

Ceftriaxone Utilization Pattern in Inpatient Department of Internal Medicine of a Tertiary Care Hospital

Yasmin S¹, Ahmed QSU², Rahman MM³, Ela FA⁴

Abstract

Background: Antibiotic resistance becomes a global threat due to the rampant misuse and over use of antibiotics. Among them Ceftriaxone is the most popular drug due its broad spectrum and low rates of toxicity and there is a prominent relationship between the use of antimicrobial in hospital and its resistance. Therefore, close monitoring of ceftriaxone prescribing pattern is very important to combat this resistance.

Objective: This study was conducted to identify the extent of Ceftriaxone use in internal medicine department of a tertiary care hospital.

Methods: A descriptive cross-sectional study was carried out through record review among 372 purposively selected patients in internal medicine department of Dhaka Medical College from July 2018 to June 2019. All data were evaluated by WHO antibiotic guideline and BDNF and analyzed by SPSS.

Result: The proportion of Ceftriaxone use was 47.15%, RTI 10.22% was the most common indication for Ceftriaxone, 53.23% Ceftriaxone prescribed empirically, Metronidazole 22.67% was the most common co-administered drug, 22.58% prescription was rational.

Conclusion: On the basis of the study findings it can be concluded that Ceftriaxone therapy is mostly empirical based. Respiratory tract infection is the common medical condition for ceftriaxone use. Metronidazole is the most commonly prescribed co-administered antibiotic. Irrational use of ceftriaxone therapy is high.

Key words: Ceftriaxone, Utilization pattern.

Introduction

Ceftriaxone is a third generation Cephalosporins, having bactericidal activity which act by inhibiting bacterial cell wall synthesis.¹ Among beta-lactam antibiotics ceftriaxone is a broad spectrum one with low rates of toxicity and ease of administration.² In developing countries infections are the most common cause of morbidity and mortality. Though antibiotics have reduced this morbidity and mortality, antibiotic resistance become a world health threat due to the rampant misuse and over use of these antibiotics.³

Over the past several decades, penicillin-resistant pneumococci, methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci, extended-spectrum beta-lactamase-producing *Escherichia coli*, *Klebsiella pneumoniae*, and imipenem-resistant gram-negative bacilli, which are old and newly resistant organism have evolved in delays in effective therapy and increased the length of hospitalization, and raised the costs for patients.⁴ Moreover, antimicrobial drug resistance has been extended to add between \$100 million and \$30 billion annually to health-care costs.⁵ Nevertheless, ceftriaxone has frequently been prescribed inappropriately and excessively in clinical settings especially where there is less opportunity to make a clear diagnosis.^{6,7} Moreover, ceftriaxone can be used as prophylaxis in some cases.⁸ According to a review on AMR among Eastern African countries 46-96% Gram negative and 50-100% Gram positive bacteria were resistant to ceftriaxone which is already very high.⁹ The present sceneries suggest that there is a prominent relation between use of antimicrobial in hospital and its resistance.¹⁰ Therefore, close monitoring of ceftriaxone prescribing pattern is very important to sustain its susceptibility and on an account of this, the present study is conducted to identify the extent of ceftriaxone use in internal medicine department of a tertiary care hospital.

1. Dr. Suraiya Yasmin
Assistant Professor and Head, Department of Pharmacology
Khulna City Medical College, Khulna.
2. Lt Col Dr. Quazi Sabran Uddin Ahmed
Classified surgical specialist, BGB Hospital, Dhaka.
3. Dr. Md. Moklesur Rahman
Residential Medical Officer, 250 Beded General Hospital
Meherpur
4. Dr. Farhana Ahmed Ela
M.Phil. (Pharmacology), Dhaka Medical College, Dhaka.

Correspondence to:

Dr. Suraiya Yasmin
Assistant Professor and Head, Department of Pharmacology
Khulna City Medical College
E-mail: dr.suraiya29@gmail.com

Materials and Methods

This was a descriptive, cross sectional study which was carried out in inpatient department of internal medicine of Dhaka Medical College Hospital through record review. Total study period was one year extending from July 2018 to June 2019. Study population was all patients admitted in internal medicine department of Dhaka Medical College Hospital selected by purposive sampling technique. Among 789 antibiotic containing prescriptions during the study period 372 patients had the record of prescriptions taking ceftriaxone were considered under study. After taking written consents, the prescriptions on file were seen randomly and sorted whether prescription contained ceftriaxone or not. If the prescription had ceftriaxone then it was recorded in data collection form as sample and if the prescription had antibiotic other than ceftriaxone then it was recorded as an entry only to be utilized to calculate the proportion of ceftriaxone prescribing. Patients who did not give consent were excluded from the study. Data were collected from the record using a checklist and analyzed by SPSS.

Results

Table 1: Distribution of patients by gender (n= 372)

Gender	Number of patients	Percentage
Male	232	62.37
Female	140	37.63
Total	372	100

Table 1 shows that among 372 patients 232 (62.37%) were male and 140 (37.63%) were female.

Table 2: Distribution of the patients by age (n= 372)

Age in years	Number of patients	Percentage
16-65	268	72.04
>65	104	27.96
Total	372	100

Table 2 shows, maximum 268 (72.04%) patients were in 16-65 years old and 104 (27.96%) patients were >65 years of age.

Table 3: Distribution of patients by type of Ceftriaxone therapy (n=372)

Type of therapy	Number of patients	Percentage
Empirical	198	53.23
Prophylactic	165	44.35
Definitive	9	2.42
Total	372	100

Table 3 shows maximum 198 (53.23%) patients were treated empirically, 165 (44.35%) were prophylactically and 9 (2.42%) were definitely / specifically.

Table 4: Distribution of patients by duration of ceftriaxone use (n=372)

Duration in days	Number of patients	Percentage
< 3	8	2.15
3-7	324	87.1
8-14	38	10.21
>14	2	0.54
Total	372	100

Table 4 shows, maximum 324 (87.1%) patients were used ceftriaxone for 3-7 days.

Table 5: Distribution of patients by nomenclature of prescribed Ceftriaxone (n=372)

Nomenclature	Number of patients	Percentage
Generic name	281	75.54
Trade name	91	24.46
Total	372	100

Table 5 shows that 281(75.54%) prescriptions were prescribed in generic name and 24.46% were in trade name.

Table 6: Distribution of patients by most common diseases for which ceftriaxone was prescribed (n=372)

Diseases	Number of patients	Percentage
RTI	38	10.22
UTI	31	8.33
CKD	27	7.26
Fever under evaluation	24	6.45
COPD	23	6.18
Stroke	22	5.91
Acute abdomen under evaluation	22	5.91
CLD	22	5.91
Acute confusional state	21	5.65
Septicemia	19	5.11
PUD	18	4.84
Acute gastroenteritis	16	4.30
Leukemia	16	4.30
Bronchial asthma	15	4.03
DKA	15	4.03
Meningitis	12	3.23
Hepatic encephalopathy	12	3.23
Enteric fever	10	2.69
Anaemia under evaluation	9	2.42
Total	372	100

Table 6 shows that RTI 38(10.22%) was the most frequent disease where ceftriaxone used then UTI 8.33% and CKD 7.26%.

Table 7: Distribution of patients by co-administered antibiotics with ceftriaxone (n=172)

Antibiotics	Number of patients	Percentage
Metronidazole	39	22.67
Amoxiclav	36	20.93
Rifaximin	13	7.56
Clarithromycin	11	6.40
Flucloxacilin	9	5.23
Meropenem	9	5.23
Amikacin	9	5.23
Ciprofloxacin	7	4.07
lindamycin	7	4.07
Vancomycin	6	3.49
Gentamycin	6	3.49
Cefuroxime	5	2.91
Ceftazidim	3	1.74
Azithromycin	3	1.74
Cefixime	2	1.16
Doxycycline	2	1.16
Levofloxacin	2	1.16
Nitrofurantoin	1	0.58
Moxifloxacin	1	0.58
Erythromycin	1	0.58
Total	172	100

Table 7 shows that, most frequently co-administered antibiotics with ceftriaxone were Metronidazole 39 (22.67%) then Amoxiclav 36 (20.93%) and Rifaximin 13 (7.56%).

Table 8: Distribution of patients by evaluation status of therapy (n= 372)

Status of therapy	Number of patients	Percentage
Irrational	288	77.42
Rational	84	22.58
Total	372	100

Table 8 shows that in 288 (77.42%) patient's therapy was irrational and in 84 (22.58%) therapy was rational.

Discussion

In this study demographic profile showed that most patients taking ceftriaxone were male (62.37%) than

female (37.63%) which may indicate that male were more concern about their health care than female. Similar findings were found to the study conducted in Ethiopia, where (53.8%) male and (46.2%) female.¹¹

The predominant age group of this study was 16-65 years (72.04%) similar to the study Addis Ababa, Ethiopia where 14-65 years age group was predominant.¹² The reason of this finding may be the patients of this age range are more likely to be sick and to have more serious illness. In present study, it was found that more than 47% of admitted patients were treated with ceftriaxone which was around similar to the study done in Ethiopia (58%).¹¹ In this study, the focus was mainly on Ceftriaxone. In this study, 75.54% Ceftriaxone are prescribed in generic name which was below the WHO standard value of 100%. The most common disease in the current study for which Ceftriaxone was prescribed predominantly was respiratory tract infection (RTI) (10.22%) followed by urinary tract infection (UTI), chronic kidney disease (CKD) occupied 8.33%, 7.26% respectively. Similar study was found by Suhas Reddy *et al.*, 2015¹³ presented respiratory tract infection as the most common disease followed by urinary tract infection. The common type of ceftriaxone therapy in this study was empirical (53.23%) and only (2.42%) were based on culture and sensitivity, which were around similar to Ayele AA *et al.*, 2017.¹⁴ The probable reasons of this high percentage of empiric therapy may be most of the indoor patients were severely ill, there were too much patient load than hospital capacity, lack of 24hours availability of culture and sensitivity opportunity in the hospital. In this current study Ceftriaxone was administered mostly for 3-7 days (87.1%). On the other hand, a study conducted by Sileshi *et al.* 2016¹¹ showed that most of ceftriaxone were administered for 8-14 days. In this study we found that Metronidazole (22.67%) was the most commonly prescribed co-administered antimicrobial along with Ceftriaxone and the second most common drug was Amoxiclav (20.93%). Similar study was found in Ethiopia where Metronidazole was most commonly co-administered antimicrobial.¹¹ In this study (77.42%) prescriptions were irrational which was similar to study done Gondar, Ethiopia 2017¹⁴ where inappropriateness was very high.

Appropriate prescribing habits should be encouraged among prescribers, which can be acquired by conducting awareness programs about antimicrobials resistance and judgment selection of empirical antibiotic regimen. Again, time to time drug utilization monitoring should be committed in hospitals and prescribers to increase the success rate of awareness program.

Conclusion

On the basis of the study findings it can be concluded that Ceftriaxone therapy is mostly empirical based. Respiratory tract infection is the common medical condition for ceftriaxone use. Metronidazole is the most commonly prescribed co-administered antibiotic. Irrational use of ceftriaxone therapy is high.

References

1. KD Tripathi. *Essentials of medical pharmacology*. 6th ed, New delhi: Jaypee Brothers Medical publishers; 2009, pp. 667, 703-7.
2. William, F. and Janis, E. The cephalosporins. *Mayo Clinic Proceedings*, 1996, 74: pp. 187-195.
3. American society of health system pharmacists, ASHP. *Guideline on medication use evaluation*, Am J Health system pharma. 1996, 53:pp.1953-5.
4. Cosgrove SE, Carmeli Y. The impact of antimicrobial resistance on health and economic outcomes. *Clin Infect Dis* 2003,36: pp.1433-1437.
5. Phelps CE. Bug/drug resistance: sometimes less is more. *Med Care* 1989,27: pp.194-203.
6. Veličković-Radovanović R, Stefanović N, Damjanović I, Petrović J, Mitić R, Lilić R, et al. Monitoring of the Cephalosporins Consumption in the Tertiary Care Hospital. *J Clin Pharm Ther.* 2015, pp.31-36. <https://doi.org/10.5633/amm.2015.0205>.
7. Thriemer K, Katuala Y, Batoko B, Alworonga J-P, Devlieger H, Van Geet C, et al. Antibiotic Prescribing in DR Congo: A Knowledge, Attitude and Practice Survey among Medical Doctors and Students. Meng X, editor. *PLoS One*. Public Library of Science. 2013, 8: e55495. <https://doi.org/10.1371/journal.pone.0055495> PMID: 23441152.
8. Nyongole O, Akoko L, Mwangi A, Mchembe M, Kamala B, Mbembati N. Antibiotic use in urological surgeries: a six years review at Muhimbili National Hospital, Dar es salaam-Tanzania. *Pan Afr Med J. African Field Epidemiology Network*. 2015, 22:226. <https://doi.org/10.11604/pamj.2015.22.226.6253> PMID: 26952184.
9. Ampaire L, Muhindo A, Orikiriza P, Mwangi-Amumpaire J, Bebell L, Boum Y. A review of antimicrobial resistance in East Africa. *Afr J Lab Med. AOSIS*. 2016, 5:432. <https://doi.org/10.4102/ajlm.v5i1.432> PMID: 28879114.
10. Rogues AM, Placet Thomazeau B, Parneix P, Vincent I, Ploy MC, Marty N, et al, Use of antibiotics in hospitals in south western France, *J Hospital Infect*. 2004, 58: pp.187-92.
11. Sileshi A, Tenna A, Feyissa M, Shibeshi W, Evaluation of Ceftriaxone Utilization in Medical and Emergency Wards of TikurAnbessa Specialized Hospital: a Prospective Cross sectional Study. *BMC Pharmacology and Toxicology*. 2016, 17:7, DOI 10.1186/s40360-016-0057-x.
12. Shimels T, Bilal A, Mulugeta A, Evaluation of Ceftriaxone Utilization in Internal Medicine Wards of General Hospitals in Addis Ababa, Ethiopia: a Comparative Retrospective Study. *Journal of Pharmaceutical Policy and Practice*. (2015) 8:26, DOI 10.1186/s40545-015-0047-1.
13. Reddy CS, Sankar BK, Ambujakshi HR, Anila KN, Majumder P, Mohammed N et al. A Study on Prescription Pattern of Ceftriaxone in General Medicine Department of a South Indian Teaching Hospital. *Indian Journal of Research in Pharmacy and Biotechnology*. 2015, 3:2 pp 130-133.
14. Ayele AA, Gebresillassie BM, Erku DA, Gebreyohannes EA, Demssie DG, Mersha AG, et al. Prospective evaluation of Ceftriaxone Use in Medical and Emergency wards of Gondar University Referral Hospital, Ethiopia. *Pharmacol Res Pe*.