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A STUDY ON DRUG UTILIZATION EVALUATION OF THIRD GENERATION CEPHALOSPORINS IN A TERTIARY CARE CORPORATE HOSPITAL

M. Praveen kumar*[1], K. Bhanu Prasad[1], D.Pratyusha[2], G.Swathi[2], G.Sai priya[2], N.Sriram[1]

[1]Assistant Professor, Department of Pharmacy Practice, Holy Mary Institute of Technology and Science, Bogaram, Keesara, Hyderabad, India- 501301.
[2]PharmD Interns, Department of Pharmacy Practice, Holy Mary Institute of Technology and Science, Bogaram, Keesara, Hyderabad, India- 501301.

ABSTRACT
Objective: The main objective of this study is to evaluate the use of third generation cephalosporin antibiotics in a tertiary care corporate hospital. Study design: An observational and prospective study was conducted in 300 patients for a period of 6 months. Result: Out of 300 cases, we found that only 8.33% cases are presented with generic name, rest all prescriptions were found to be according to brand name. The majority of diseases in which 3rd generation cephalosporins prescribed were found in Surgical department i.e.,105(35%) followed by Pyrexia 45(15%), Gastroenterology 36(12%) and Neurology 12(4%). Conclusion: A significant proportion of prescriptions followed the WHO guidelines, but there is a need to emphasize to all prescribers to encourage prescribing by generic name and to do the culture sensitivity tests more often so as to reduce the incidence of a grave danger i.e. antibiotic resistance.

Key words: Third generation cephalosporins, Antibiotics.

INTRODUCTION

Definition:

Drug Utilization Evaluation (DUE) is an ongoing authorized and systematic quality improvement process[1]. According to WHO (World Health Organisation), Drug Utilization evaluation is defined as the marketing, distribution, prescription and use of drugs in society, with special emphasis on the resulting medical, social and economic consequences.

Drug use is a complex process. In any country a large number of socio-cultural factors contribute to the ways drugs are used. In India, these include national drug policy, illiteracy and poverty, use of multiple health care systems, drug advertising and promotion, sale of prescription drugs without prescription, competition in the medical and pharmaceutical market place and limited availability of independent, unbiased drug information. The complexity of drug use means that optimal benefits of drug therapy in patient care may not be achieved because of underuse, overuse or misuse of drugs. Inappropriate drug use may also lead to increased cost of medical care, antimicrobial resistance, adverse effects and patient mortality[2]. Hence in recent years studies on drug utilization have become a potential tool to be used in the evaluation of health systems[3]. The interest in drug utilization studies began in the early 1960's[4] and its importance has increased since then because of increase in marketing of new drugs, wide variation in the pattern of drug prescribing and consumption, growing concern about delayed adverse effects and the increasing concern regarding the cost of drugs [5].

TYPES OF DRUG USE STUDIES:

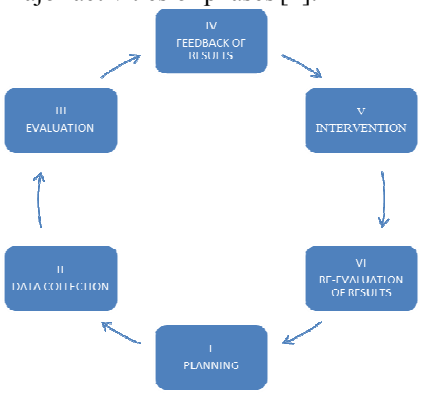
Corresponding Author :- **M. Praveen Kumar** Email:- praveen.pharmd16@gmail.com

DU studies are either Qualitative or Quantitative .

- **Qualitative** DU studies are multidisciplinary operations which collect, organize, analyze and report information on actual drug use. They usually examine use of specific drugs or specific conditions[6].
- **Quantitative** DU studies involve the collection, organization and display of estimates or measurements of drug use. This information is generally used for making purchase decisions or preparing drug budgets[2].

DUE CYCLE:

The DU study program is a continuous process occurring/repeating cyclically and will be more valuable if the cycle is completed rather than different steps being performed in isolation. The DU study cycle includes the following major activities or phases [2].



DUE CYCLE

STEPS INVOLVED IN CONDUCTING DRUG USE STUDY:

Step 1 Identify drugs or therapeutic areas of practice for inclusion in the program.
Step 2 Design of study.
Step 3 Define criteria and standards.
Step 4 Design the data collection form.
Step 5 Data collection.
Step 6 Evaluate results.
Step 7 Provide feedback of results.
Step 8 Develop and implement interventions.
Step 9 Re-evaluate to determine if drug use has improved.
Step 10 Reassess and revise the DUE program.
Step 11 Feedback results.

Drug Utilization Evaluation (DUE) has been defined by the American Society of Health System Pharmacists (ASHP) as a "Criteria-based, on-going, 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" [7].

Drug therapy is considered to be major component of patient management in healthcare setting, including primary healthcare. Although the benefit patients gain from pharmacological intervention are valuable, the risks of drugs and consequences of inappropriate use cannot overlooked[8]. The introduction of potent drugs with an increased incidence of adverse drug reactions, the cost of medication, and focus on drug use outcomes and the clinical misuse of drugs may result in preventable patient morbidity and mortality, costly remedial care, additional cost for diagnosis and management of iatrogenic disease and unnecessary wastage of health resources. In recognition to this problem DUE has been recommended as a method for identifying inappropriate or unnecessary drug use, it monitor, evaluate and promote rational drug therapy [9]. DUE is a method by which information is retrieved to identify problems of drug use and also serves as a means to rectify the problem, there by contributing to rational drug therapy [10]. DUE examines the process of drug administration, dispensing, outcomes of treatment, thereby helping the health care system to realize, interpret and ameliorate the prescribing, administration and utilization of medication.

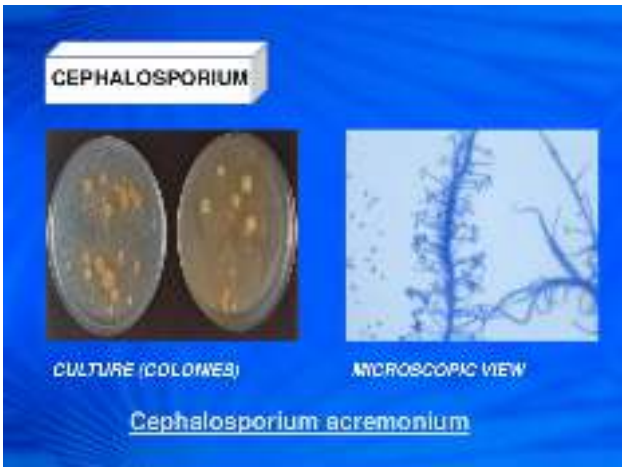
Clinician often prescribe three or four drugs to treat the most trivial conditions for the sake of satisfying the patients need to receive drugs or the drug sellers need for profit. Inadequate knowledge of treatment regimens, lack of diagnostic competence have contributed to incorrect drug choice, incorrect dose, adverse drug reactions, drug interactions, and use of more [9] expensive drugs when less expensive drugs would be equally or more effective [11]. DUE studies are required for all drugs in general and particularly for antibiotics because use of antibiotics in hospitals account for 20% to50% of drug expenditures [12].

ROLE OF PHARMACIST IN DUE:

- Performing pilot studies, collection of data, analyzing collected data and writing a report.
- To plan, organize and implement a DUE program.
- Developing, supervising and coordination of DUE program.
- To promote goals and objectives of DUE.
- To document outcomes of program its effectiveness and cost benefits.
- To present DUE results that obtained at meetings and conferences.
- To educate hospital about DUE and its use[13,14].

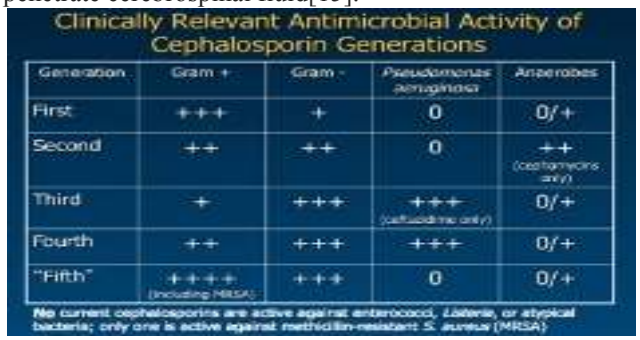
CEPHALOSPORINS:

Cephalosporins are a large group of antibiotics derived from the mold Acremonium (previously called Cephalosporium). This mold yielded three main compounds, historically called Cephalosporin N and C, and P, from which the first cephalosporins were derived[15]. Cephalosporins were first isolated from cultures of "Cephalosporium acremonium", a fungus, by an Italian scientist "GIUSEPPE BROTZU". He noticed that they were effective against Salmonella typhi (typhoid fever) which had beta lactamases[16].



Cephalosporins are bactericidal (kill bacteria) and work in a similar way to penicillins. They bind to and block the activity of enzymes responsible for making peptidoglycan, an important component of the bacterial cell wall. They are called broad-spectrum antibiotics because they are effective against a wide range of bacteria. Since the first cephalosporin was discovered in 1945, scientists have been improving the structure of cephalosporins to make them more effective against a wider range of bacteria. Each time the structure changes, a new "generation" of cephalosporins are made. So far there are five generations of cephalosporins. All cephalosporins start with cef, ceph, or kef[17].

Third generation cephalosporins followed the second generation cephalosporins. No one third generation cephalosporin treats all infectious disease scenarios. Cefotaxime and ceftizoxime offer the best gram-positive coverage out of all the third-generation agents; ceftazidime and cefoperazone are unique in that they provide antipseudomonal coverage. Ceftriaxone has a long half life which allows for once daily dosing and all of the third-generation cephalosporins except for cefoperazone penetrate cerebrospinal fluid[15].



LIST OF THIRD GENERATION CEPHALOSPORINS ARE:

PARENTERAL	ORAL
Cefataxime	Cefixime
Ceftizoxime	Cefpodoxime proxetil
Ceftriaxone	Cefdinir
Ceftazidime	Ceftibuten
Cefoperazone	

MECHANISM OF ACTION:

Cephalosporins are bactericidal and have the same mode of action as other β-lactam antibiotics (such as penicillins), but are less susceptible to B-lactamases. Cephalosporins disrupt the synthesis of the peptidoglycan layer forming the bacterial cell wall.

The peptidoglycan layer is important for cell wall structural integrity. The final transpeptidation step in the synthesis of the peptidoglycan is facilitated by penicillin binding protein (PBPs). PBPs bind to the D-Ala-D-Ala at the end of muropeptides (peptidoglycan precursors) to crosslink the peptidoglycan. Beta-lactam antibiotics mimic the D-Ala-D-Ala site, thereby irreversibly inhibiting PBP crosslinking of peptidoglycan[17].

REVIEW OF LITERATURE:

Prakash Goudanavar et al: In the study population 300 patients were enrolled and demographic characteristics of patients which include gender distribution and age distribution were discussed. Ceftriaxone was commonly prescribed third generation cephalosporin with 57.66%, the results are presented. Injection was mostly prescribed as dosage form with 86.33%. Ceftriaxone and sulbactum combination was prescribed more with 28%. The prescriptions with interactions and without interactions are presented. The appropriateness of the DUE was analysed based on"Criteria For Drug Use Evaluation" of the American Society of Hospital Pharmacist(ASHP)[19].

C Suhas Reddy et al: A total of 250 patients were enrolled in the study, 200 from general medicine (n1) and 50 from general surgery (n2) department. Out of 250 patients', majority of patients' 58 (23.2%) belonged to age group of 31- 40years. 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. Out of 250 patients enrolled in the study from both the departments, 182(72.8%) patients received only third generation cephalosporins. 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[20].

Dr. Bandari Kiran et al: The mean duration of hospitalization among the study population was 6.25 days. 121 cephalosporins prescribed out of 115 patients. Majority of patients were 26 belonged to age group 61-70 (34.21%). used generic (22) 18.18% and brand drugs was (99) 81.82%. Route of administration of cephalosporin's were prescribed more commonly in injection form (105) 86.78%. Cefoperazone +sulbuctum (47) (38.84%) and cefixime (40) were commonly prescribed 3rd generation

cephalosporins. Fourty one (41) patients were received cephalosporins along with co-prescribed other antibiotics in the treatment. The majority of co-prescribed other antibiotics were Metronidazole prescribed in fifteen (15) patients 36.59%. The majority of patients were utilized cephalosporins in Hepatology thirty (30) patients with 26.09%, According to the ATC classification the overall direct costs from use of cephalosporins and other antibiotics consumption was 4, 71,758.4 lakhs of rupees in 719 bed days and the (Daily Drug Dose) DDD/100BD was 6577.64 rupees consumed in hospital stay[21].

Saugat Dahal et al: Out of 150 cases collected, the most common prescribed third generation cephalosporins are Ceftriaxone(68%), followed by Cefixime(20.66%) and Cefotaxime(11.33%). In an entire study, the route of administration of parenteral drugs(79.33%) was found more compared to the oral drugs(20.667%). In our study, the drugs per encounter were 5.8 and third generation cephalosporin per prescription was 1.013. Similarly, the most common infections treated with third generation cephalosporins were Lower Respiratory Tract Infection(LRTI)which includes Chronic Obstructive pulmonary Diseases(COPD34.667%), acute bronchitis(12%), chronic bronchitis(10.667%), pneumonia(23.33%), followed by meningitis(9.33%), acute gastritis (7.33%) and others(2.667%)[22].

Jyothi.K et al: One hundred and one patients were identified for the use of cephalosporins. Cephalosporins usage accounted for 30.02% of total admission. Male patients accounted for 50.50% while female patients were 49.50%. The average length of hospital stay was 7 days. Co-morbid condition is accounted for24.88%. 74.26% patients received cephalosporins for empirical therapy whereas 25.74% received for specific treatment. Majority of hospitalized patients had UTI (16.83%) followed by GI (14.85%) as primary diseases. The widely prescribed 3rd generation cephalosporin was ceftriaxone 48.51%. Majority of hospitalized patients received injection 81.18% and oral 18.82%of cephalosporins.Cephalosporins especially third generation were widely used in medicine departments to treat various disease conditions. Urinary tract Infections is the major disease condition followed by Respiratory Tract Infections and Digestive system infections were seen in the admitted patients[23].

G. Sathyanarayanan et al: Cephalosporins are empirically prescribed in the general medicine department. Male patients accounted for (61.3%) and female patients were (38.6%). Majority of study population diagnosed with Urinary tract infection 21.33% (UTI) followed by other disorders like Lower respiratory tract infections 18.66% (LRTI), Upper respiratory tract infections11.33% (URTI) as primary disease. 32% of co morbidity conditions were seen. Majority of cephalosporins were prescribed in injection form (64.6%) and oral form (35.33%). Among the classification of cephalosporins mostly, Third generation cephalosporins were mostly prescribed (80.65%)[24].

Firehiwot Amare Abebe et al: A total of 296 patient cards out of 336 were found to have complete information for the intended purpose of Ceftriaxone. Among the 296 patients, 138(46.6%) were female and 158(53.4%) male. The average age of the patients was 34.3 (ranging 1 day to 83 years). Most of them were adults being in the range 14-65(73.31%). In 235(79.4%) cases, Ceftriaxone was dosed as 2g/day. Most cases of Ceftriaxone utilization was involved in surgical ward 108(36.5%); the remaining were in internal medicine (medical ward) 100(33.8%); pediatrics ward 45(15.2%); ICU and emergency ward 24(8.1%) and gynecology and obstetrics ward 19(6.4%)[25].

Rekha Bisht et al: Total 250 inpatients were interviewed by using a data collection form. The study revealed that out of 250 patients, 213 were prescribed third generation cephalosporins. Ceftriaxone (46%) was most widely prescribed drug followed by cefixim (20.18%), ceftazidime (12.25), cefotaxime (8.92) and cefpodoxime (5.63).The maximum use of third generation cephalosporins was in medicine ward (39%) followed by patients in surgical (59, 28%), gynecology (36, 17%), orthopedic (18, 8%) and pediatric ward (9, 4%). The most common reasons for administration of third generation cephalosporins were high grade fever and gastrointestinal infections (26.29%) followed by respiratory tract infections (33,15.49%), injury cases (43, 20.19%), urinary tract infection (35,16.43%), skin and soft tissue infection (19,8.9%) and septicemia (04, 1.88%) and maximum patients were between the age group of 41-50 (23.47%) who were prescribed third generation cephalosporins[26].

Prakash Goudanavar et al: 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[27].

Nalamaru Surendra Reddy et al: During the study period, total of 80 patients (49 males and 31 females) were

included in the study. Out of 80 patients male patients 49 (61.25%) were found to be higher than the female patients 31 (38.75%). Among them patients were found to be in 1day-1year age group (47.5%) followed by 1year – 5 years age group (33.75%), 5 – 10 years age group (15%), above 10 years age group (3.75%). Among 80patients different diagnosis was done. Majority of the patients were found to be diagnosed with Respiratory tract infections 22(27.5%) followed by fever 17(21.25%),hematological disorders 15(18.75%),CNS disorders 13(16.25%)[28].

OBJECTIVES:

The usage of third generation cephalosporins are evaluated by the following objectives:

Primary objective: To assess the DUE study of 3rd generation cephalosporins.

Secondary objective :

- To evaluate the 3rd generation cephalosporins with variables, age and gender.
- To ensure rational use, safety and effectiveness of drug.
- To assess the pharmacoeconomics.
- To identify the most common infections treated with 3rd generation cephasporins.
- To identify the DUE of 3rd generation cephalosporins in inpatient department of various wards.
- To provide information about DUE of 3rd generation cephalosporins to health care professionals and patients.
- To assess the percentage of drugs prescribed by generic and brand name of cephalosporins.

METHODOLOGY:

1. STUDY SITE:

The study was conducted in Sunshine hospitals, behind Paradise hotel, Secunderabad.

2. STUDY PERIOD:

The study was conducted for a period of 6 months.

3. STUDY DESIGN:

The study was prospective and observational study.

4. SAMPLE SIZE:

A total of 300 prescriptions were included in the study and were followed for the drug use evaluation study.

5. STUDY APPROVAL:

The study protocol and written informed consent form were approved by the ethical committee at the hospital.

6 . STUDY CRITERIA:

The study criteria are in-patients of medicine, ICU and casualty departments who were treated with third generation cephalosporins.

6.1 Inclusion criteria:

- Males and females both are involved.
- Individuals more than 18 years.
- In-patients.

6.2 Exclusion criteria:

- Patients who are not willing to give the consent.
- Pregnancy and lactating women.
- Psychiatric patients.
- Pediatrics.

RESULTS:

A total of 300 cases were collected in In-patient departments of Sunshine hospital, Secunderabad for the period of six months. The following evaluation was made from the collected data.

➢ **GENDER WISE DISTRIBUTION:**

In our present study, it was found that more male patients were admitted to the various departments in the hospital, when compared to the female patients. Out of 300 patients enrolled the number of male patients was found to be 166 (55.33%) while number of female patients was 134 (44.67%). The reason for higher incidence of male patients may be due to increased exposure to environmental triggers which may be the cause of various bacterial infections.

Out of 300 patients, the maximum number of patients who were prescribed 3rd generation cephalosporins were between the age groups 51-60 ie.,75 patients(25%) followed by age groups 61-70 ie., 71 patients(23.67%).

During the study, out of 300 patients it was found that the use of third generation cephalosporins was highest in general medicine department ie.,82 patients (27.33%) followed by Gastroenterology department ie.,64 patients(21.33%), Orthopaedics ie.,53 patients (17.67%) and Neurology ie.,33 patients (11%).

In this study, it was found that out of 300 patients who were given 3rd generation cephalosporins, 251 patients (83.67%) were prescribed rationally while 49 patients (16.33%) were prescribed irrationally.

Out of 300 cases, a majority of the drugs were purely prescribed based on the Brand names ie., 275 (91.67%) followed by Generic names ie., 25 (8.33%).The pattern of prescription in terms of the generic name was found to be low and should be encouraged more.

We found two route of administration mostly used in patients of Third Generation Cephalosporin which were parenteral and oral. Out of 300 cases collected,291(97%) were found to be parenteral drugs which were given intravenously and 5(1.67%) were oral drugs in a tablet form and 4(1.33%) drugs were given in both parentral and oral routes.

In maximum cases, the drug information was given to Physician 136(45.3%) followed by Nurse 107(35.7%) and then Patient 57 (19%).

Most common prescribed third generation cephalosporins were Cefoperazone sodium+ sulbactam(Magnex forte) i.e.,148 patients(49.33%) followed by Ceftriaxone(Monocef) i.e.,86 patients(28.67%), Ceftazidime+tazobactam(Forzid-Tz)

i.e.,25 patients(8.33%), Cefotaxime (Taxim) i.e.,20 patients(6.67%).

From the above table it is inferred that out of 300 cases, the majority of diseases were found in Surgical department i.e.,105(35%) followed by Pyrexia 45(15%), Gastroenterology 36(12%) and Neurology 12(4%).

In this study the average cost of the treatment of the prescribed drug is Rs.2970 and the average cost of suggested low cost drug is Rs.854.The mean difference between the cost of prescribed drug and suggested low cost drug was found to be Rs.2116. So, it is suggested that low cost drug should be prefered to prescribe the patients for their betterment in both health and economic status.

According to our study, the average of high cost drug (HCD) was found to be more in males i.e., Rs.3104 followed by females is Rs.2862.The average of low cost drug(LCD) in males is Rs. 847 and in females it is Rs.860.The mean difference between HCD and LCD in males was found to be Rs.2257 and in females it was found to be Rs.2002.Hence, the cost of drug is more in males when compared to females.

In our study, the average of high cost drug (HCD) was found to be more in age group of 91-100 i.e., Rs.8041 followed by age group of 61-70 i.e., Rs.3734.The average of low cost drug (LCD) in age group 91-100 is Rs.1833 followed by age group 61-70 i.e., Rs.1040.The mean difference between HCD and LCD in age groups 91-100 is Rs.6208 followed by age group 61-70 is Rs.2694.

In this study, the average of high cost drug (HCD) was found to be more in Urology i.e., Rs.4312 followed by Nephrology i.e., Rs.4147. The average of Low cost drug(LCD) in Urology is Rs.1922 followed by Nephrology i.e., Rs.1274. The mean difference between HCD and LCD in Urology and Nephrology were found to be Rs.2390 and Rs.2873 respectively.

According to our study, the average of high cost drug (HCD) was found to be more in Rational use i.e., Rs.3035 followed by Irrational use is Rs.2638. The average of low cost drug (LCD) in Rational use is Rs.873 followed by Irrational use Rs.759. The mean difference between HCD and LCD in Rational use and Irrational use were found to be Rs.2162 and Rs.1879 respectively.

In this study, the average of high cost drug (HCD) was found to be more in Injection i.e., Rs.3020 and by Oral it is Rs.590. The average of low cost drug(LCD) in Injection is Rs.865 and by Oral route it is Rs.355.The mean difference between HCD and LCD in Injection and Oral routes were found to be Rs.2155 and Rs.235 respectively.

According to this study, the average of high cost drug (HCD) was found to be more in Cefoperazone sodium+sulbactam (Magnex forte) i.e., Rs.4827 and Cefoperazone sodium+sulbactam (Magnex forte), Cefixime it is Rs.4386. The average of low cost drug(LCD) in Cefoperazone sodium+sulbactam (Magnex forte) is Rs.1101 and Cefoperazone sodium+sulbactam (Magnex forte), Cefixime it is Rs.1000.The mean difference between HCD and LCD of Cefoperazone sodium+sulbactam(Magnex forte) and Cefoperazone sodium+sulbactam(Magnex forte),Cefixime were found to be Rs.3726 and Rs.3386 respectively

According to our study the average of high cost drug (HCD) was found to be more in Chronic liver disease i.e., Rs.4124 and Respiratory i.e., Rs.3162 .The average of low cost drug(LCD) in Chronic liver disease is Rs.1210 and Respiratory it is Rs.882.The mean difference between HCD and LCD of Chronic liver disease and Respiratory were found to be Rs.2914 and Rs.2280 respectively.

From the above table it was inferred that out of 300 cases, when we compare department with respect to gender, majority of cases were found in males i.e., 43 each in Gastroenterology and General medicine departments, 25 in Orthopaedics, 18 in Neurology department followed by females i.e., 39 in General medicine, 28 in Orthopaedics, 21 in Gastroenterology department. The lowest number of cases in both males and females were seen in nephrology (4 cases in males and 5 cases in females) and cardiology (2 cases in males and 7 cases in females) departments respectively.

In this study, out of 300 cases, when we compare department with respect to age, majority of cases which used 3rd generations cephalosporins were seen in Orthopaedics department i.e., 22 cases in the age group of 51-60 years followed by General medicine i.e., 19 cases in the age group of 61-70 years, and Gastroenterology i.e., 16 cases in the age group of 51-60 years respectively. Very few cases were noticed in the age group of 91-100 years i.e., 2 cases in Gastroenterology and 1 case in Urology department.

According to our study, out of 300 cases, when we compare department with respect to rationality of 3rd generation cephalosporins, the rational use was found to be more in General medicine(70), Gastroenterology (52),orthopaedics(43) followed by irrational use i.e., 12 each in General medicine and Gastroenterology, 10 in orthopaedics, 2 in nephrology and 1 in pulmonology departments respectively.

According to our study, out of 300 cases, when we compare department with respect to the drug distribution, majority of the 3rd generation cephalosporins were prescribed by brand names in General medicine(77), Gastroenterology(59),Orthopaedics(46),Urology(27) followed by generic names in Neurology(8), Orthopaedics(7),General medicine(5), Gastroenterology(5) departments respectively.

In this study, from the above table, out of 300 cases when we compare department with respect to the route of administration, majority of the 3rd generation cephalosporins were given in the form of **Injection** i.e., 78 in General medicine, 62 in Gastroenterology, 51 in Orthopaedics and 27 in Urology departments, followed by **Oral/Injection** form i.e., 3 in General medicine and 1 in Gastroenterology departments. Only very few cases were

treated with **Oral route** 3rd generation cephalosporins i.e., 1 case each (in General medicine, Gastroenterology and neurology) and 2 cases in Orthopaedics departments respectively.

According to our study, out of 300 cases when we compare department with respect to the prescribing pattern, the most commonly prescribed drugs were found to be Cefoperazone sodium+sulbactam (i.e., 38 cases in Orthopaedics, 31 cases in Gastroenterology, 30 cases in General medicine and 19 cases in Pulmonology departments), Ceftriaxone (i.e., 38 cases in General medicine, 19 cases in Neurology, 11 cases each in Orthopaedics and Gastroenterology departments).

Whereas the combination of Cefoperazone sodium+sulbactam, Cefixime was prescribed only in 1 case i.e., in General medicine department.

From the above table it was inferred that out of 300 cases, the majority of diseases were seen in males (58 in Surgical department) followed by females (47 in surgical department). The lowest number of diseases in males was found to be (7 in others) and in females it was found to be (3 in Neurology).

From the above table , out of 300 cases when we compare the disease with respect to age, the majority of diseases were found in age group of 51-60 years (35 in surgical cases) followed by age group of 61-70 years (23 in surgical cases, 14 in pyrexia, 12 in GIT, 11 in respiratory).

In this study, out of 300 cases when we compare disease with respect to rationality, the rational use was found to be more (i.e., 91 cases in surgical department) while it was found to be less in irrational use (i.e., 1 case in neurology).

Form the above table , when we compare the disease with respect to drug distribution, the majority of the drugs were prescribed in their brand names i.e., 95 (Surgical department), 44(Pyrexia) and 32(GIT infections) followed by their generic names i.e.,10(Surgical department),4(Respiratory tract infections, GIT infections) and 1(Pyrexia, CLD, neurology).

From that above table, when we compare disease with respect to the route of administration, the majority of the drugs were given in the form of injection i.e.,103 in surgical department, 42 (pyrexia) and 18(CLD) followed by oral/injection form i.e.,1 case each in GIT infections, UTI and oral route i.e., 1 case each in pyrexia, CLD and UTI.

From the above table it is inferred that, out of 300 cases the mostly prescribed drug was cefoperazone sodium+ sulbactum i.e., 59 cases in surgical department followed by Ceftriaxone (24 cases in surgical department). Whereas the combination of Ceftriaxone, Cefoperazone sodium+sulbactam was prescribed in very few cases.

In this study when we compare every individual drug with respect to the gender, the majority of drugs prescribed were Cefoperazone (82 in males, 74 in females), Ceftriaxone(51 in males, 43 in females), Ceftazidime(16 in males, 10 in females) and Cefotaxime(15 in males, 6 in females).

From the above table, out of 300 cases when we compare every individual drug with respect to age, the most commonly prescribed drugs were found to be Cefoperazone in the age group of 61-70 years (47), 51-60 years(36) followed by Ceftriaxone in the age group of 51-60 years(27), 61-70 years(16). The least prescribed drugs were Ceftizoxime, Cefixime and Cefpodoxime in the age group of 41-50 years, 31-40 and 51-60 years respectively.

According to our study, out of 300 cases when we compare every individual drug with respect to rationality, the rational use was found to be more in Cefoperazone(130), Ceftriaxone(81), Ceftazidime(22), Cefotaxime(17) and Cefixime(5) followed by irrational use i.e., in Cefoperazone(26) and Ceftriaxone(13) respectively.

From the above table, out of 300 cases when we compare every individual drug with respect to drug distribution, majority of the drugs which are prescribed in their brand names were Cefoperazone(148), Ceftriaxone(77), Ceftazidime(25) and Cefotaxime(19). The drugs which are prescribed in their Generic names were Ceftriaxone(17),Cefoperazone(8), Cefotaxime(2) and Ceftazidime(1).

According to our study, out of 300 cases, when we compare every individual drug with respect to department, the most commonly prescribed drug was found to be Cefoperazone in Orthopaedics(38), General Medicine(36), Gastroenterology(33),Pulmonology(19) departments. The least prescribed drug was found to be Cefpodoxime in Neurology(1) and Orthopaedics(1) departments respectively.

According to our study, out of 300 cases when we compare every individual drug with respect to disease the majority of the drugs were prescribed in surgical cases i.e., Cefoperazone(60), Ceftriaxone(25), Ceftazidime(12), Cefotaxime(6),Cefixime(1) and Cefpodoxime(1) followed by Pyrexia i.e., Cefoperazone(22), Ceftriaxone(14) and Cefotaxime(4) and GIT infections i.e., Cefoperazone(16) and Ceftriaxone(18).

Table 1. Gender wise Distribution

Gender	No. Of Patients	(%)
F	134	44.67
M	166	55.33
Total	300	100

Table 2. Age wise Distribution:

Age group	No. of Patients	(%)
<21	13	4.33
21-30	26	8.67
31-40	36	12
41-50	32	10.67
51-60	75	25
61-70	71	23.67
71-80	36	12
81-90	8	2.67
91-100	3	1
Total	300	100

Table 3. Department wise Distribution:

Department	No. of Patients	(%)
Cardiology	9	3
Gastroenterology	64	21.33
General Medicine	82	27.33
Nephrology	9	3
Neurology	33	11
Orthopaedics	53	17.67
Pulmonology	23	7.67
Urology	27	9
Total	300	100

Table 4. Rationality wise distribution:

Rationality	No. of Patients	(%)
Irrational	49	16.33
Rational	251	83.67
Total	300	100

Table 5. Prescription wise distribution:

Prescribed As	No. Of Prescriptions	(%)
Brand Name	275	91.67
Generic Name	25	8.33
Total	300	100

Table 6. Route of administration wise distribution:

Route Of Admnistration	No. Of Patients	(%)
Parenteral	291	97
Parenteral, Oral	4	1.33
Oral	5	1.67
Total	300	100

Table 7. Drug Information Wise Distribution:

DUE Info Given To	No. Of Persons	(%)
Nurse	107	35.7
Patient	57	19.0
Physician	136	45.3
Total	300	100

Table 8. Prescribing Pattern Of Cephalosporins Given:

Cephalosporins Given (generic name)	No. Of Patients	(%)
Cefixime	3	1
Cefoperazone sodium+sulbactam	148	49.33
Cefoperazone sodium+sulbactam,Cefixime	1	0.33
Cefoperazone sodium+sulbactam,Cefotaxime	1	0.33
Cefotaxime	20	6.67
Cefpodoxime	2	0.67
Ceftazidime	1	0.33
Ceftazidime+Tazobactam	25	8.33
Ceftizoxime	5	1.67
Ceftriaxone	86	28.67
Ceftriaxone, Cefixime	2	0.67
Ceftriaxone,Cefoperazone sodium+sulbactam	6	2
Total	300	100

Table 9. Disease wise distribution:

Disease	No Of Patients	%
Chronic Liver Disease	19	6.3
GIT	36	12
Neurology	12	4
Others	22	7.3
Pyrexia	45	15
Respiratory	35	11.7
Surgery	105	35
UTI	26	8.7
Total	300	100

PHARMACO-ECONOMICS:

Table 10. Comparision of Treatment Cost Between Prescribed and Suggested Drug:

Parameters	Cost in rupees		Difference	P value
	Prescribed drug	Suggested low cost drug		
Average cost of treatment	2,970	854	2116	P<0.0001
Standard deviation	2,736	744	1992	
Minimum cost of treatment	101	63	38	
Maximum cost of treatment	15,351	4,624	10727	

Table 11. Comparision of High Cost Drug and Low Cost Drug With Reference To Gender:

Gender	HCD	LCD	Difference
	Mean	Mean	
F	3,104	847	2,257
M	2,862	860	2,002
P value	P=0.4482	P=0.8814	

Table 12. Comparision of High Cost Drug and Low Cost Drug With Reference To Age:

Age Group	HCD	LCD	Difference
	Mean	Mean	
<21	1,173	441	732
21-30	2,506	794	1,712
31-40	2,121	638	1,483
41-50	3,242	992	2,250
51-60	2,582	747	1,835

61-70	3,734	1,040	2,694
71-80	3,522	949	2,573
81-90	2,606	702	1,904
91-100	8,041	1,833	6,208
P value	P=0.0002***	P=0.0077**	

Table 13. Comparision of High Cost Drug and Low Cost Drug With Reference To Department:

Department	HCD	LCD	Difference
	Mean	Mean	
Cardiology	2,663	651	2,012
Gastroenterology	3,382	903	2,479
General Medicine	2,280	614	1,666
Nephrology	4,147	1,274	2,873
Neurology	2,383	694	1,689
Orthopaedics	2,734	670	2,064
Pulmonology	3,754	890	2,864
Urology	4,312	1,922	2,390
P value	P=0.008**	P<0.0001***	

Table 14. Comparision of high cost drug and low cost drug with reference to rational use:

Rational Use	HCD	LCD	Difference
	Mean	Mean	
Irrational	2,638	759	1,879
Rational	3,035	873	2,162
P value	P=0.3545	P=0.3287	

Table 15. Comparision of High Cost Drug and Low Cost Drug With Reference To Route Of Administration:

Route Of Administraion	HCD	LCD	Difference
	Mean	Mean	
Injection	3,020	865	2,155
Injection,Oral	2,285	701	1,584
Oral	590	355	235
P value	P=0.1267	P=0.2895	

Table 16. Comparision of High Cost Drug and Low Cost Drug With Reference To prescribing pattern

Cephalosporins	HCD	LCD	Difference
	Mean	Mean	
Cefixime	607	328	279
Cefoperazone sodium+sulbactam	4,827	1,101	3,726
Cefoperazone sodium+sulbactam,Cefixime	4,386	1,000	3,386
Cefoperazone sodium+sulbactam,Cefotaxime	3,423	856	2,567
Cefotaxime	456	316	140
Cefpodoxime	565	395	170
Ceftazidime	2,839	1,734	1,105
Ceftazidime+Tazobactam	3,429	2,097	1,332
Ceftizoxime	1,933	333	1,600
Ceftriaxone	406	245	161
Ceftriaxone,Cefixime	666	474	192
Ceftriaxone,Cefoperazone sodium+sulbactam	3,707	939	2,768
P value	P<0.0001***	P<0.0001***	

Disease	HCD	LCD	Difference
	Mean	Mean	
Chronic Liver Disease	4124	1210	2914
Gastro Intestinal Disease	2451	723	1728
Neurology	1826	568	1258
Others	3043	763	2280
Pyrexia	3044	894	2150
Respiratory	3162	882	2280
Surgery	3095	904	2191
Urinary Tract Infection	2421	678	1743
P value	P=0.3113	P=0.2068	

Table 17. Comparision of Department With Reference To Gender:

Gender	Department								P Value
	Cardio	GE	GM	Nephro	Neuro	Ortho	Pulmn	Uro	
F	7	21	39	5	15	28	8	11	P=0.145
M	2	43	43	4	18	25	15	16	
Total	9	64	82	9	33	53	23	27	300

Table 18. Comparision of High Cost Drug and Low Cost Drug With Reference To Disease:

Age Group	Department								P Value
	Cardio	GE	GM	Nephro	Neuro	Ortho	Pulmn	Uro	
<21	.	2	8	.	.	1	1	1	P=0.0625
21-30	1	7	11	1	3	3	.	.	
31-40	2	7	11	1	2	9	2	2	
41-50	.	10	9	1	5	4	.	3	
51-60	2	16	14	2	10	22	4	5	
61-70	1	9	19	1	9	10	11	11	
71-80	3	7	7	3	3	4	5	4	
81-90	.	4	3	.	1	.	.	.	
91-100	.	2	.	.	.	.	.	1	
Total	9	64	82	9	33	53	23	27	300

Table 19. Comparision of department with reference to rational use:

Rational Use	Department								P Value
	Cardio	GE	GM	Nephro	Neuro	Ortho	Pulmn	Uro	
Irrational	4	12	12	2	4	10	1	4	P=0.2512
Rational	5	52	70	7	29	43	22	23	
Total	9	64	82	9	33	53	23	27	300

Table 20. Comparision of Department With Reference To Drug Distribution:

Prescribed In	Department								P Value
	Cardio	GE	GM	Nephro	Neuro	Ortho	Pulmn	Uro	
Brand Name	9	59	77	9	25	46	23	27	P=0.0072**
Generic Name	.	5	5	.	8	7	.	.	
Total	9	64	82	9	33	53	23	27	300

Table 21. Comparision of department with reference to route of administration:

ROA	Department								P Value
	Cardio	GE	GM	Nephro	Neuro	Ortho	Pulmn	Uro	
Injection	9	62	78	9	32	51	23	27	P=0.8608
Injection,Oral	.	1	3	.	.	.	.	.	
Oral	.	1	1	.	1	2	.	.	
Total	9	64	82	9	33	53	23	27	300

Table 22. Comparision of Department With Reference to Prescribing Pattern

Cephalosporins	Department								P Value
	Cardio	GE	GM	Nephro	Neuro	Ortho	Pulmno	Uro	
Cefixime	.	1	1	.	.	1	.	.	P<0.0001***
Cefoperazone sodium+sulbactam	6	31	30	6	11	38	19	7	
Cefoperazone sodium+sulbactam, Cefixime	.	.	1	.	.	.	.	.	
Cefoperazone sodium+sulbactam, Cefotaxime	.	1	.	.	.	.	.	.	
Cefotaxime	1	11	3	.	1	2	1	1	
Cefpodoxime	.	.	.	.	1	1	.	.	
Ceftazidime	.	.	.	.	1	.	.	.	
Ceftazidime+Tazobactam	.	3	2	2	.	.	.	18	
Ceftizoxime	.	5	.	.	.	.	.	.	
Ceftriaxone	2	11	38	1	19	11	3	1	
Ceftriaxone, Cefixime	.	.	2	.	.	.	.	.	
Ceftriaxone, Cefoperazone sodium+sulbactam	.	1	5	.	.	.	.	.	
Total	9	64	82	9	33	53	23	27	300

Table 23. Comparision of disease with reference to gender:

Gender	Disease								P Value
	CLD	GIT	NEURO	OTH	PYREX	RESP	SURG	UTI	
F	9	12	3	15	18	19	47	11	P=0.1623
M	10	24	9	7	27	16	58	15	
Total	19	36	12	22	45	35	105	26	300

Table 24. Comparision of disease with reference to age:

Age Group	Disease								P Value
	CLD	GIT	NEURO	OTH	PYREX	RESP	SURG	UTI	
<21	1	.	.	3	3	2	1	3	P=0.0282*
21-30	2	4	3	3	5	2	5	2	
31-40	3	5	.	3	5	3	14	3	
41-50	2	5	6	2	4	2	10	1	
51-60	3	7	2	4	8	12	35	4	
61-70	3	12	1	2	14	11	23	5	
71-80	5	3	.	3	4	2	13	6	
81-90	.	.	.	1	2	1	2	2	
91-100	.	.	.	1	.	.	2	.	
Total	19	36	12	22	45	35	105	26	300

Table 25. Comparision of disease with reference to rational use

Rational Use	Disease								P Value
	CLD	GIT	NEURO	OTH	PYREX	RESP	SURG	UTI	
Irrational	5	6	1	6	9	5	14	3	P=0.5924
Rational	14	30	11	16	36	30	91	23	
Total	19	36	12	22	45	35	105	26	300

Table 26. Comparision of Disease With Reference To Drug Distribution:

Prescribed In	Disease								P Value
	CLD	GIT	NEURO	OTH	PYREX	RESP	SURG	UTI	
Brand Name	18	32	11	20	44	31	95	24	P=0.8392
Generic Name	1	4	1	2	1	4	10	2	
Total	19	36	12	22	45	35	105	26	300

Table 27. Comparision of Disease With Reference To Route Of Administration:

ROA	Disease								P Value
	CLD	GIT	NEURO	OTH	PYREX	RESP	SURG	UTI	
Injection	18	35	12	22	42	35	103	24	P=0.6121
Injection,Oral	.	1	.	.	2	.	.	1	
Oral	1	.	.	.	1	.	2	1	
Total	19	36	12	22	45	35	105	26	300

Table 28. Comparision of Disease With Reference To Prescribing Pattern

Cephalosporins	Disease								P Value
	CLD	GIT	NEURO	OTH	PYREX	RESP	SURG	UTI	
Cefixime	.	.	.	.	1	.	1	1	P=0.3302
Cefoperazone sodium+sulbactam	12	14	3	10	20	18	59	12	
Cefoperazone sodium+sulbactam,Cefixime	.	.	.	.	1	.	.	.	
Cefoperazone sodium+sulbactam,Cefotaxime	.	1	.	.	.	.	.	.	
Cefotaxime	1	1	2	1	4	2	6	3	
Cefpodoxime	1	.	.	.	.	.	1	.	
Ceftazidime	.	1	.	.	.	.	.	.	
Ceftazidime+Tazobactam	3	1	1	.	3	3	12	2	
Ceftizoxime	.	.	.	2	2	.	1	.	
Ceftriaxone	1	17	5	8	12	12	24	7	
Ceftriaxone,Cefixime	.	.	.	.	1	.	.	1	
Ceftriaxone,Cefoperazone sodium+sulbactam	1	1	1	1	1	.	1	.	
Total	19	36	12	22	45	35	105	26	300

Table 29. Individual drugs: comparision of individual drug with reference to gender:

Gender	Cephalosporins							P Value
	Cefix	Cefop	Cefot	Cefpod	Ceftaz	Ceftiz	Ceftria	
F	2	74	6	.	10	2	43	P=0.6491
M	4	82	15	2	16	3	51	
Total	6	156	21	2	26	5	94	300

Table 30. Comparision Of Individual Drug With Reference To Age:

Age Group	Cephalosporins							P Value
	Cefix	Cefop	Cefot	Cefpod	Ceftaz	Ceftiz	Ceftria	
<21	1	2	3	.	1	.	7	P=0.5759
21-30	.	11	1	.	3	.	12	
31-40	2	17	3	.	2	1	13	
41-50	1	13	2	.	5	2	9	
51-60	.	36	6	2	5	2	27	
61-70	.	47	3	.	7	.	16	
71-80	1	23	2	.	3	.	8	
81-90	1	4	1	.	.	.	2	
91-100	.	3	.	.	.	.	.	
Total	6	156	21	2	26	5	94	300

Table 31. Comparision of individual drug with reference to rational use:

Rational	Cephalosporins							P Value
	Cefix	Cefop	Cefot	Cefpod	Ceftaz	Ceftiz	Ceftria	
Irrational	1	26	4	.	4	1	13	P=0.9953
Rational	5	130	17	2	22	4	81	
Total	6	156	21	2	26	5	94	300

Table 32. Comparision Of Individual Drug With Reference To Drug Distribution:

Prescribed In	Cephalosporins							P Value
	Cefix	Cefop	Cefot	Cefpod	Ceftaz	Ceftiz	Ceftria	
Brand	6	148	19	2	25	5	77	P=0.0393*
Generic	.	8	2	.	1	.	17	
Total	6	156	21	2	26	5	94	300

Table 33. Comparision Of Individual Drug With Reference To Department:

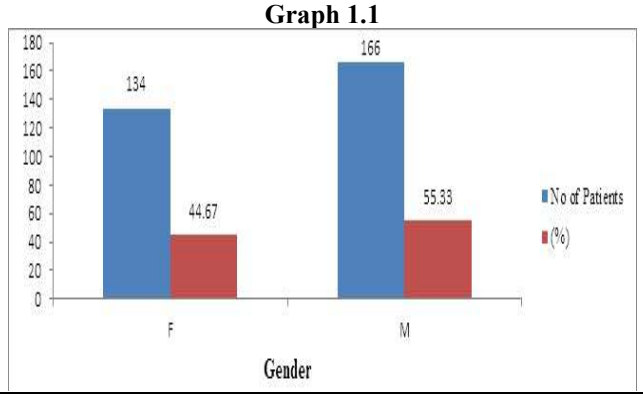
Department	Cephalosporins							P Value
	Cefix	Cefop	Cefot	Cefpod	Ceftaz	Ceftiz	Ceftria	
Cardio	.	6	1	.	.	.	2	P<0.0001***
GE	1	33	12	.	3	5	12	
GM	4	36	3	.	2	.	45	
Nephro	.	6	.	.	2	.	1	
Neuro	.	11	1	1	1	.	19	
Ortho	1	38	2	1	.	.	11	
Pulmo	.	19	1	.	.	.	3	
Uro	.	7	1	.	18	.	1	
Total	6	156	21	2	26	5	94	300

Table 34. Comparision of Individual Drug With Reference To Disease:

Disease	Cephalosporins							P Value
	Cefix	Cefop	Cefot	Cefpod	Ceftaz	Ceftiz	Ceftria	
CLD	.	13	1	1	3	.	2	P=0.3845
GIT	.	16	2	.	2	.	18	
NEURO	.	4	2	.	1	.	6	
OTH	.	11	1	.	.	2	9	
PYREX	3	22	4	.	3	2	14	
RESP	.	18	2	.	3	.	12	
SURG	1	60	6	1	12	1	25	

UTI	2	12	3	.	2	.	8	
Total	6	156	21	2	26	5	94	300

Graph 1.1



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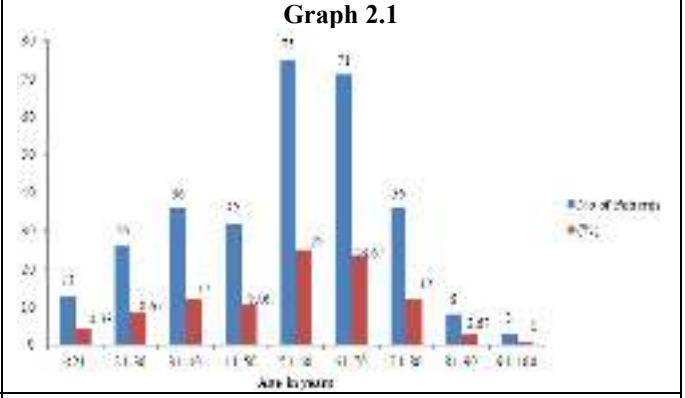

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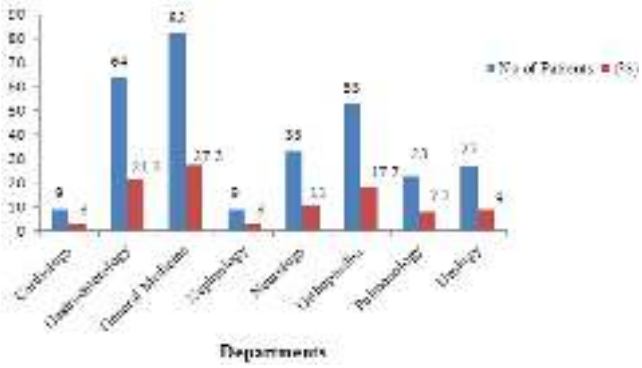

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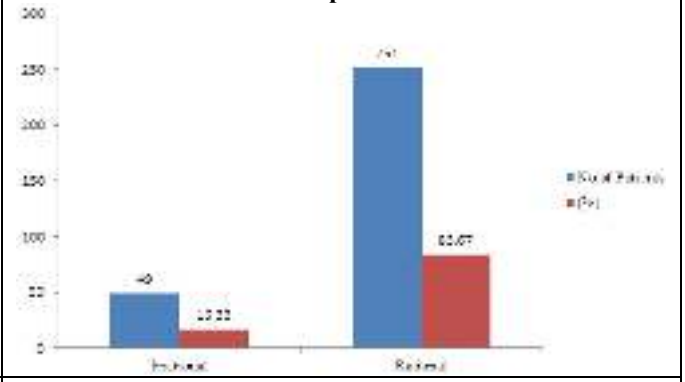

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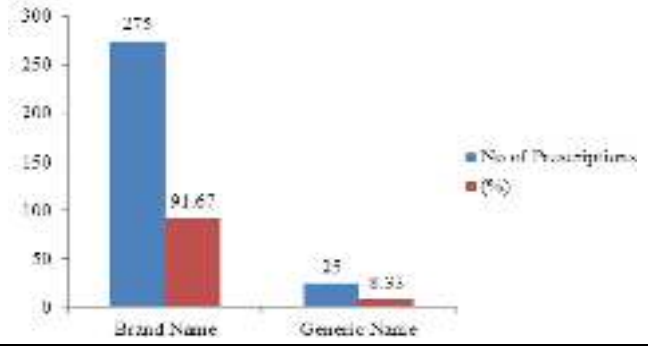

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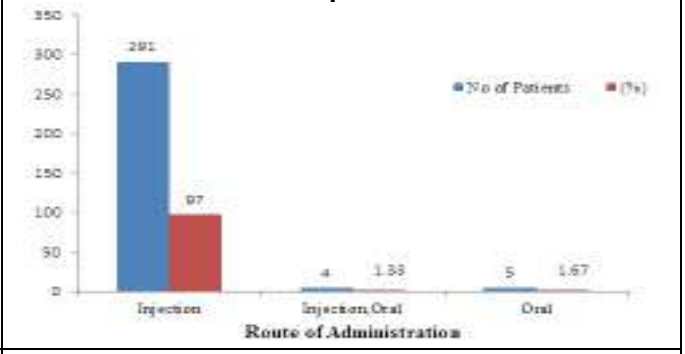

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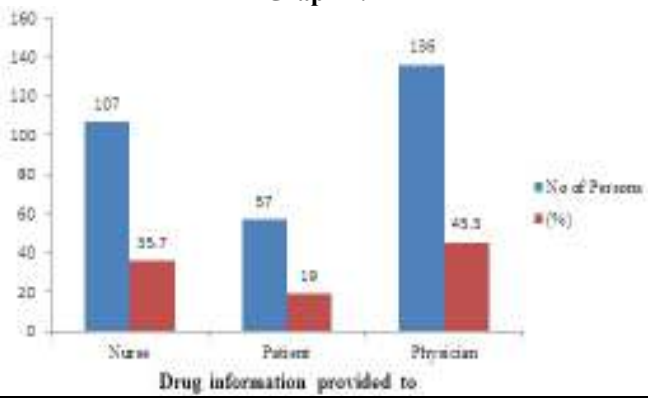

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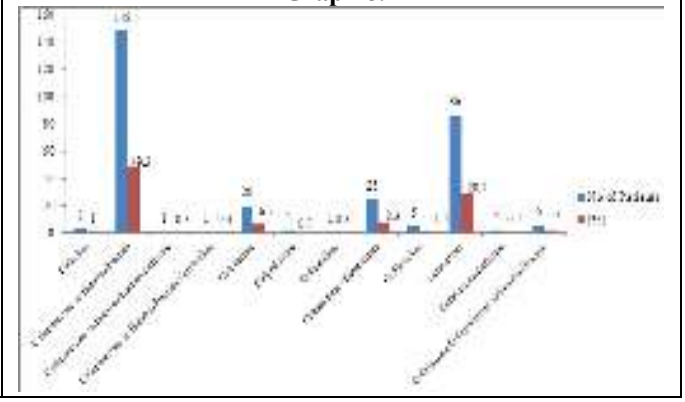

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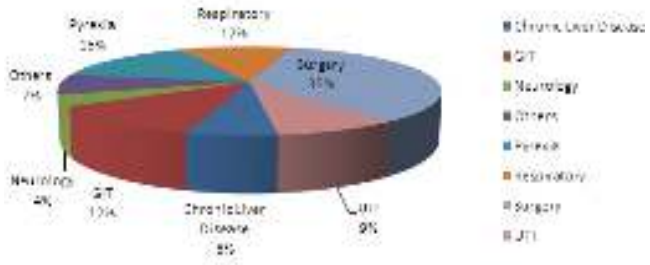

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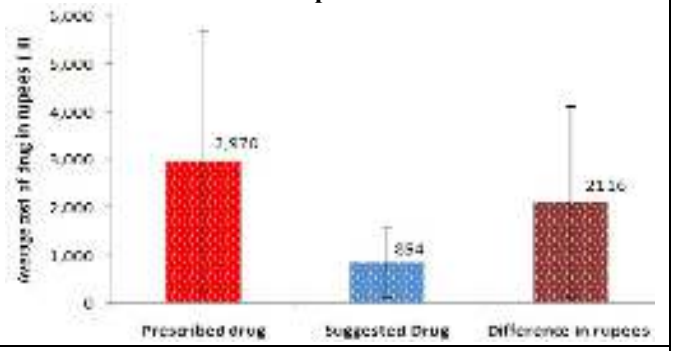

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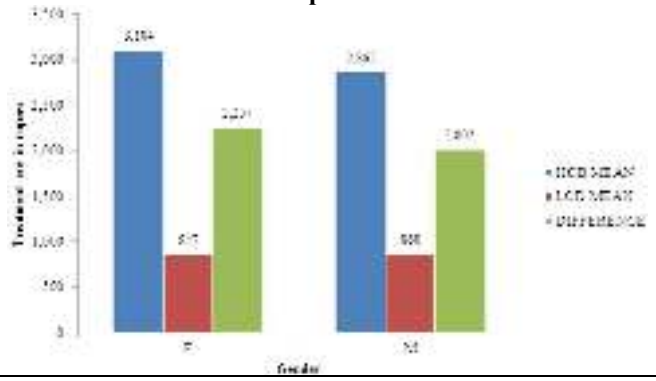

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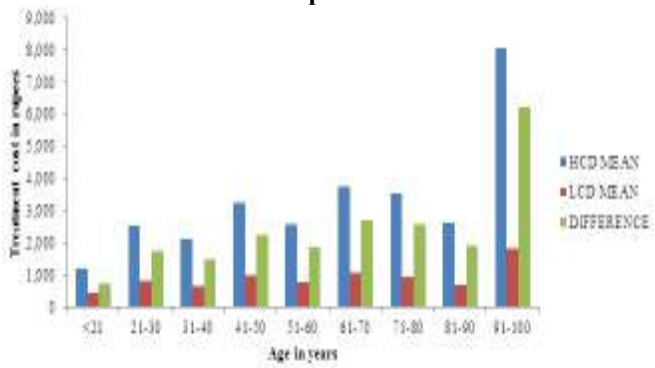

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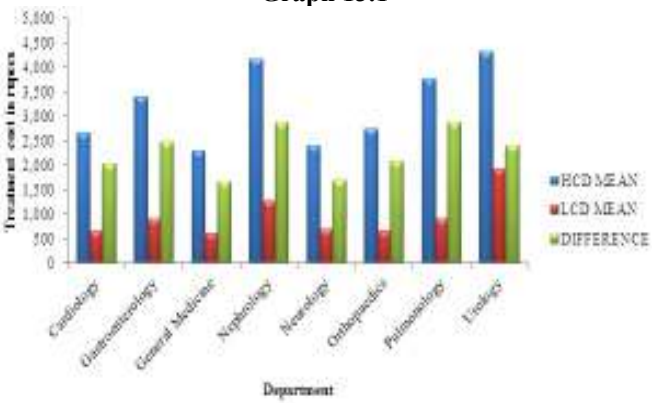
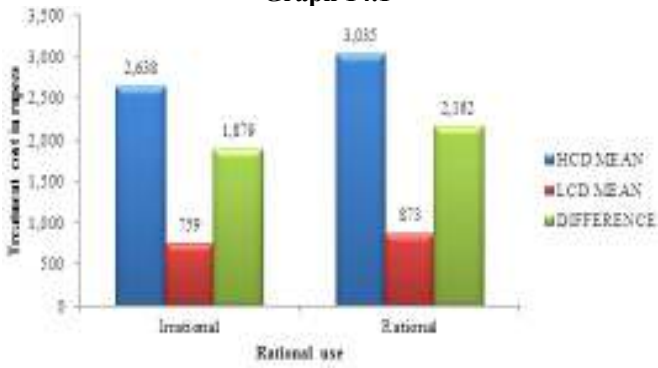
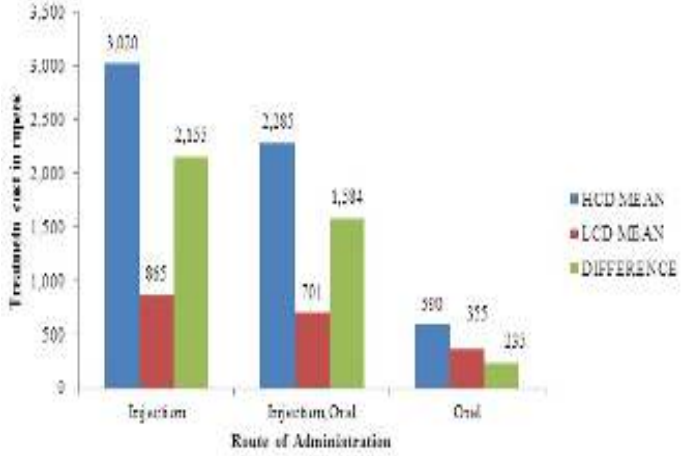


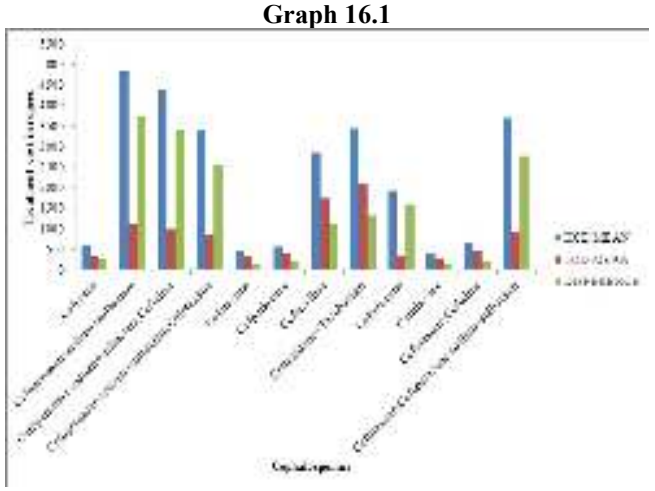
Graph 14.1



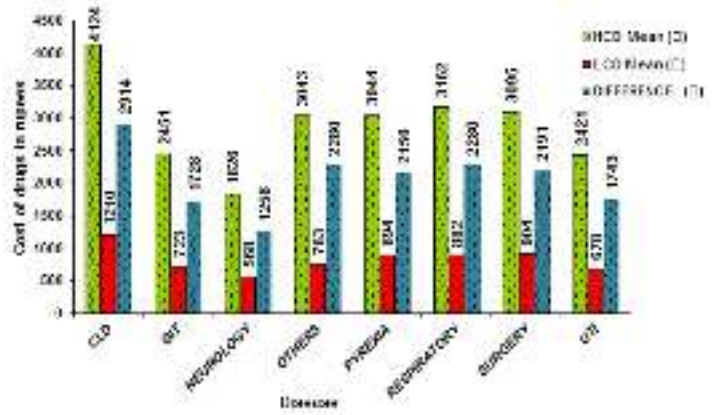
Graph 15.1



Graph 16.1



Graph 17.1



DISCUSSION:

- The data was collected prospectively from 300 in-patients and drug utilization pattern were analysed. In this study demographics characteristics shows males (55.33%) are commonly prescribed with third generation cephalosporin as compared to females (44.67%). This findings is similar to the study conducted by **Arul B et al** [29].
- The maximum number of patients who were prescribed 3rd generation cephalosporins were between the age groups of 51-60 (25%) followed by age groups 61-70(23.67%). The reason for higher incidence of older patients i.e above 51 years may be due to increased exposure to environmental triggers which may be the cause of various bacterial infections. This can be attributed to the fact that the age group above 60 years are mainly used for post-operative prophylaxis as the geriatric patients are more likely to be sick & to have more serious illness. This was similar to the study conducted by **Rekha Bisht et al** [26].
- The use of 3rd generation cephalosporins were found to be maximum in General medicine(82, 27.33%), followed by Surgical Gastroenterology (64, 21.33%), Orthopaedics (53, 17.67%), Neurology(33, 11%) .This was similar to the study conducted by **Firehiwot Amare Abebe et al** [25].
- The use of 3rd generation cephalosporins were Rational in most of the cases i.e (251, 83.67%) and Irrational use is (49, 16.33%).
- Out of 300 cases, a majority of the drugs were prescribed based on the Brand names (91.67%) followed by Generic names (8.33%). Use of brand names were more frequent and could be as a result of various promotional strategies from different pharmaceutical companies trying to ace their products. Prescribing drugs by generic name would become easy for the hospital to have maintenance over its regulatory stock and would also lower the cost of treatment [29].
- Majority of cephalosporins were prescribed in the parenteral IV route (97%) and followed by oral route (1.67%) and the combination of these both is (1.33%). This was similar to the study conducted by **G. Sathyanarayanan et al** [24].
- In majority of cases the drug information was provided to physician(45.4%) followed by nurse(35.7%) and patient(19%).
- The most prescribed third generation cephalosporins are Cefoperazone sodium+ sulbactam (49.33%), Ceftriaxone(28.67%) followed by Ceftazidime+tazobactam(8.33%) and Cefotaxime (6.67%).
- Third generation cephalosporins were mostly given in cases of post or pre operative care(35%)followed by pyrexia(15%) and Gastrointestinal diseases(12%).
- The average cost of the treatment of the prescribed drug is Rs.2970 and the average cost of suggested low cost drug is Rs.854. So, it is suggested that low cost drug should be preffered to prescribe the patients for their betterment in both health and economic status.

SUMMARY:

- Drug Utilization Evaluation (DUE) is an ongoing authorized and systematic quality improvement process[1] which is designed to-

1. Review drug use and/or prescribing patterns.
2. Provide feedback of results to clinicians.
3. Develop criteria and standards which describe optimal drug use.
4. Promote appropriate drug use through education and other interventions[2].

- Drug use is a complex process. In any country a large number of socio-cultural factors contribute to the ways drugs are used. In India, these include national drug policy, illiteracy and poverty, use of multiple health care systems, drug advertising and promotion, sale of prescription drugs without prescription, competition in the medical and pharmaceutical market place and limited availability of independent, unbiased drug information[2].
- The types of drug use information are Drug based information, Problem based information, Patient

information, Prescriber information, Pharmaco-economics[6]**.**

- DU studies are either **Qualitative** or **Quantitative[6].**
- The pharmacists play an important role to promote goals and objectives of DUE.
- **Cephalosporins** are a large group of antibiotics derived from the mold Acremonium (previously called Cephalosporium)[15].
- Cephalosporins are bactericidal (kill bacteria) and work in a similar way to penicillins. They bind to and block the activity of enzymes responsible for making peptidoglycan, an important component of the bacterial cell wall. They are called broad-spectrum antibiotics because they are effective against a wide range of bacteria.
- The most commonly used third generation cephalosporins are :

1. **Parenteral**: Cefataxime, Ceftizoxime, Ceftriaxone, Ceftazidime, Cefoperazone.
2. **Oral**: Cefixime, Cefpodoxime proxetil, Cefdinir, Ceftibuten.

- This is a prospective and observational survey based study where patients are eligible for enrollment in to the study. A protocol was prepared and submitted, which was approved by Institutional Ethics Committee of Sunshine hospital, Secunderabad, which is a Multi-super specialty tertiary care hospital. In this study 300 patients were enrolled after obtaining the consent. After data collection it was analysed for statistical significance. The data collection form was prepared and used. This form mainly contains the demographic details of the patient, medication history, diagnosis and treatment of the patient.

CONCLUSION:

- In our study,we found that only 8.33% cases are presented with generic name, rest all prescriptions were found to be according to brand name. In our study, we concluded that the prescription pattern of third generation cephalosporins were not found to be satisfactory.
- Rational prescribing of antibiotics would help avoid poly pharmacy and prevent drug resistances.
- From over view of the study, cephalosporin's especially third generation drugs were widely used when compared to second generation of drugs.
- The majority of diseases were found in Surgical department i.e.,105(35%) followed by Pyrexia 45(15%), Gastroenterology 36(12%) and Neurology 12(4%).
- The clinical situations requiring the use of third generation cephalosporins are likely to be encountered in patients who are hospitalized, have recently received antibiotics, or are immunocompromised.
- The therapy provided in the prescriptions were efficacious but there is a need to emphasize to all prescribers encourage prescribing by generic name and to do the culture sensitivity tests more often so as to reduce the incidence of a grave danger i.e. antibiotic resistance.
- Antibiotic resistance is rapidly increasing global problem. It contributes to health and economic losses world wide.
- As antibiotics have important role in clinical care, thus efforts should be made to reduce the volume of antimicrobial unnecessary antibiotic prescribing.
- The present study shows the high proportion of hospitalized patients who receive antibiotics particularly broad spectrum agents like cephalosporins.
- In addition to their broader spectrum activity, third generation cephalosporins are widely used for empirical treatment of severe or complicated infections and for direct treatment of otherwise resistant organisms.
- The expanding use of these agents can promote escalating antibiotic resistance within both individual and communities.
- As a result, the medical profession is losing some of its most potent therapies for patients with greatest need.

FUTURE DIRECTIONS:

- Antibiotic resistance is rapidly increasing global problem. It contributes to health and economic losses world wide. As antibiotics have important role in clinical care, thus efforts should be made to reduce the volume of unnecessary antibiotic prescribing.
- The present study shows the high proportion of hospitalized patients who receive antibiotics particularly broad spectrum agents like cephalosporins.
- In addition to their broader spectrum activity, third generation cephalosporins are widely used for empirical treatment of severe or complicated infections and for direct treatment of otherwise resistant organisms.
- The expanding use of these agents can promote escalating antibiotic resistance within both individual and communities. As a result, the medical profession is losing some of its most potent therapies for patients with greatest need[26].
- The appropriateness of cephalosporins was found to be higher than inappropriateness. A combination of physician education programs and feedback control system directed towards rational cephalosporins use is suggested for proper medical treatment.
- The involvement of clinical pharmacists in clinical practice helps to increase proper usage of cephalosporins i.e., rational use and optimum outcome[19].
- 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 the need to establish rational antibiotic use[27].
- The treatment regimen application in majority of the cases is done without doing any culture sensitivity test

which may lead to wide spread of irrational prescription. So physician must be more specific in their diagnosis despite the financial burden of culture test[28].

- The therapy provided in the prescriptions were efficacious but there is a need to emphasize to all prescribers encourage prescribing by generic name and to do the culture sensitivity tests more often so as to reduce the incidence of a grave danger i.e. antibiotic resistance[29].

REFERENCES

1. Text book of Clinical Pharmacy practice - G.Parthasarathi, 2nd Edition, Page no. 451-460.
2. Einarson T. Pharmcoepidemiology. In: Parthasarathi G, Hansen KN, Nahata MC, editors. A Text book of Clinical Pharmacy Practice essential concepts and skills. 1st ed., Hyderabad: Universities Press (India) Limited; 2008. p.405-23.
3. Laporte JR, Porta M, Capella D. Drug utilization studies: A tool for determining the effectiveness of drug use. *Br J Clin Pharmac*, 16, 1983, 301-04.
4. Andersen M. Is it possible to measure prescribing quality using only prescription data? *Basic Clin Pharmacol Toxicol,* 98, 2006, 314-19.
5. Moore TJ, Cohen MR, Furberg CD. Serious adverse drug events reported to the Food and Drug Administration, 1998-2005. *Arch Intern Med,* 167, 2007, 1752-59.
6. Sjoqvist F, Birkett D. Drug Utilization. In: Bramley DW editor. Introduction to Drug Utilization Research. (WHO booklet) New York: WHO office of publications; 2003.P.76-84.
7. Bethesda, MD. American Society of Hospital Pharmacist.Criteria for drug use evaluation Volume 1.ASHP 1990.
8. Guglieo BJ. Antimicrobial therapy. *Cost-benefit consideration Drugs,* 38, 1989, 473-80.
9. Sathvik BS. Drug utilization Review .In: Parthasarathi G, Karin NH, Milap CN, editors.A textbook of Clinical Pharmacy Practice.1stedition.India: Orient Longman; 2004, 362-375.
10. Folke S, Donald B. Drug utilization .Introduction to drug utilization research. WHO office of publications. 2003, 76-84.
11. Drug Use Evaluation; Session11.drug & therapeutic Committee Training Course. Rational pharmaceutical management plus program.Center for population, Health & Nutrition, USA. 2001; XI-1 to XI-13.
12. Schentage J, Ballow C. Changes in Antimicrobial Agent Usage Resulting from Interaction Among Clinical Pharmacy, The Infection Disease Division & The Microbiology Laboratory. *Diagn Microbiol Infect Dis*, 1993, 16:255-64.
13. Cockcroft DW, Gault MH. Prediction of creatinine clearance from serum creatinine. Nephron 1976; 16: 31-41
14. Prof. J VijayRatna, editor. Role of Pharmacist in today's society, AU college of Pharmaceutical Sciences, Andhra University, Visakhapatnam; 2005.
15. https://www.drugs.com/drug-class/third-generation-cephalosporins.html
16. https://www.slideshare.net/shrinathraman/cephalosporins-22203041
17. https://en.wikipedia.org/wiki/Cephalosporin
18. Text book of Essentials of Medical Pharmacology-KD TRIPATHI, 7th Edition, Page no.729-730.
19. Prakash Goudanavar, Lovely Panavila, Nijimol Ninan and Pratima KC. A Prospective Study on Drug Use Evaluation Of Third Generation Cephalosporins In A Tertiary Care Teaching Hospital. *International Journal of Chemistry, Pharmacy & Technology*, 2(3), 2017, 119-126.
20. Suhas Reddy C, Hamid Reza Davoudi, Binai K Shankar, Ahamada Safna Mariyam. Drug Utilization Evaluation Of Cephalosporins In The General Medicine And General Surgery Departments In Tertiary Care Teaching Hospital. *American Journal of Pharmacy and Health Research,* 2015, 3(6).
21. Bandari Kiran, Md.Abuzar Ghufran, Sunil Kumar TS, Shravan Kumar D. The Drug Utilization of Cephalosporins in a Tertiary Care Hospital. *World journal of pharmacy and pharmaceutical sciences*. 5(1), 2017, 1201-1216.
22. Saugat Dahal, Sushobhan Bhandari, Bhishma Ghimire, Mahesh NM, Krishnamurthy MS, Afzal Khan A. Drug Utilization Evaluation of Third Generation Cephalosporins In A Tertiary Care Hospital. *Journal of biomedical and pharmaceutical research*, 6(3), 2017, 141-146.
23. Jyothi K, Jagadish Babu D. Drug Utilization Evaluation of Cephalosporins In General Medicine Units Of Rural Tertiary Care Hospital. *International Journal of Current Pharmaceutical Research*, 4(2), 2012.
24. Sathyanarayanan G, Geetha P, Shanmugasundaram P. A Prospective Observational Study On Assessment And Evaluation Of Cephalosporin In General Medicine Department At Tertiary Care Hospital. Research journal of pharmacy and technology. 9(8), 2016.
25. Firehiwot Amare Abebe, Derbew Fikadu Berhe, Abera Hadgu Berhe, Hailemichael Zeru Hishe and Melaku Asfawuwessen Akaleweld. Drug Use Evaluation of Ceftriaxone: The Case of Ayder Referral Hospital, Mekelle, Ethiopia. *International Journal of Pharmaceutical Sciences And Research*, 3(7), 2012.
26. Rekha Bisht, Bhattacharya S, Katiyar A. Utilization of Third Generation Cephalosporins In Multispeciality Teaching Hospital, Dehradun. *Indian Journal of Pharmacy Practice***,** 2(3), 2009.

27. Prakash Goudanavar, Lovely Panavila, Nijimol Ninan, Pratima KC. Drug Use Evaluation of Third Generation Cephalosporins In A Tertiary Care Teaching Hospital. International Journal of Therapeutic Applications. 32, 2016.
28. Nalamaru Surendra Reddy, Gudise Kejiya, P.Lakshmi, B.Manohar and Diviti Ranganayakulu1. Evaluation of Cephalosporins Use Among Pediatric In-Patients At Tertiary Care Teaching Hospital. *International Journal of Institutional Pharmacy and Life Sciences,* 5(2), 2015.
29. Arul B, Rangabashyam SR, Kothai R, Bobby Mathew Thomas, Elavarasi M, Glory M. Abraham. Drug Utilisation Review of Cephalosporins In A Tertiary Care Hospital – A Retrospective Study. *World Journal of Pharmacy and Pharmaceutical Sciences*, 6(9), 1737-1743.