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Drug Utilization Evaluation of Cephalosporins in the General Medicine and General Surgery Departments in Atertiary Care Teaching Hospital

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ABSTRACT

Aim was to conduct a prospective observational study on Drug Utilization Evaluation of cephalosporins, to determine the frequency of usage of Cephalosporin and to study the indications for which cephalosporins were prescribed. A total of 250 patients were enrolled in the study, 200 from general medicine (n_1) and 50 from general surgery (n_2) department. Data were collected, by scrutinizing the inpatient case sheet from both departments, for a period of 6 months. Out of 250 patients', majority of patients' 58 (23.2%) belonged to age group of 31- 40 years. The average age of male and female patients' were (41.37±16.13) and (44.69±16.14), (41.87±15.96) and (31.06±18.63) in general medicine and general surgery respectively. This study observed that cephalosporins were prescribed to 58 (29%) of patients with Respiratory Tract Infection (RTI). Out of 250 patients enrolled in the study from both the departments, 182 (72.8%) patients received only third generation cephalosporins, while the remaining received a combination of cephalosporin with a β-lactam inhibitor. The most prescribed drug in the general medicine department was ceftriaxone121 (60.1%).The average duration of use of Cephalosporin was 5 and 8.5 days in general medicine and general surgery departments respectively. Prescriber should follow the standard treatment guidelines for improving the Rational Use of Drugs and to prevent the development of resistance. The duration of use of cephalosporins is in partial compliance with the guidelines.

Keywords: Cephalosporin, Drug Utilization Evaluation, Defined Daily Dose, Average cost.

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INTRODUCTION

Antimicrobials are used to treat infections caused by various microorganisms, including bacteria, mycobacterium, virus, parasites and fungi. Antimicrobial drugs are the greatest contribution of the 20th century to therapeutics[1]. In order to reduce the selective pressure of antibiotics, it is important to make sure that antibiotics are used rationally. Cephalosporins are bactericidal (inhibit the bacterial cell wall synthesis) in actions. Cephalosporin is commonly used class of Anti-bacterials. They are preferred over other classes of antibiotics due to**,** lower hypersensitivity reactions, broad spectrum of action, cheaper cost and better outcomes. Third generation Cephalosporins are the most commonly prescribed empiric broad spectrum antibiotic[2]. Having given its advantages, preserving the sensitivity of Cephalosporin is important. Though; Cephalosporin use often provides lifesaving therapy to those who have a serious bacterial infection, resistance to antimicrobials is a global problem and some of the significant global threats are multi-drug resistant Tuberculosis and drug-resistant Malaria. Drug Utilization Evaluation (DUE) is an ongoing, authorized and systemic 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 describes optimal drug use, promote appropriate drug use through education and other interventions[3]. Defined Daily Dose (DDD) is the average maintenance dose for the clinical indication of a drug in adult patients[4.] For calculating the DDD if the data available on the number of units of a drugs sold, the number defined daily dose's consumed, formula[5]

$$\frac{\text{Amount of drug sold in 1 year (mg)}}{\text{DDD (mg) x 365 days x No.of inhabitants}} \times 1000 \text{ inhabitants}$$

Pharmacoeconomics is the depiction and investigation of thecosts of drug therapy to health care systems and society. Basic constituents of pharmacoeconomics are the drug products or service, costs and outcomes[6].

Primary objective

I. To determine the frequency of drug usage of Cephalosporin antibiotics.
II. To study the indications for which the drug was being prescribed.

Secondary Objective:

I. To analyze the Define Daily Dose(DDD) and Pharmacoeconomic Evaluation.
II. To determine the percentage dosage form usage of the Cephalosporin antibiotics.
III. To assess relationship between patient demographics and prescription pattern.

MATERIALS AND METHODS

The study was a Prospective Observational study, conducted among inpatients' of the general medicine(n_1) and general surgery(n_2) departments. The study was conducted over a period of 6 months. Patients' aged 18 years and above and who met the inclusion and exclusion criteria were enrolled in the stud, and their data was collected by using a self-designed patient data collection forms.

The study was approved by Dr. B.R. Ambedkar medical college and hospital Ethics committee. Permission letter was then secured from Medical Director Office. The confidentiality of data collected was preserved. Name and address of patient and prescriber was omitted from the data collection format.

Inclusion criteria

- The Inclusion criteria was Patients of either sex aged ≥18 years.
- Patients receiving only cephalosporins, admitted in the General Medicine(n_1) and general surgery(n_2) Department.

Exclusion criteria

- The Exclusion criteria was Patients of either sex aged <18 years of age.
- Patients admitted in departments other than General Medicine (n_1) and general surgery (n_2) departments.
- Patients who are not willing to participate in the study.

Statistical analysis

The collected Data was analysed for mean,standard deviation (SD) and percentage calculation, using Microsoft Excel and SPSS V-21.0.

RESULTS AND DISCUSSIONS

A total of 250 study population were enrolled in the study of which 200 from general medicine (n_1) and 50 from general surgery (n_2) department. With regarding to age distribution, Majority of the study population 58 (23.2%) belongs to an age of 31-40yrs, details are given in Table 1. Ingeneral medicine & surgery department majority of the study population belongs to 21-30yrs and 31-40yrs of age, details are given in Table 2 & 3, respectively. In general medicine & general surgery departments number of males were 134 & 43 and females were 66 & 7 respectively, majority of the study population were males, which was similar to the study conducted by Kaliamoorthy K *et al*[2]. In general medicine department, antibiotics were often used empirically or following a specific evidence of infection. In a study population of 200 patients'

from general medicine department, 162 (81%) patients' were given disease specific therapy, while 38 (19%) were given empirical therapy. The cephalosporin antibiotic use in the department of general surgery was primarily used for prophylaxis. In a study population of 50, 24 (48%) received as pre-surgical prophylaxis, 22 (44%) as post-surgical prophylaxis, 4 (8%) as both pre- and post-surgical prophylaxis. Majority of the study population in the general medicine department (n_1) had Respiratory Tract Infection 58 (29%) the details are presented in Table 4. In general surgery department (n_2), 20 (40%) of patients underwent wound debridement and details are given in Table 5. Only third generation cephalosporins are used in majority of study populations182 (72.8%), and a combination of Cephalosporine +β-lactamase inhibitorsfor 68 (27.2%). The prescribing pattern of cephalosporins in general medicine and surgery department is given in the Table 6 & 7 respectively. Out of 250 members' enrolled in the study, 244 patients' (97.6%) prescribed with only one cephalosporin, while 5 (2%) patients' were prescribed with two Cephalosporins and only 1 (0.4%)patient was prescribed with three Cephalosporins during their hospital stay. Parenteral route of administration were widely considered in the both the departments when compared to oral route. 189 (94.5%) and 41(82%) received through parenteral route in both general medicine and surgery department respectively. While the Oral route of administration was given for 11 (5.5%) and 9 (18%) patients in the general medicine and surgery department respectively. In consideration with Relationship between patient demographics and prescription pattern,in general medicine department the age group between 21 – 30 years received (22%) and where as in general surgery the age group between 41 -50years received (30.14%) of Cephalosporin, the summary given Table 8. Out of 200 study population, the overall defined daily doses (DDD) in general medicine have been increased for 16 members and decreased for 7 member, where as in surgery department have been increased in 11 members and decreased in 11 members, out of 50 study patients, the summary of both departments given in Table 9 & 10respectively. The Cephalosporin treatment cost incurred by the patients during hospital stay and per day is shown in the Table 11. The average duration of use of Cephalosporin In general medicine was 5 days and in general surgery it was 8.5 days. In general medicine department minimum and maximum duration of use is, 1 and 16 days respectively, where as in general surgery department, the minimum and maximum duration of use was, 3 and 26 days respectively. Out of 250 study population included in the study, Majority of members 58 (23.2%) belonged to age group of 31 - 40 years. In general medicine department, majority of the study population, 44 (22%) are between 21 - 30years of age and in general surgery department, it is 16 (32%) among 31 – 40years. A similar study conducted by Kaliamoorthy K *et al* observed that

20.86% of male are at an age group of 51 - 60 years, while 30.67% of females are at an age group of 21 - 30 years. With regard to the gender, out of 200 Patients from general medicine department, males were 134 (67%) and females 66 (33%). In the group of patients from general surgery department, males patients are 43 (86%) and females 7 (14%). This is in line with the observation of Kaliamoorthy K *et al*, that female patients was 61.81%, males were 38.19%. Out of 250- 205 (82%) do not had any co-morbidities, 45 (18%) had co-morbidities[3]. The rate of rational Cephalosporin use was 162 (81%) and it was statistically higher in those patients from whom specimens had been taken for culture i.e., patients receiving specific therapy. The empirical use was 38 (19%) in general medicine department. This is in line with the study conducted by Tunger O *et al*., where he reported the rational use was 45.7% [9]. This study observed that Cephalosporin was mostly prescribed for Respiratory Tract Infections (58, 29%). This confirms the observations of a study by Steinmann MA *et al*, which reported 63% patients with ARTI and 51% with URTI[7]. In general surgery department, out of 50 patients enrolled in the study, 20 (40%) patients underwent Wound Debridement. Of the 250 patients, 182 (72.8%) patients received only third generation Cephalosporin, whereas 68 (27.2%) patients received Cephalosporin + β lactamase inhibitors combination. This shows a preference to 3rd generation Cephalosporin over the older generations. This study revealed that, out of 200 study patients in general medicine department, 121 (60.1%) received Ceftriaxone, 28 (14%) received Ceftriaxone-Tazobactam, 18 (9%) Cefotaxime, 17 (8.5%) Cefoperazone, 8 (4%) Cefixime, 7 (3.5%) Ceftriaxone-Salbactam, and 1 (0.5%) Cefpodoxime. Out of 50 study patients in general surgery department, 21 (42%) received Ceftriaxone-Tazobactum, 10 (20%) Cefotaxime, 7 (14%) Ceftriaxone-Salbactam, 6 (12%) Cefpodoxime-Clavulanic acid, 4 (8%) - Cefoperazone, and 2 (4%) Cefixime. Out of 250 study patients, 244 (97.6%) received 1 Cephalosporin, and 5 (2%) study subjects received only 2 cephalosporin & one patients' received (0.4%) 3 cephalosporins class of drugs. Parenteral route was used in 189 (94.5%) and 41 (82%) of the Cephalosporin in both general medicine and general surgery wards respectively. With regarding to the relationship between patient demography & prescription pattern; in general medicine (22%) of Cephalosporin were prescribed to the age group between 21 – 30 years while (30.14%) of Cephalosporin were prescribed to the age group between 41 - 50 years. Cephalosporin's Defined Daily Dose (DDD) was compared with standard DDD prescribed by WHO. In general medicine, the hospital completely adhered to the standard DDD (WHO) for, Cefixime, Cefoperazone, Ceftriaxone+salbactum , Partially for - Ceftriaxone , Ceftriaxone+tazobactum, Cefpodoxime, Cefotaxime. The DDD is above the normal limit in- Ceftriaxone- 11 (8.94%) cases,

Ceftriaxone+tazobactum- 2 (7.14%), Cefpodoxime- 3 (33.33%). The DDD is below the normal limit in- ceftriaxone- 2 (7.14%), Ceftriaxone+tazobactum - 3 (10.71%) cases, Cefpodoxime - 2 (11.11%).Overall DDD was above normal in 16 (7.76%) cases and below the normal limit in 7 (3.39%) cases. In general surgery, the hospital is completely adhered to the standard DDD (WHO) for, Cefoperazone use, Partially for - Cefixime, Cefotaxime, Ceftriaxone+salbactum, eftriaxone+Tazobactum, Cefpodoxime+Clavulanic acid . The DDD is above normal limit in, Cefotaxime- 3 (1.19%) cases, Ceftriaxone+salbactum- 2 (5.12%), Ceftriaxone + tazobactum- 4 (1.3%), Cefpodoxime+Clavulanic acid- 2 (3.70%).The DDD is below the normal limit in, Cefixime- 3 (7.31%)cases, Cefotaxime- 2 (0.79), Ceftriaxone+tazobactum- 3 (0.98%), Cefpodoxime+Clavulanic acid- 3 (5.55%). Overall DDD was above normal in 11 (1.4%) cases and below the normal limit in 11 (1.4%) cases. This confirms with the observation of Ravesh D, a total of 8.6% were above the limit[8]. The average total cost incurred for Cephalosporin per patient in general medicine ward was found to be Rs 895.64, for the average of 2.32 days and in general surgery ward was found to be Rs 766.02, for the average of 0.74 days, similar study was done by Weiam et al., reported the median cost antibiotics is Rs 1098 (group A) & 575 (group B)[10]. The average total cost per each day for a patient was found to be Rs 71.30 in general medicine and in general surgery department Rs 48.53. The average duration of use of Cephalosporin in general medicine was 5 days and in general surgery it was 8.5 days. The average duration of use of Cephalosporin in general medicine was 5 days and in general surgery it was 8.5 days. This is in accordance with the observation of Shankar RP et al., where the average duration of use was 5 days[11]. In general medicine department minimum and maximum duration of use was, 1 and 16 days respectively, where in general surgery department, the minimum and maximum duration of use was 3 and 26 days respectively.

Table 1: Age distribution of patients in both the departments (n=250)

Age Distribution	Number of Patients	Percentage (%)
18-20	16	6.4%
21-30	57	22.8%
31-40	58	23.2%
41-50	48	19.2%
51-60	28	11.2%
61-70	31	12.4%
71-80	10	4%
81-90	2	0.8%
Total no: of patients	250	100%

Table 2: Age distribution of patients in general medicine department (n_1 = 200)

Age Distribution	Number of Patients	Percentage (%)
18-20	16	8%
21-30	44	22%
31-40	43	21.5%
41-50	37	18.5%
51-60	23	11.5%
61-70	29	14.5%
71-80	6	3%
81-90	2	1%
Total no:of patients	200	100%

Table 3: Age distribution of patients in general Surgery department (n_2 = 50)

Age Distribution	Number of Patients	Percentage (%)
18-20	0	0%
21-30	13	26%
31-40	16	32%
41-50	11	22%
51-60	5	10%
61-70	0	0%
71-80	5	10%
81-90	0	0%
Total no:of patients	50	100%

Table 4: Types of disease conditions in general medicine department (n_1=200)

Sl. No	Types of infections	No: of cases	Percentage (%)
1	Respiratory tract infections (RTI)	58	29%
2	Urinary tract infections (UTI)	30	15%
3	Fever	27	13.5%
4	Miscellaneous	23	11.5%
5	Gastro Intestinal Diseases (GI)	19	9.5%
6	Generalized Infections	18	9%
7	Pneumonia	14	7%
8	Hepatic Infections	11	5.5%

Table 5: Types of surgical procedures executed in general surgery department in study population (n_2=50)

Sl. No	Procedures	Number of times	Percentage (%)
1	Wound debridement	20	40 %
2	Appendicitis	8	16 %
3	Hemorrihoidectomy	8	16 %
4	Carbuncle-Drainage	6	12 %
5	Hernioplasty	5	10 %
6	Cholescystectomy	3	6 %

Table 6: Individual Cephalosporin prescribedin general medicine department (n_1=200)

Sl. No	Prescribed drugs	No:of patients used	Percentage (%)
1	Ceftriaxone	121	60.1 %
2	Ceftriaxone-Tazobactam	28	14 %
3	Cefotaxime	18	9 %
4	Cefoperazone	17	8.5 %
5	Cefixime	8	4 %
6	Ceftriaxone+Calbactum	7	3.5 %
7	Cefpodoxime	1	0.5 %
8	Cefpodoxime + Clavulanic acid	0	0 %
9	Total	200	100 %

Table 7: Individual Cephalosporin prescribed in general surgery department (n_2=50)

Sl.No	Prescribed drugs	No:of patients used	Percentage (%)
1	Ceftriaxone+Tazobactum	21	42 %
2	Cefotaxime	10	20 %
3	Ceftriaxone+Salbactum	7	14 %
4	Cefpodoxime + Clavulenic acid	6	12 %
5	Cefoperazone	4	8 %
6	Cefixime	2	4 %
7	Ceftriaxone	0	0 %
8	Cefpodoxime	0	0 %
9	Total	50	100 %

Table 8: Relationship between patient demographics and prescription pattern (n=250)

Sl.No	Age Distribution	Average doses in	
		General medicine (n_1=200) (%)	General surgery (n_2=50) (%)
1	18-20	8	0.5
2	21-30	22	25.1
3	31-40	21.5	26.7
4	41-50	18.5	30.4
5	51-60	11	5.2
6	61-70	14.5	0
7	71-80	3	11.8
8	81-90	1.5	0
	Total	100	100

Table 9: Defined Daily Doses in general medicine department (n_1=200)

Sl.No	Drugs	WHO DDD	DDD			AVG DDD
			Normal	Exceed	Below	
1	Cefixime	0.4	8	0	0	3.67
2	Cefotaxime	4	16	0	2	0.49
3	Ceftriaxone	2	110	11	2	0.87
4	Ceftriaxone+Salbactum	2	1	0	0	1.18
5	Ceftriaxone+Tazobactum	2	23	2	3	0.81
6	Cefpodoxime	0.4	6	3	0	1.36

7	Cefoperazone	4	19	0	0	4.02
8	Cefpodoxime+Clavulanic acid	0.4	0	0	0	0

Table 10: Defined Daily Doses in general surgery department (n_2=50)

Sl. No	Drugs	WHO DDD	DDD			AVG DDD
			Normal	Exceed	Below	
1	Cefixime	0.4	38	0	3	0.92
2	Cefotaxime	4	246	3	2	0.45
3	Ceftriaxone	2	0	0	0	0
4	Ceftriaxone+Salbactum	2	37	2	0	1.26
5	Ceftriaxone+Tazobactum	2	298	4	3	1.03
6	Cefpodoxime	0.4	0	0	0	0
7	Cefoperazone	4	44	0	0	0.60
8	Cefpodoxime+Clavulenic acid	0.4	49	2	3	1.40

Table 11: Treatment cost in both general medicine & general surgery department (n=250)

Sl. No	Parameters	Cost	
		General medicine (n_1)	General surgery (n_2)
1.	Average hospital cost per day	71.30	48.53
2.	Average Hospital Stay(days)	2.32	0.74
3.	Total Cost (rs)	895.64	766.02
4.	Average duration of use(days)	5	8.5
5.	Minimum duration of use (days)	1	3
6.	Maximum duration of use (days)	16	26

CONCLUSION

From this study we concluded that, Cephalosporin was mostly used for specific therapy in general medicine department where as it is used as pre-surgical prophylaxis in the department of general surgery. In the department of General medicine, the most common indication for use of Cephalosporin was Respiratory tract infections, whereas in the department of General Surgery, wound debridement was the most common indication. About 72.8% of patients received 3rd generation Cephalosporins only. Ceftriaxone was the most commonly prescribed cephalosporin in general medicine department, while Ceftriaxone- Tazobactam was the most prescribed cephalosporin in general surgery. Defined Daily Doses evaluation was conducted for all the Cephalosporins prescribed for the study patients. The hospital was largely compliant to WHO DDDs. The average duration of use of Cephalosporins in general medicine department was 5 days; while it was 8.5 days in general surgery department.

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REFERENCES

1. KD Tripathi. Essestials of medical pharmacology. 6th ed., New Delhi: Jaypee Brothers Medical publishers; 2009: 667, 703-7.
2. Kaliamoorthy K, Sankaralingam R, Punniyakotti S, Janardhan V, Cheekala UMR.Drug utilization evaluation of third generation cephalosporin using core drug use indicators. J Pharm Sci 2012;25:339-42.
3. G Partha Sarathi, Karin Nyfort-Hansen, Milap C Nahata. Clinical pharmacy practice-Essential concept and skills. 2nd ed., Kansas*:* universal press; 2012. 447-8,450.
4. KG Ravikumar, BD Miglani. A textbook of pharmacy practice.1sted., Maharashtra: carrier publications; 2009. 559.
5. I Truter, IC Wiweman, TJ Van W Kotze. The defined daily dose as a measure of drug consumption in south Africa. S Afr Med J 1996; 86: 675-9.
6. Safwat T, Khattab A, Hatem A, Gouda E, Rabie G, Mostafa Y, et al. Management of adult lower respiratory tract infections. The consensus statement of the Egyptian Scientific Society of Bronahology. Egypt J Bronchol 2012; 6: S8-S14.
7. Steinman MA, Landefeld SC, Gonzales R. Predictors of broad spectrum antibiotic prescribing for acute respiratory tract infections in adult primary care. Journal of American Medical Association2003;289:719-25.
8. Raveh D, Muallem Zilcha E, Greenberg A, Wiener Well Y, Schlesinger Y, Yinnon AM. Drug Utilization Evaluation of Three broad-Spectrum Antimicrobials: Cefepime, Piperacillin, Tazobactam and Meropenem. Q J Med 2006;99:397–406.
9. Tunger O, Dinc G, Ozbakkaloglu B, Atman U, Algün U. Evaluation of rational antibiotic use.Int J Antimicrob2000;15(2):131-5.
10. Weiam A Harwan, Maggie M Abbassi, May M EI Attar, Samar F Farid. Pharmacoeconomics study of antibiotics used in the treatment of lower respiratory tract infection in ICU patients. Acase study in Egyptian hospital. Bulleten of Faculty of Pharmacy, Cairo University 2014; 52: 135-144.
11. Shankar RP, Partha P, Shenoy Nk, Easow JM, Brahmadathan NB. Prescribing pattern of antibiotics and sensitivity patterns of common microorganisms in the Internal medicine

wards of a teaching hospital in Western Nepal: a prospective study. Annals of Clinical Microbiology and Antimicrobials 2003; 2:1-9.