Section: Pharmacology

Original Research Article

STUDY OF DRUG UTILIZATION PATTERN OF CEPHALOSPORINS IN A TERTIARY CARE HOSPITAL

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Abstract

Background: A bacterial resistance with the use of antimicrobial agents (AMA's) is the major concern globally. It may be the results of widespread use of broad-spectrum antibiotics used for prophylaxis and empirically which is more likely to happen in case of severely ill, immunocompromised and patients having devices or implants. There is an increase in the occurrence of known resistant pathogens and as well as emergence of newly resistant bacteria, Hence, present study was carried to perform drug utilization of Cephalosporins in various in-patient departments of pharmacology, Patna Medical College, Patna, Bihar. **Materials and Methods:** A cross-sectional, prospective and observational study was carried out in the in-patient departments of Medicine and Department of Surgery, Patna Medical College, Patna, Bihar for 6 months. Two Hundred Patients were selected based of inclusion and exclusion criteria, and informed consent will be taken. Patient demographics, final diagnosis, culture sensitivity test and data on drugs administered, its dose, frequency and route of administration were collected from the patient's case records and documented in patient profile forms for performing drug utilization evaluation. The data was analyzed using Microsoft excel to calculate the percentage. **Result:** The results are based on the 200 prescriptions analyzed who met to our inclusion and exclusion criteria. Among 200 patients, a total 171 antibiotics were prescribed in which Cephalosporins contributed for 46.7%. Results are divided into 3 parts demographics, lab investigation and prescribing pattern. **Conclusion:** Ceftriaxone was highly utilized Cephalosporins as monotherapy, and Cefoperazone + Sulbactam as combination therapy. Irrational use of antibiotics can leads to emergence of resistance thus this study gives insight into a drug utilization of Cephalosporins which will promote rational use of drugs.

INTRODUCTION

A bacterial resistance with the use of antimicrobial agents (AMA's) is the major concern globally.[1] It may be the results of widespread use of broad-spectrum antibiotics used for prophylaxis and empirically which is more likely to happen in case of severely ill, immunocompromised and patients having devices or implants.[2] There is an increase in the occurrence of known resistant pathogens and as well as emergence of newly resistant bacteria, such as Enterococcus faecium, Staphylococcus aureus, Clostridium difficile, Klebsiella pneumoniae, Acinetobacter baumanii, Pseudomonas aeruginosa and Enterobacteriaceae.[3]

Cephalosporins are a class of β-lactams antibiotics, most commonly used in the hospital setting because of their extended spectrum of activity.[4] They are categorised into 5 generations but presently the fifth generations are under trials. First generations are active against gram positive bacteria whereas the later generations showed better activity against the gram-negative bacteria.[5] The wide use of Cephalosporins resulted in the emergence of resistance, which explains the necessity of Drug Utilization Evaluation (DUE). DUE is performed to assess the use of antibiotics which emphasis on improvement of drug use and provides better patient care.[6]

According to WHO guidelines, drug utilization was defined as the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences. DUE is a part of pharmacoepidemiology, provide insights into extent, pattern, determinants and outcomes of drug use and prescribing.[7]

DUE is an on-going, authorized and systematic quality improvement process, which is designed to review drug use and/or prescribing patterns, provides

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feedback of results to clinicians and other relevant groups. It develops criteria and standards which describe optimal drug use and promote appropriate drug use through education and other interventions.[8,9]

The main aim of DUE program is to facilitate the rational use of drugs. The rational use of a drug implies the prescription of a well-documented drug at an optimal dose, together with the correct information, at an affordable price. It will help to know the effectiveness of the treatment, treatment failures and ADRs.[4] Hence, present study was carried to perform drug utilization of Cephalosporins in various in-patient departments of pharmacology, Patna Medical College, Patna, Bihar.

MATERIALS AND METHODS

A cross-sectional, prospective and observational study was carried out in the in-patient departments of Medicine and Department of Surgery, Patna Medical College, Patna, Bihar for 6 months.

Source of data: Patient case sheets, Laboratory investigations.

Inclusion Criteria

All the in-patients prescribed with antibiotics.

Exclusion Criteria

- OPD patients.
- Pregnant and Lactating women.
- Mentally retarded & unconscious patients.
- Patients unwilling to take part in study.

Method of collection of data and analysis: Two Hundred Patients were selected based of inclusion and exclusion criteria, and informed consent will be taken. Patient demographics, final diagnosis, culture sensitivity test and data on drugs administered, its dose, frequency and route of administration were collected from the patient's case records and documented in patient profile forms for performing drug utilization evaluation. The data was analyzed using Microsoft excel to calculate the percentage.

RESULTS

The results are based on the 200 prescriptions analyzed who met to our inclusion and exclusion criteria. Among 200 patients, a total 171 antibiotics were prescribed in which Cephalosporins contributed for 46.7%. Results are divided into 3 parts demographics, lab investigation and prescribing pattern.

Demographics: Gender wise distribution of study population

Out of 200 prescription we found that females (58%) were predominant than male patients (42%) as given in [Table 1].

Age wise distribution of study population

For age wise distribution of study population, age was categorized into 4 groups i.e 60 years. Higher number of patients were belonged to age group between 41-60 followed by age above >60 years as given below in [Table 2].

Laboratory investigation:

Culture sensitivity test

In our study culture sensitivity test was performed for 88 patients and 112 patients were given with the Cephalosporins without performing culture sensitivity test as illustrated in [Figure 1].

Prescribing pattern:

Department wise distribution of study population

During the study we found that Cephalosporins were most widely used in the surgery department (30%) followed by general medicine (27%), pulmonology (14%) and urology (13%) shown in [Figure 2] below.

Prescribing frequency of various generations of Cephalosporin

According to the study 3rd generation Cephalosporins (83.75%) were used more in numbers when compared to other generations of Cephalosporins as illustrated in [Figure 3]. The commonly used Cephalosporins during study is given in the [Table 3]. Prescription of antibiotics per prescription Among 200 prescriptions, 45 % of prescriptions contained only 1 antibiotic as monotherapy, 41 % of prescription contained 2 antibiotics and only 1% had 5 antibiotics as illustrated in [Figure 4].

Based on monotherapy or combination therapy

A total of 171 antibiotics we found that monotherapy (70.17%) was more preferred over combination therapy (29.83%) as shown in [Table 4].

Based on route of administration (ROA)

Out of 200 prescriptions analyzed, we have observed that parenteral dosage form (76.02%) was preferred over oral therapy (15.20%) as given below [Table 5].

Based on generic or brand names

During the study we found that the greater numbers of antibiotics were prescribed by brand name (72.51%) than generic names (27.48%) which is illustrated in [Table 6].

Table 1: Gender wise distribution of study population.

Gender	Number	Percentage (%)
Female	116	58
Male	84	42
Total	200	100

Table 2: Age wise distribution of study population

Age group (years)	Average age with SD	Female (N=116)		Male (N=84)	
		Number	Percentage	Number	Percentage
<18	7.85±8.49	24	20.7	18	21.40

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18-40	32.37±12.72	22	29	16	19.00
41-60	50.39±3.80	44	37.8	30	35.70
>60	75.52±9.19	26	22.4	20	23.80
Total	--	116	58	84	42

Table 3: Commonly used Cephalosporins.

Generations	Drugs	Number	Percentage
2nd generation	Cefuroxime	24	15
	Ceftriaxone	68	42.5
	Cefoperazone + Sulbactam	38	22.5
3rd generation	Cefatoxime	16	10
	Cefixime + Clavunate	8	5
	Cefixime	4	2.5
4th generation	Cefpime	4	2.25
Total		160	

Table 4: Prescription pattern

Prescription pattern	Number	Percentage (%)
Monotherapy	120	70.17
Combination therapy	51	29.83
Total	171	100

Table 5: Prescription pattern based on route of administration

Prescription pattern	Number	Percentage (%)
Parenteral		
Oral		
Total		100

Table 6: Prescription pattern based on generic name or brand name.

Prescription pattern	Number	Percentage (%)
Brand name	151	75.5
Generic name	49	24.5
Total	200	100

DISCUSSION

Inappropriate use of antibiotics used in the hospital and community is leading to the crisis of antibiotic resistance which ultimately results in the pathogens becoming resistant to the older antibiotics. Thus, this study was focused on the drug utilization of Cephalosporins in the in-patient departments of tertiary care hospital. The study was carried for 6 months and 200 prescriptions were enrolled in the study based on the inclusion and exclusion criteria. Out of 171 antibiotics prescribed.

During the study we found that more number of females patients were seen over male patients which was similar to the previous study conducted,[10] and another study showed contradictory results with our study in which male patients were larger in number than female patients.[11] The large number of patients were seen between the age group between 41-60 years followed by the age >60 years which was matching with earlier study conducted. Older people age 60 years and above are more prone for infection thus use of more antibiotics are seen.[12]

Culture sensitivity test is performed to find the antimicrobial susceptibility to disease causing microorganism. In our study, we found that a greater number of prescriptions had empirical use of Cephalosporins; Cephalosporins were prescribed without performing the culture sensitivity test as some of the previous studies carried out in which, most of Cephalosporins were given without performing culture sensitivity test.[13] This results in the use of Cephalosporins without knowing the susceptibility pattern of pathogens which is the cause for development of resistance.[4]

As the study was focused to find the drug utilization of Cephalosporins, we found that third generation Cephalosporins were predominantly used when compared to the other generations Cephalosporins. These results were parallel to the previous study and opposing to the results by another study.[14,15] Third generations Cephalosporins has showed enhanced activity against many organisms, good tolerability and also, they are cost effective.

Cephalosporins were most widely used in the surgery department followed by general medicine, pulmonology and results were similar to the former study conducted.[16] The reason may be because of broad spectrum activity which allows them for empirical treatment which likely to happen in the surgery department and Cephalosporins are effective against the bacteria which cause respiratory tract infection. Previous study showed that Cephalosporins were mostly prescribed by brand name similar to our study,[17] wherein we also found that the Cephalosporins were mostly prescribed by brand names when compared to generic names and contrary to another study showed prescription by generic name.[18] Prescribing the drugs by generic names will helps to have good inventory control, avoid confusion while dispensing and are economic when compared to brand drugs.

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Monotherapy was preferred in this study over combination therapy because in our study most of Cephalosporins was used for surgical prophylaxis which requires single antibiotics. Ceftriaxone was highly used as monotherapy as it has greater potency, wide spectrum of activity and Cefoperazone+ Sulbactam combination of third generation Cephalosporins, is active against both gram negative and gram-positive bacteria with β-lactamase inhibitors. Both in combination act synergistically to have effective action and sulbactam will prevent the degradation of β-lactam ring by β-lactamases enzyme which are produced by bacteria.[19]

We found that parenteral route was most commonly used route of administration which may be because the study was conducted in the in-patient departments, better bioavailability and faster onset of action.

The study visions about the drug utilization pattern of Cephalosporins. However, the limitation of study was small sample size, only carried out in one class of antibiotics.

Future studies should focus on conducting similar studies in different class of antibiotics and also in newer antibiotics to promote rational use of antibiotics.

CONCLUSION

Ceftriaxone was highly utilized Cephalosporins as monotherapy, and Cefoperazone + Sulbactam as combination therapy. Irrational use of antibiotics can leads to emergence of resistance thus this study gives insight into a drug utilization of Cephalosporins which will promote rational use of drugs.

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