



A study on drug use of ceftriaxone in a private hospital of Nepal

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Received: 17-11-2014 / Revised: 17-12-2014 / Accepted: 25-12-2014

ABSTRACT

The purpose of this study was to evaluate the use of ceftriaxone in a Private Hospital. Cross sectional descriptive study was used to assess rational use of ceftriaxone. The study was conducted by reviewing medication records of 180 patients who received ceftriaxone during hospitalization from June 2014 to August 2014. Descriptive research design was used for the research. The study involved the collection of data at time of drug being used during the course of treatment of patient during hospitalization using structured data collection form by reviewing the in-patient prescription and medication record and then evaluated for the various purposes. Among 180 patients male (55.6%) were more than female (44.4%). Maximum number of patients fell under age range 21-30 years (20.0%). The duration of therapy was found to be high in the range 2-7 days (76.11%). Most of the patients were prescribed with dose 1gm (69.4%) and most prescribed frequency was BD (76.1%). The mean daily prescribed dose was found 2.30 gm/day. Ceftriaxone was found to be highly utilized in general ward (59.4%). Among total patients, 27.8% were co-morbid while 72.8% patients were non co-morbid. 97.8% of patients were with other co-administered drug along with ceftriaxone and 2.2% did not have any other co-administered drug along with ceftriaxone. Gastrointestinal tract drug were the mostly co-administered therapeutic class of drugs used with ceftriaxone. Ceftriaxone was found to be highly used as preoperative prophylaxis followed by fever and bone & soft tissue infections.

Key words: Drug use evaluation, Ceftriaxone, Hospital, Rational use



INTRODUCTION

Infectious diseases are the most common causes of morbidity and mortality in developing countries. Antibiotics are used to control of infectious diseases [1]. Antibiotics represent approximately 30% of acute care hospitals drug expenditure and are prescribed for 20-50% of in-patients. Use of antibiotics has contributed to the dramatic fall in morbidity and mortality from communicable and infectious disease over the last 50 years globally. However, the control of infectious disease is seriously threatened by the steady increase in the number of microorganisms that are resistant to antimicrobial agents. Emergence of antimicrobial resistance is a result of the use, over use and misuse of antibiotic [1, 2]. Bacterial resistance to antimicrobial agents due to the increasing use of antimicrobial agents has become a worldwide concern. The increased prevalence of known resistant organisms and the emergence of newly resistant organisms have resulted in delays in effective therapy and the length of hospitalization for the patients as well as have led to increased

costs for patients. When considering this, the logical first step is to evaluate the suitability of antibiotic usage [1, 3]. Serious problems such as microorganism resistance, several side effects and even may lead to death caused by inappropriate use of antibiotics [4]. Various factors like irrational drug use, poly-pharmacy, incorrect drug choices, incorrect doses, drug interactions have contributed to increased morbidity, mortality and healthcare expenses or use of the drugs devoid of proven efficacy [5]. For evaluation of the appropriate usage of antimicrobial agents antibiotic use evaluation is a basic measure. DUE is implemented to evaluate antibiotic usage because assessment of antimicrobial use can be performed by evaluating their use [1]. DUE or MUE under the same terminology used for the evaluation of the drug usage on the patients and it helps the healthcare system to understand, interpret, improve the prescribing patterns, administration and use of medications [5]. Drug use evaluation is a system of ongoing, systematic criteria-based evaluation of drug use that will help to ensure that medicines are used appropriately at the individual patient level [6,

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7 and 8]. The goal of the drug use evaluation is to promote the optimal medication therapy and ensure that the drug therapy meets current standards of care. Drug use evaluation not only provides a means of identifying drug use problem but also provides a means to correct the problem and thereby contributes to rational drug therapy if it is properly developed. A DUE is drug or disease-specific and can be structured so that it will assess the actual process of prescribing, dispensing or administering a drug indications, dose, drug interactions, etc. DUE is the same as drug utilization review (DUR) and terms are used synonymously [7]. Medication use evaluation (MUE) is similar to DUE but emphasizes on improving patient outcomes and individual quality of life; it is, therefore, highly dependent on a multidisciplinary approach involving all professionals dealing with drug therapy. A MUE will assess clinical outcomes [7].

Drug use evaluation is a systematic quality improvement activity. The purpose of drug use evaluation is to improve the quality and cost-effectiveness of drug use and thereby improve patient care. Drug use evaluation may be applied to a drug, therapeutic class, disease state or condition, a drug use process or outcomes [8]. The actual process of medication prescribing, administration or dispensing can be assessed by drug use evaluation. Drug use evaluation includes a comprehensive review of patients, prescription and medication data before, during and after dispensing in order to assure appropriate therapeutic decision making and positive outcomes. Drug use evaluation is simply a performance improvement process that focuses on evaluation and improvement of drug use processes to achieve optimal therapeutic and patient outcomes [9]. DUE studies determine whether drugs are used appropriately, safely, and effectively to improve patient health status [10].

Australian Society of Clinical and Experimental Pharmacologist and Toxicologist (ASCEPT) defines DUE as systemic review of all the aspect of drug use with specific objective of ensuring quality use of medicine use, improving patient care and cost effective drug use [5]. Many studies revealed that antibiotics are very often inappropriately used. The misuse or inappropriate use of antibiotics results in bacterial resistance to antimicrobial agents. The resistance to antibiotics has become a major public health concern worldwide. Resistance to antibiotics is the biggest problem in developing countries like Nepal and spreads among countries and regions causing treatment failure, increasing treatment cost and risk of mortality and morbidity. Many studies reported that millions of moneys

were being wasted when drugs are improperly used at same time keeping the patient to unnecessary risk of morbidity and mortality. Assessment of the antimicrobials can be done better by studying their use so this study applies drug use evaluation method. A number of studies revealed that drug use evaluation studies improve the prescribing practices, quality of life, use of medication, decreases healthcare cost and promotes better utilization of resources in healthcare system. Among all antibiotics cephalosporins are frequently prescribed antibiotics Ceftriaxone is the most commonly used antibiotic among the cephalosporin because it has high antibacterial activity, wide spectrum of activity and low chance for causing toxicity. It is used to treat the wide range of the serious infections. Instead of its wide use in today's scenario ceftriaxone even shows resistance. Emergence of resistance is result of use, over use & misuse. Drug use evaluation of single drug in inpatients setting is not yet been well established in Nepal. The unnecessary, inappropriate and prolonged use may lead to the ceftriaxone resistant bacteria and risk to decline its efficacy. Ceftriaxone is used in high volume in different wards of hospital. So it is necessary to evaluate the suitability of ceftriaxone usage in hospital of Nepal.

METHODS AND METHODOLOGY

Study site and Duration: The study was conducted in a Private Hospital of Nepal for a period of 3 month from June 2014 to August 2014 in different wards of hospital after taking the ethical consideration from the ethical board of institute.

Study Design: It is a cross sectional descriptive study.

Source of data: The medication records of all the patients in different wards of the hospital who receives ceftriaxone during the study period.

Sample size: The sample size is 180. The data collected are sufficient for drug use study of ceftriaxone.

Sampling technique: The sampling technique used was non probability, purposive sampling technique. The researcher approached patients who fit the criteria on daily basis and had visited for any form of treatment during the study period.

Selection of patients:

Inclusion criteria: In-patients in different wards of hospital who are prescribed with ceftriaxone.

Exclusion criteria:

- Out patients treated with ceftriaxone.
- Emergency patients treated with ceftriaxone.
- Patients below 1 year.
- Intensive care unit patients treated with ceftriaxone.

Method and material of data collection: This is a prospective cross sectional descriptive study. The prospective study was conducted in different wards of hospital by preparing structured data collection form. This is prospective study so data will be collected when ceftriaxone is dispensed or used to the patients during hospital stay. Data was collected from patients who fulfill the inclusion criteria. Patient's ceftriaxone containing prescription case sheets of in-patient department was collected and evaluated for appropriateness. Patient's records also examined for the distribution of gender, and age, daily dose, frequency of administration, duration of therapy and most commonly prescribed cases, mostly co-administered drug and presence of co-morbidity. Structured data collection forms are used for the collection of the data.

Materials:

- Data collection forms (Questionnaire)
- Patient medication record.

Study Variables:**Independent variables:**

- Daily prescribed dose
- Frequency of use
- Duration of use
- Age
- Gender
- Co-morbidity
- Co-administer drug
- Indication / Use

Dependent variable: Drug use

Statistical analysis: The data was processed and analyzed by using SPSS version 20 and Microsoft Excel 2007 for the required purposes to evaluate ceftriaxone use. In this study various statistical analyses like mean, frequency, and percentage was done as my study is descriptive study.

Ethical consideration: Approval and permission from the institutional review board of concerned hospital and approval from NMCAL was taken before the study. The identity of the patient and any information that might cause any harm to the patient was not disclosed. All the research activities were carried out under the supervision and guidance of supervisor.

RESULT AND DISCUSSIONS

A total of 180 patient data sheets were enrolled in this study for the desired purpose that is for evaluation of use of ceftriaxone.

Gender distribution of patients: Among 180 patients male patients are more than female patients in this study 100 (55.6%) were male patients while 80 (44.4%) were female patients. In this study population of male patients were more (55.6%) than the population of female patients 80 (44.4%). The finding of the study is similar to a study conducted by *Shanker et al* that showed a male predominance (61.60%) compared to females (38.8%).

The finding of this study was similar to the study conducted by *Abebe et al* that showed among the 296 patients, 158 (53.4%) male and 138 (46.6%) were female. The finding of this study was also similar to the study done *Babu et al.* in which out of 101 patients from medicine ward male patients were higher in number 51 (50.50%) than female patients in number 50 (49.50%).

The finding of this study was also similar to the findings of study done in medical ward of Dessie referral Hospital, Dessie-Ethiopia in which among total 316 patient cards 151(47.8%) were female and 165 (52.2%) were male.

Age distribution of patients: The average age of patient was found to 39.92 year ranging from 3 years to 94 years in my study. Maximum patients included in the study were fall under age range 21-30 years (20.0 %) followed by the range 41-50 years (17.2%), 11-20 years (16.1%) and so on as shown in the table below.

Maximum patients included in this study fell under age range 21-30 years (20.0 %) that indicates most of the patients enrolled in study fall in adult group as shown by my study.

The average age of patients found in this study was more than that found in the study conducted by *Abebe et al* in which the average age of patient was found to 34.3 years (ranging 1 day to 83 years). This might be due to exclusion of patients under age of one year in my study.

The average age of the patient found in my study was more than that found in the study conducted by *GA Ayinalem et al.* in which the average age of the patient was 34.3years (ranging from 18 years to 83 years.). Most of them being in the age range 18-65 years.

Ward distribution of ceftriaxone utilization: In this study three different departments of hospital were included namely general ward, cabin and post-operative ward. Most of ceftriaxone utilization was involved in the general ward of hospital. Out

of 180 prescription 107 (59.4%) found to be highly utilized in general ward remaining were found to utilized in cabin 48 (26.7%) and 25 (13.9%) in post-operative ward.

The finding of my study was contrast to the study done by *Abebe et al* in which ceftriaxone is highly utilized 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%). The contrast was because of dissimilarities of the study departments but the medical ward (general ward) which obtained second position in ceftriaxone utilization on that study secures first position in my study.

Duration of ceftriaxone use: The duration of therapy was found to be high in the range of 2-7 days (76.11%) followed by stat (13.33%), 1 day (8.89%) and in the range 8-14 days (1.67%). The mean duration of use was found to be 2.66 days. The duration of ceftriaxone therapy was found to be high in the range of 2-7 days (76.11%) which is the appropriate duration of ceftriaxone use. The finding of my study is similar to the retrospective cross sectional study conducted by *Abebe et al* which was used to assess and evaluate rational use of ceftriaxone in Ayder referral Hospital, Mekelle-Ethiopia which showed duration of ceftriaxone therapy high in the range 2-7 days (51.69%). But second highest duration of ceftriaxone therapy was found to be stat (13.33%) which is different from the same study because in that study second highest duration of ceftriaxone therapy was found in the range 8-14 days (28.04%). The mean duration of ceftriaxone therapy used was found to be 2.66 days in this study which is less than that obtained in Ayder referral Hospital, Mekelle-Ethiopia 7.2 days. This is an important factor as the number of days in which an antibiotic is used correlates with resistance prevalence [11]. The finding of my study was also similar to the study conducted in medical ward of Dessie referral Hospital, Dessie-Ethiopia in which the duration of ceftriaxone therapy was found to be high in the range 7-2 days (51.69%) as in my study.

Frequency of use: The result of this study revealed that the most prescribed frequency for ceftriaxone was BD (76.1%) that is two times daily followed by single use (15.0%), OD (15.0%), and TID (1.1%)

Dose prescribed: In the study most prescribed dose was 1gm. Out of 180 patients included in the study 125 patents (69.4%) were prescribed with 1gm dose. Remaining patients were followed by 2gm (25.0%), 1.5gm (3.3%) and other dose (2.2%).

Co-administered drugs: Out of 180 patients enrolled in the study 4 (2.2%) patients did not have any other drug prescribed or administered with ceftriaxone and 176 (97.8%) patients had two or more other drugs co-administered with ceftriaxone.

Therapeutic class of drugs used with ceftriaxone

in the study: The mostly used therapeutic class of drug with ceftriaxone was gastrointestinal tract drugs (in 136 patients) followed by intravenous fluids (in 116 patients), analgesics, antipyretics and anti-inflammatory drugs (in 113 patients), antimicrobials (in 68 patients) and the details of the therapeutic drugs are given in the table. The mostly used therapeutic class of drug with ceftriaxone was gastrointestinal tract drugs (in 136 patients) followed by intravenous fluids (in 116 patients), analgesics, antipyretics and anti-inflammatory drugs (in 113 patients), antimicrobials (in 68 patients). There are various types of drugs that are co-administered with of ceftriaxone in most of the patients in the study so they are categorized according to the pharmacological classification so as to include individual drug in more effective manner. I classified them into different nine categories namely antimicrobials, analgesics, antipyretics and anti-inflammatory drugs, Gastrointestinal tract drugs, Intravenous fluids, Nervous system drugs, Hormones and related drugs, Cardiovascular and renal drugs, Respiratory system drugs and Others based on drug use pattern in my study and literature reviews I did. Drugs which were included in the antimicrobials include Metronidazole, Azithromycin, Levofloxacin, Gentamycin, Amikacin, Cefpodoxime, Ciprofloxacin, Doxycycline, Ofloxacin, and Acyclovir which were used in my study populations. Among of them mostly used antimicrobial was Metronidazole followed by Azithromycin, Amikacin and Levofloxacin. In some case two antimicrobial were used with ceftriaxone such as Ciprofloxacin and Azithromycin, Amikacin and Metronidazole, Gentamycin and Metronidazole. Antimicrobials such as cefpodoxime, Doxycycline, Acyclovir, gentamycin, Ofloxacin were used in single cases only respectively. Among analgesics antipyretics and anti-inflammatory drugs Paracetamol, Diclofenac, Keterolac, Nimesulide, Aspirin, Ibuprofen, Aceclofenac, Naprosyn, Piroxicam, codeine phosphate and paracetamol combination were used in my study population.

Gastrointestinal tract drugs used along with ceftriaxone include acid lowering agents, anti-emetics and laxative in my study. The acid lowering agents belonging to various categories including H₂ anti-histaminic example Ranitidine,

Famotidine, Proton pump inhibitors example Pantoprazole, Omeprazole, Esomeprazole, Rabeprazole and Antacids were used in the study population. Anti-emetic agents belonging to various categories like 5-HT₃ antagonist example Ondansetron, Prokinetic drug example Metoclopramide, H₁ anti-histaminic example Promethazine were used. Anti-spasmodic agents like Hyoscine butyl bromide and Drotaverine were used. Among them PPIs were used in most of cases being Pantoprazole in high number because they are used to reduce the side-effects associated with other co-administered drugs like NSAIDs.

Next category of co-administered drugs included intravenous fluids including Normal Saline (NS), Dextrose Normal Saline (DNS), Ringer Lactate (RL), and 5% Dextrose (5D). Being NS in higher number followed by DNS in utilization. In some cases combination of these fluids were used like NS and DNS, DNS and RL, DNS and 5D.

Nervous system category of the drug includes drugs used in both central nervous system and peripheral nervous system drugs. The central nervous system drugs used in my study population includes Anaesthetic agents including both general example Fentanyl, Propofol and local example Xylocaine, Bupivacaine, anaesthetic agents. Other central nervous system drugs includes Opioid analgesic example pethidine, Tamadol, Codeine phosphate, The CNS drugs like Clonazepam, Lorazepam, Phenytoin, Clobazam, Amytryptline were also used in the study. Peripheral nervous system drug include Tizanidine which is a muscle relaxant.

Next category of the drugs includes Hormones and Related drugs including Dexamethasone, Hydrocortisone, Prednisolone, Insulin, Oral hypoglycaemic agents. Cardiovascular and renal drug includes antihypertensive agents, mannitol, Furosemide, Tamsulosin. Respiratory system drug includes Carbocystine, Salbutamol, Bromohexine and Terbutaline, cough Syrups. Other drugs includes various drugs which were used in the study population including transeamic acids, vitamins and multivitamins anticancer drug (methotrixate), Atorvastatin, Minerals, Folic acid, Nasal drops etc.

The mostly used therapeutic class of drug with ceftriaxone was gastrointestinal tract drugs (in 136 patients) taking first position followed by intravenous fluids (in 116 patients), analgesics, antipyretics and anti-inflammatory drugs (in 113 patients), antimicrobials (in 68 patients) in my study. The finding of my study is contrast to the study done by *Abebe et al* in which maintenance

fluids takes the first position among co-administered drugs followed by diclofenac, metronidazole and anti-tubercular drug this was because I classified drug in therapeutic classes rather than individual drug. But in my study metronidazole was the highly used antimicrobial agent co-administered with ceftriaxone. In my study ringer lactate was used only in three cases which also contrast to the result found on study done in Ayder referral Hospital, Mekelle-Ethiopia in which Ceftriaxone was co-administered with ringer lactate in 98 cases (33.1%). This increases the probability of IV incompatibility of ceftriaxone with calcium containing drugs, which included ringer lactate. This indicated the presence of medication related problem namely IV incompatibility with respect to ceftriaxone use. But in case of my study there was no indication of such medication related problem which was associated with intravenous fluids.

The finding of my study was also similar to the study conducted by *Babu et al.* in which metronidazole was the mostly prescribed antimicrobial agent with cephalosporins. But my study was contrast to that study in terms of therapeutic class of co-administered drugs in which antimicrobials was the highly prescribed therapeutic class followed by gastro intestinal tract drugs and analgesic and antipyretic but in my study gastrointestinal tract drugs was the highly prescribed therapeutic class followed by intravenous fluids and analgesic, antipyretic and anti-inflammatory drugs.

The finding of my study was contrast to the study conducted in medical ward of Dessie referral Hospital, Dessie-Ethiopia in which Maintenance fluids were the most commonly co-administered medications with a frequency of 62.16%. But in my study IV fluids were in second position of co-administered drugs.

Single intramuscular dose of ceftriaxone 0.25g combined with oral doxycycline achieved clinical success in 95% of women with mild to moderate pelvic inflammatory disease compared with 97% treated with oral clindamycin plus ciprofloxacin in a randomized trial.

According to data from clinical trials, gastrointestinal events are the most common adverse events associated with ceftriaxone. Among gastrointestinal adverse effects diarrhea is the most commonly reported adverse effect so metronidazole was found to utilize mostly with ceftriaxone among antimicrobial agents in this study. Oral metronidazole is the first choice for the treatment of *Clostridium difficile* colitis, which is

responsible for over 80% of antibiotic-associated cases of diarrhea, especially the most severe.

Co-morbidity condition of patients: Out of total 180 patients enrolled in the study 131 (72.8%) patients did not have any co-morbid condition whereas 49 (27.2%) had co-morbid condition. The most common co-morbidity were Diabetes mellitus, hypertension. This finding of my study was similar to the one by Babu et al. in which number of co-morbid condition patients less than non-co-morbid patients, out of 101 patients enrolled in that study 75.25% patients did not have any co-morbid conditions but remaining 24.75% patients had one and two co morbid conditions but the frequency were different due difference in the study population.

Daily prescribed dose: The daily prescribed dose was found to be 2gm per day (63.3%) in maximum patients in the study which was followed by 4gm per day (16.7%), 1gm per day (15.5%) and 1.5gm per day. The mean daily prescribed dose of ceftriaxone was found 2.30 gm per day

The daily prescribed dose was found to be 2gm per day which is the correct daily prescribed dose for ceftriaxone as given by WHO. The mean daily prescribed dose of ceftriaxone was found 2.30 gm per day. The finding of my study was similar to the study conducted in Ayder referral Hospital, Mekelle-Ethiopia in which most of the patients were dosed as 2gm per day. The finding of my study was similar to the finding of study conducted by GA Ayinalem et al. in which most of the patient were prescribed with 2gm per day dose.

Use of ceftriaxone: In my study ceftriaxone was mostly used for preoperative prophylaxis 32 (17.78%), followed by fever 28 (15.56%), bone and soft tissue infection 20 (10.58%) and so on as shown in table below.

The result revealed in this study was similar to the study conducted by Aebe et al. in Ayder Referral Hospital, Mekelle Ethiopia in which Ceftriaxone

was mainly used as preoperative prophylaxis (38.8%). The result of this study also showed similar findings as in found in Assessment of reasonable use of Ceftriaxone in internal and surgical wards in an educational hospital in Tehran. The finding of this study was in contrast to the result revealed from the study, Drug Use Evaluation of Ceftriaxone in Medical Ward of Dessie Referral Hospital, North East Ethiopia in which Ceftriaxone was mainly used as pneumonia treatment (38.8%). The result revealed from this study showed appropriate use of Ceftriaxone because when Ceftriaxone administered prior to surgical procedures for which it is indicated, a single 1 g dose of ceftriaxone provides protection from most infections due to susceptible organisms throughout the course of the procedure. The preoperative administration of a single 1 g dose of ceftriaxone may reduce the incidence of postoperative infections in patients undergoing surgical procedures.

CONCLUSION

The result of the study showed that the duration of ceftriaxone use within range of 2-7 days with mean duration of use 2.66 days, mostly prescribed dose 1gm and daily prescribed dose being 2gm per day, mostly prescribed frequency twice daily, mostly prescribed for pre-operative prophylaxis. So the drug use study of ceftriaxone with respect to the duration of use, frequency of administration, daily prescribed dose and use or indications manipulates correct prescription practice in Alka Hospital from my study. But from this study I found that there is extensive use of ceftriaxone empirically without susceptibility testing of the patients.

Acknowledgements

The authors are thankful to Alka Hospital Pvt. Ltd. for providing the opportunity for carrying out this study and National Model College for Advance Learning for providing necessary facilities to carry out this work.

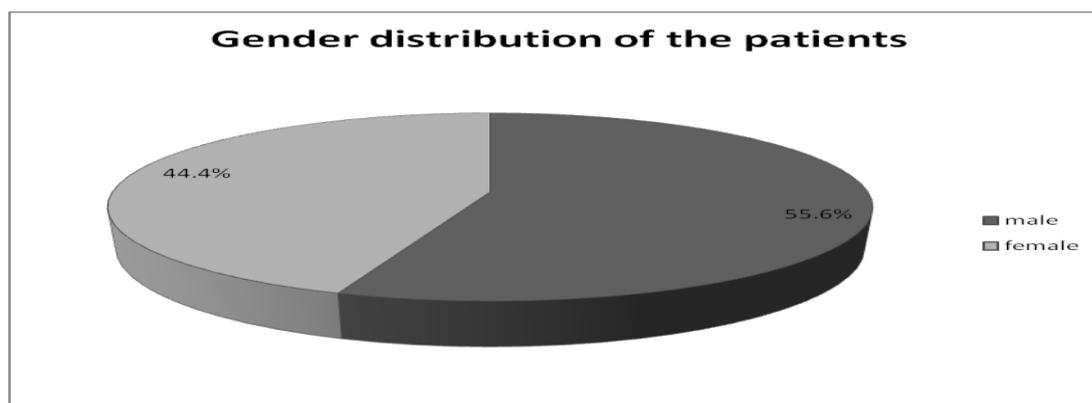


Figure 1: Gender distribution of patients

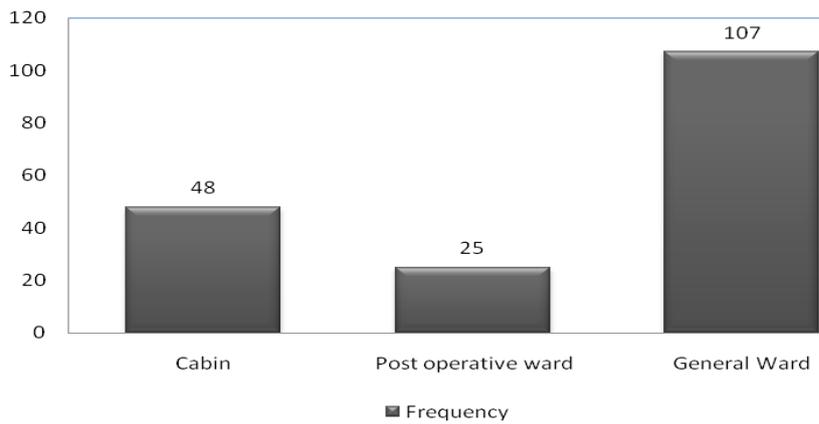


Figure 2: Distribution of Ceftriaxone utilization.

Table 1: Age distribution of patients included in study

Age	Frequency	Percent
1-10	5	2.8
11-20	29	16.1
21-30	36	20.0
31-40	28	15.6
41-50	31	17.2
51-60	14	7.8
61-70	20	11.1
71-80	16	8.9
81>	1	0.6
Total	180	100.0

Table 2: Duration of ceftriaxone use

Duration	Frequency	Percentage
Stat	24	13.33
1day	16	8.89
2-7 days	137	76.11
8-14 days	3	1.67

Table 3: Frequency of drug use prescribed

Drug prescribed	Frequency	Percentage
Single	27	15.0
OD	14	7.8
BD	137	76.1
TID	2	1.1
Total	180	100

Table 4: Dose prescribed for the patients

Dose	Frequency	Percentage
1gm	125	69.4
1.5gm	6	3.3
2gm	45	25.0
Others	4	2.2
Total	180	100

Table 5: Frequency of co-administered drugs

Co-administered drugs	Frequency	Percentage
Yes	176	97.8
No	4	2.2
Total	180	100

Table 6: Therapeutic class of drugs co-administered with ceftriaxone

Therapeutic class of drugs	Frequency
Antimicrobial drugs	68
Analgesic, antipyretic and anti-inflammatory drugs	113
Gastrointestinal tract drugs	136
Intravenous fluids	116
Nervous system drugs	58
Hormones and related drugs	14
Cardiovascular system and renal drugs	20
Respiratory system drugs	10
Other drugs	37

Table 7: Co-morbidity condition of patients

Co-morbidity	Frequency	Percentage
Yes	49	27.2
No	131	72.8
Total	180	100

Table 8: Daily prescribed dose for the patients

Daily prescribed dose	Frequency	Percentage
1gm	27	15.5
1.5gm	3	1.7
2gm	114	63.3
3gm	6	3.3
4gm	30	16.7
Total	180	100

Table 9: Use of ceftriaxone

Indication	Frequency	percentage
Preoperative prophylaxis	32	17.78
Fever	28	15.56
Bone and soft tissue infection	20	10.58
UTI	18	10
GI problem	17	9.44
CNS problem	15	8.33
Respiratory tract problem	14	7.78
Urolithiasis	13	7.22
Urogenital	12	6.67
others	11	6.11

REFERENCES

1. Ayinalem, G. A., Gelaw, B. K., Belay, A. Z., & Linjesa, J. L. (2013). Drug use evaluation of ceftriaxone in medical ward of Dessie Referral Hospital, North East Ethiopia. *International Journal of Basic & Clinical Pharmacology*, 2(6), 711-717.
2. Abebe F.A., Berhe D.F., Berhe A.H., Hishe H.Z. and Akaleweld M.A., Drug use evaluation of Ceftriaxone: The Case of Ayder Referral Hospital, Mekelle, Ethiopia. *Int J Pharm Sci Res*, 2012; Vol. 3(7): 2191-2195.
3. Lee, H., Jung, D., Yeom, J. S., Son, J. S., Jung, S. I., Kim, Y. S., ... & Woo, G. J. (2009). Evaluation of ceftriaxone utilization at multicenter study. *The Korean journal of internal medicine*, 24(4), 374-380.
4. Shohrati, M., Hosseini, S., Rahimian, S., & Parandeh, A. P. (2010). Assessment of reasonable use of ceftriaxone in internal and surgical wards. *Kowsar medical journal*, 15(3), 171-176.
5. Shekar, H. S. (2005). Drug use evaluation of cephalosporin's in medicine departments at Victoria hospital Bangalore.
6. American society of health system pharmacists, ASHP. Guideline on medication use evaluation. *American Journal of Health system pharmacist* 1996; 53:1953-5.
7. WHO. Drug and therapeutic committee. A practical guide to drug use evaluation; Drug use evaluation (Drug utilization review), 2003; 155.
8. SHPA Standard of practice for drug use evaluation in Australian Hospital, *J Pharm pract Res* 2004; 34(3):220-3.
9. The Academy of Managed Care Pharmacy's, concepts in managed care pharmacy. Drug use evaluation. Alexandria, 2008.
10. Palumbo FB, Ober J., Drug use evaluation. In: Principles and practices of managed care pharmacy. Alexandria (VA): Academy of Managed Care Pharmacy; 1995. p. 51-60.
11. Jan E. Antibiotic utilization: Is there an effect on antimicrobial resistance? *Chest*, 2001; 119; 4285-4305