DRUG USE EVALUATION OF THIRD GENERATION CEPHALOSPORINS IN A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Background: Inappropriate use of antibiotics specifically, the broad spectrum antibiotics in hospital results in resistance to antibiotics. Assessment of antimicrobial use can be performed by evaluating their use . Drug use evaluation is a performance improvement method that focuses on evaluation and improvement of drug use processes to achieve optimal patient outcomes.

Objective: The present work was undertaken to study the drug utilization evaluation of third generation cephalosporins in the inpatient department of various wards of Navodaya Medical College & Hospital, Raichur

Materials & Methods: This is a prospective observational study conducted in Navodaya Medical College & Hospital from November 2015 to April 2016. A total of 100 case records of inpatients in medicine, surgery and pediatric wards were reviewed. Relevant information was recorded in a structured proforma & data was evaluated.

Results: Prescriptions of 100 patients containing third generation cephalosporins were collected and the utilization pattern were analyzed by using WHO drug core indicators. The average number of drugs per prescription was found to be 8.62. Only 2.43% of drugs were prescribed by generic name. The percentage of total prescriptions for antibiotics was 13.92%, for injections were 12.06% and drugs prescribed from EDL was 53.82%. Ceftriaxone was most frequently prescribed (64%) third generation cephalosporins in parenteral form, followed by cefoperazone(15%). Gender analysis revealed that male (56%) patients prescribed with third generation cephalosporins were more compared to female (44%). With regard to age, 73.33% of males were in above 60 years age group while 66.66% of females were in 11-20 years age group.

Conclusion: Our study concludes that, awareness about the drug-drug interactions among health care professionals, computerized systems for prescription and drug information, as well as collaborative drug selection and pharmaceutical care are some of the possible solutions to the drug usage related problems. Hence, the involvement of clinical pharmacists in clinical practice helps to increase proper usage of cephalosporins and optimum outcome.

Keywords: WHO prescribing indicators, drug utilization evaluation, antibiotics, prescribing pattern.

INTRODUCTION

The World Health Organization (WHO) in 1997 defined drug utilization as the marketing, distribution, prescription and use of drugs in society, with special emphasis on the resulting medical, social and economic consequences. Drug utilization research is an essential part of pharmacoepidemiology as it describes the extent, nature and determinants of drug exposure [1].

Drug use evaluation (DUE) is an on-going, authorised and systematic quality improvement process, which is designed to review drug use and/or prescribing patterns, provide feedback of results to clinicians and other relevant groups, develop criteria and standards which describe optimal drug use and promote appropriate drug use through education and other interventions.

The main aim of any DUE study is to promote rational drug use by reducing drug and health-related treatment costs, improving health-related quality of life, improving quality of medical treatment, improving coordinated healthcare, decreasing the number of medication-related problems and medication errors and improving prescriber's awareness and practice towards appropriate prescribing [2].

Cephalosporiumacremonium, the first source of the cephalosporins, was isolated in 1948 by Brotzu

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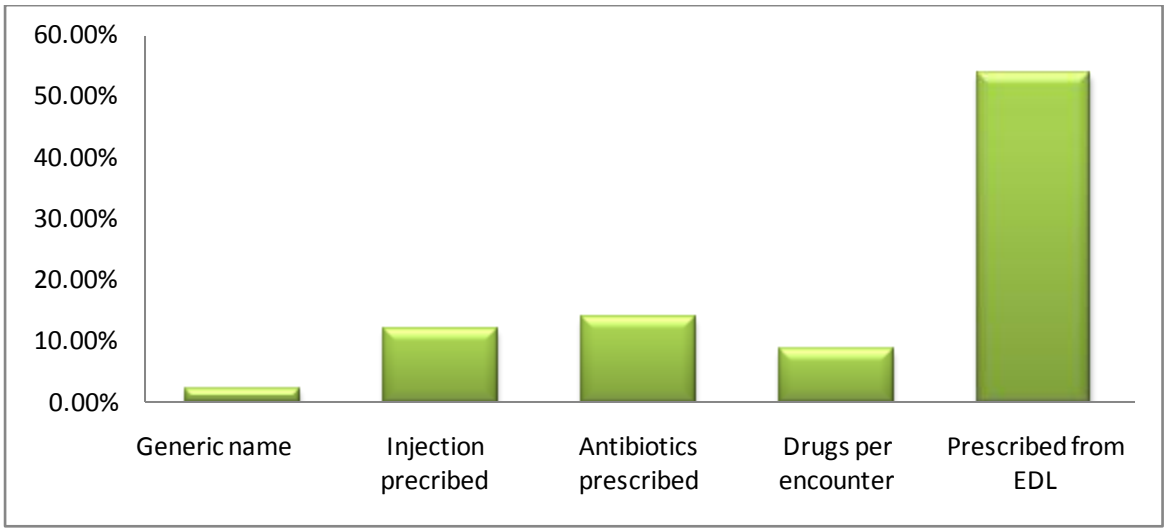

Fig. 1 WHO prescribing indicators

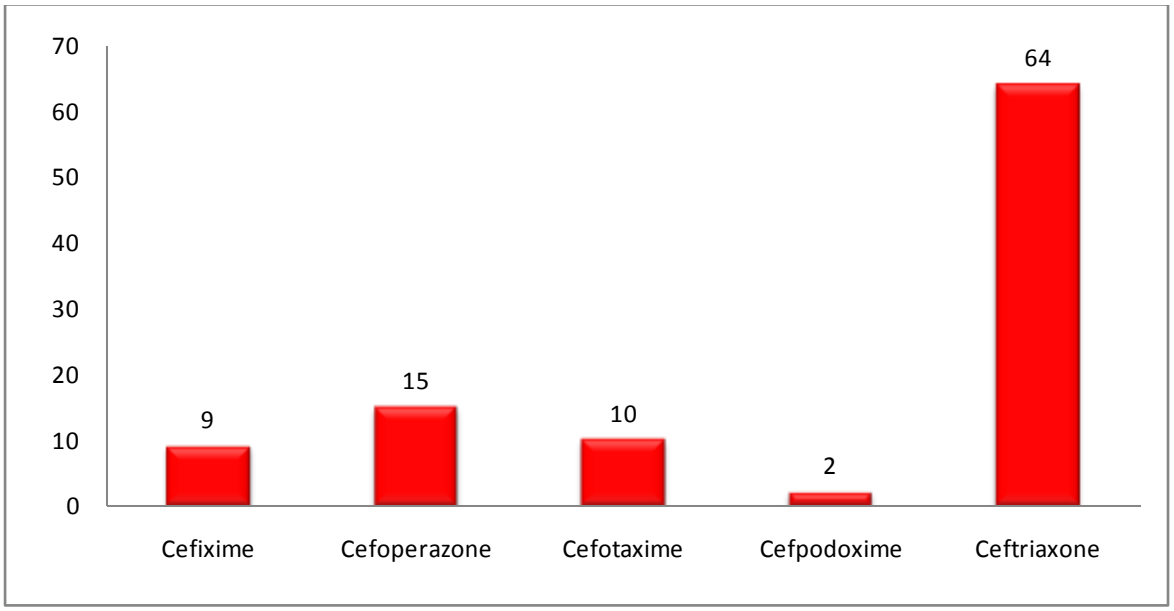

Fig. 2 Commonly prescribed third generation cephalosporins

from Sea near a sewer outlet off the Sardinian coast. Crude filtrates from cultures of this fungus were found to inhibit the *in vitro* growth of *S. aureus* and to cure staphylococcal infections and typhoid fever in human beings.

Cephalosporins possess a mechanism of action identical to penicillins, i.e,inhibition of transpeptidation process leading to the formation of imperfect cell wall; osmotic drive from the outside isotonic environment of the host cell to the inside of the hypertonic bacterial cytoplasm; and finally activation of the autolysin enzyme leading to the lysis of bacteria. Hence, cephalosporins are also bactericidal drugs [3].

Antibiotics are the most commonly used therapeutic agents, accounting for the majority of ambulatory care prescriptions. They represent approximately 30% of hospital drug expenditure and are prescribed for 20–50% of in-patients. Surveys have shown that 22–65% of antibiotic prescriptions are either inappropriate or incorrect [4].

Several studies revealed that antibiotics are very often inappropriately used. Factors such as eagerness to provide quick relief to patients have

Table 1. Demographic characteristics of enrolled patients

Characteristic	Data	
No of patients enrolled in study(n=100)		
Male	56(56%)	
Female	44(44%)	
Gender-wise distribution in different wards		
Departments	**Male**	**Female**
General Medicine	22(57.8%)	16(42.10%)
Pediatrics	17(50%)	17(50%)
Surgery	17(60.71%)	11(39.28%)
Age wise distribution		
Age	**Male**	**Female**
0-10	19(61.29%)	12(38.70%)
11-20	3(33.33%)	6(66.66%)
21-30	8(57.14%)	6(42.85%)
31-40	5(45.45%)	6(54.54%)
41-50	3(42.85%)	4(57.14%)
51-60	7(53.84%)	6(46.15%)
>60	11(73.33%)	4(26.66%)

Table 3: Indications-wise prescribing of cephalosporins (n=100)

INDICATIONS	DATA
Respiratory tract infection	18(18%)
Surgical prophylaxis	14(14%)
Fever	13(13%)
GI infections	11(11%)
Infections	7(7%)
Neurological disorder	7(7%)
UTI	6(6%)
Diabetics and foot ulcer	5(5%)
Hematological disorder	4(4%)
Cyst and nodules	3(3%)
Liver disease	3(3%)
Renal calculi	3(3%)
Cellulitis	2(2%)

promoted the misuse of antibiotics. During the past two decades, resistance to antibiotics has become a major public health concern due to the rapid spread of multi-resistant bacteria clones [5].

Table 2. Duration of treatment with cephalosporins in study population (n=100)

Duration of stay	Data
1-2 days	5(5%)
3-6 days	66(66%)
7-14 days	37(37%)
>14 days	2(2%)

Table 4: Dosage forms of cephalosporins prescribed in study population (n=100)

S.No	Dosage forms	No. of patients	Percentage
1.	Tablet	11	11%
2.	Injections	87	87%
3.	Syrup	2	2%

Table 5: ADRs observed with cephalosporins in study population (n=100)

S.NO	ADRs	No. of Patients	Percentage
1.	Nephrotoxicity	6	6%
2.	GI troubles	20	20%
3.	Thromophelibitis	3	3%

Appropriate use of antibiotics is central to limiting the development and the spread of resistant bacteria in hospitals and communities. Use of broad-spectrum antibiotics, in particular, the third generation cephalosporin in nosocomial infections have been linked to the emergence of antibiotic resistance and increase in costs [6].

The hospital setting is particularly conducive to the development of antibiotic resistance as patients who are severely ill, immunocompromised or have devices and/or implants in them are likely to receive frequent courses of empirical or prophylactic antibiotic therapy [4]. Furthermore, the absences of guidelines for antibiotic use, protocols for rational therapeutics and infection control committees have led to overuse and misuse of antimicrobials in different specialized units in hospitals [7].

Drug Utilization Evaluation (DUE) has been defined by the American Society of Health System Pharmacists (ASHP) as a "Criteria-based, ongoing,

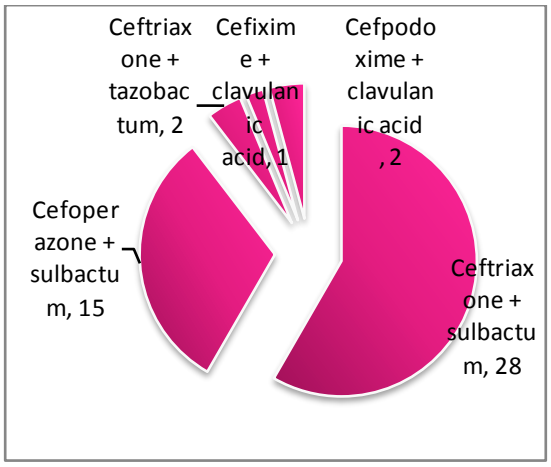

Fig. 4 : Different combinations of cephalopsorins prescribed in study population

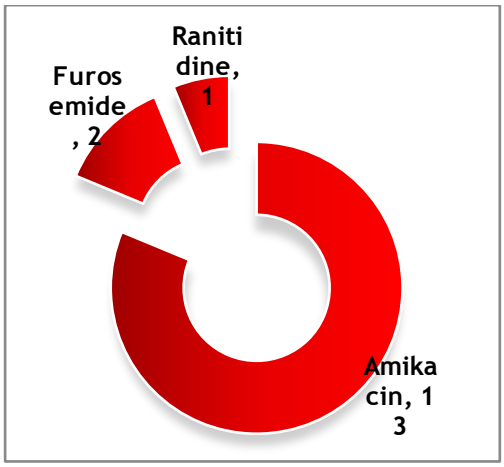

Fig. 3 : Commonly interacting drugs with cephalosporins

planning and systemic process for monitoring and evaluating the prophylactic, therapeutic and empiric use of drugs to help, assure that they were provided appropriately, safely and effectively [8].

The goal of a DUE is to promote optimal medication therapy on right indication, with correct information at an affordable price. It will also help to evaluate the effectiveness of therapy as well as prevent medication-related problems such as adverse drug reactions, treatment failures, overuse, under-use, incorrect doses [9]. If therapy is found to be inappropriate, interventions with physicians or patients will be necessary to optimize drug therapy[10]. The present study was planned to help in identifying the utilization of cephalosporins and give a review of the prescribing practices to physicians who can be modified if necessary to facilitate better health care delivery.

MATERIALS & METHODS

It was a prospective observation study conducted for 6 months from November 2015 to April 2016 in Navodaya Medical College Hospital & Research Centre, Raichur which is 1000 bedded tertiary care teaching hospital. A total of 100 patients were randomly enrolled into the study on their visit to the hospital and the study duration was 6 months. Patients from OBG were excluded from our study. The study was approved by Institutional Ethics Committee of Navodaya Medical College Hospital & Research Centre on 18th November 2015.

RESULTS

In the study population 100 patients were enrolled and their data was collected. WHO drug core indicators are shown in Fig. 1. Percentage of commonly prescribed third generation cephalosporins are presented in Fig. 2. Table 1 shows demographic characteristics of patients which include gender distribution, gender distribution in different wards; age distribution is listed in Table.no.1. Duration of treatment with third-generation cephalosporins is enlisted in Table 2. Indication wise prescribing of third generation cephalosporins are presented in Table 3 and Table 4 represents dosage forms of third generation cephalosporins prescribed in the study population. Fig. 3 and Fig. 4 represents commonly interacting drugs with third generation cephalosporins and different combinations of third generation cephalosporins prescribed in study population respectively. ADRs observed with third generation cephalosporins are shown in Table 5.

DISCUSSION

The study focused on the pattern of third generation cephalosporins prescriptions in various department of a tertiary care teaching hospital. The data was collected prospectively from 100 in-patients using specially designed data collection form and drug utilization pattern were analyzed using WHO drug core indicators. Only 21 drugs (2.43%) were prescribed by generic names. This value is less compared to the reports of other studies (Kaliamoorthy K et al[5]).Moreover, generic drugs are more cost effective than the branded ones. 12.06% of injections and 13.92 % of third generation antibiotics were prescribed in the patients. The average number of drugs per encounter was found to be 8.62 which help to

measure polypharmacy. 53.82% of drugs were prescribed from EDL.

Gender analysis revealed that male (56%) patients prescribed with third generation cephalosporins were more compared to female (44%). These findings are similar to the study conducted by Jyothi K et al[6] that showed a male predominance (50.50%) compared to females (49.50%). With regard to age, 73.33% of males were in above 60 years age group while 66.66% of females were in 11-20 years age group. As geriatric patients are more prone to infections, male patients above 60 years show predominance in the age-wise distribution.

The use of third generation cephalosporins was found to be high for the treatment of respiratory tract infection (18%) followed by surgical prophylaxis (14%).

Ceftriaxone (64%) and cefoperazone (15%) were commonly prescribed third generation cephalosporins and prescribed more commonly in injection forms. This is because the parenteral third-generation cephalosporins have excellent activity against most bacterial infections.

The duration of treatment with third-generation cephalosporins in 100 in-patients was mainly found to be 3-6 days (66%), followed by 7-14days (37%).

The most commonly prescribed combination of third generation cephalosporins was ceftriaxone & sulbactum (28%) for greater potency and efficacy in treatment of respiratory tract infections followed by cefoperazone & sulbactum (15%).

Among various dosage forms of the third-generation cephalosporins use in in-patients, injections were most frequently used (87%), followed by tablet (11%) and syrup (2%).

The most commonly interacting drug with third generation cephalosporins was amikacin(13%) followed by furosemide (2%).

The ADR observed with study population were few and minor, i.e., GI troubles (20%) and nephrotoxicity (6%) followed by thrombophlebitis (3%).

CONCLUSION

The pattern of antibiotics and injection prescribing and pattern of prescription in terms of polypharmacy appears appropriate when compared with World Health Organization prescribing indicators. The pattern of prescription in terms of the generic name was found to be low and should be encouraged more. Our study also emphasized the need for creating more awareness among the general practitioners and clinicians on this important public health issue of antibiotic resistance.The drug prescription pattern suggests th e need to establish rational antibiotic use.The results have some limitations. The study period was limited and hence seasonal variations in prescribing patterns were not revealed.

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