that resulted in incompatibility [15]. In our study, the most commonly used diluents for reconstitution of Ceftriaxone was dextrose water 5% (38%) (Fig 2).

100 percent of the prescriptions [16] but the data we collected revealed that maximum prescribing was by brand names, not generic prescribing, which did not meet the standard criteria as shown in fig.3. This also increased biasedness of a drug to certain brands. There is great variation in prescription writing by all the physicians and its transcription by a pharmacist and non generic prescribing increase the chances of misunderstanding of a prescription by a pharmacist and a large number of adverse drug events. In order to overcome this problem, prescription quality should be enhanced and proper guidelines should be followed at National and Institutional level and also good prescribing practice education should be provided for all the health care professionals. Strict adherence to standard treatment guidelines should be promoted in order to attain maximum efficacy of drug. Prescribing trends like dose, frequency and the prescription for proper indication should be according to the specified standard criteria in order to avoid the drug resistance and to prevent the empirical use of these drugs.

According to WHO core prescribing indicators, it is recommended that generic prescribing should be done in

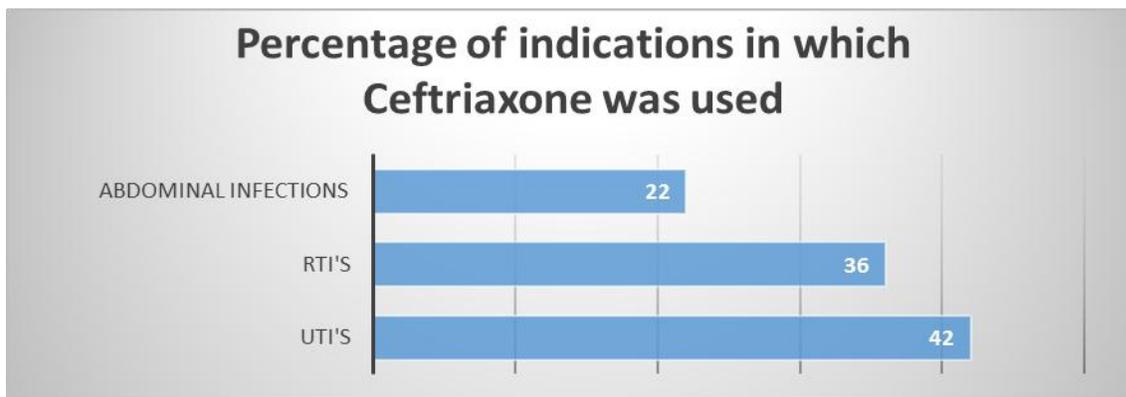


Fig. 1: Percentage distribution of indications for Ceftriaxone use in patients of Tertiary care hospital (n=50)

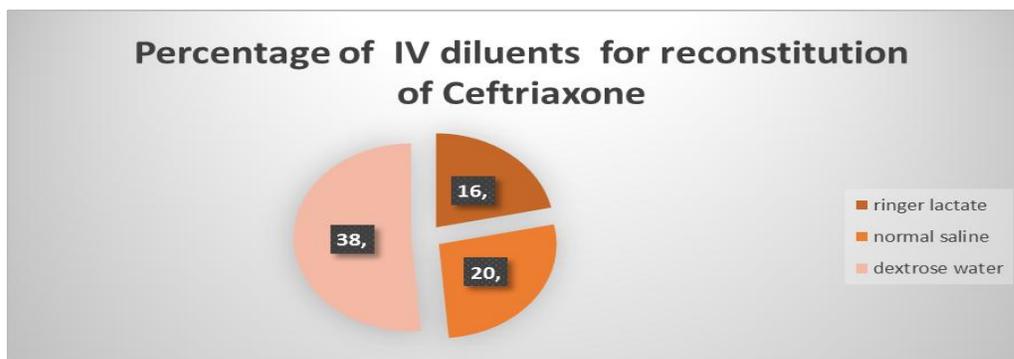


Fig 2: Percentages distribution of IV diluents used for reconstitution of ceftriaxone in the tertiary care hospital (n=50)

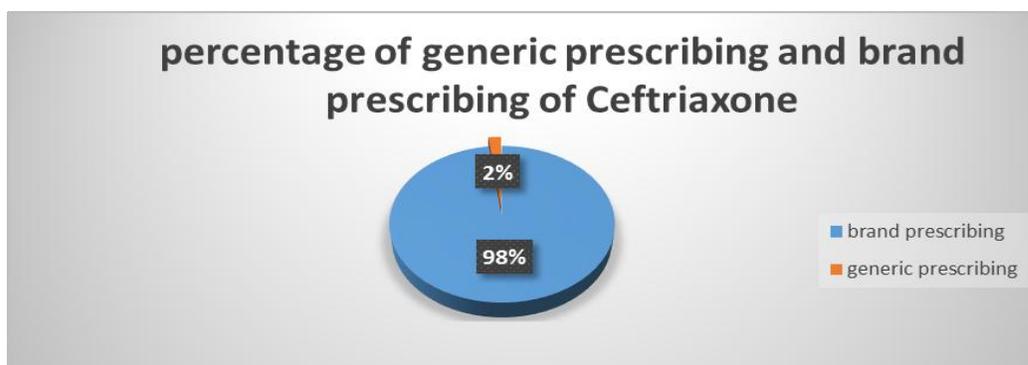


Fig.3. Percentage of brand prescribing and generic prescribing for ceftriaxone

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