Assessment of ceftriaxone use in Eastern Ethiopian Referral Hospital: A retrospective study.

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Abstract

Introduction: Drug use evaluation (DUE) is a system of ongoing, systematic criteria based evaluation of drug use that will help ensure that medicines are used appropriately at the individual patient level. Ceftriaxone was the top and first frequently prescribing antibiotics in Dilchora Hospital. Therefore, this study was designed to evaluate the use of ceftriaxone by using performance improvement method that focuses on evaluation and improvement of drug use processes.

Methodology: A cross sectional study design was used. Data collection format were developed according to WHO recommendation and validated to our context. The data was processed and analyzed using EX-Cell sheet as per WHO criteria for drug use evaluation as per standard treatment guideline of Ethiopia.

Result: Out of the 174 patients on ceftriaxone, 43 (24.71%) were diagnosed CAP and 41 (23.56%) patients were used without indication. Majority of patients 71 (47.33%) were treated with ceftriaxone for 3-7 days followed by 49 (32.67%) for 8-14 days. ceftriaxone was found to be appropriate for the justification of use in 34 (19.56%) of patients.

Conclusion: In Dilchora Hospital prescribers were not sticking to Ethiopian standard treatment guide line (STG). Majority of cases of indication for ceftriaxone was inappropriate and seen with duration of therapy on average 3-7 days. Therefore, we recommend DCH should adhere to national treatment guideline. In addition, DCH should promote the involvement of multidisciplinary team particularly the clinical pharmacists in all wards in monitoring of use of ceftriaxone and other antibiotics use.

Rationale of the Study

Drug use evaluation (DUE) is a system of ongoing, systematic criteria based evaluation of drug use that will help ensure that medicines are used appropriately at the individual patient level. DUE may be applied to a drug, therapeutic class, disease state or condition, a drug use process or outcomes [1,2]. DUE can assess the actual process of medication prescribing, administration, or dispensing. It involves a comprehensive review of patients' prescription and medication data before, during and after dispensing in order to assure appropriate therapeutic decision-making and positive outcome [3,4]. Cephalosporins are the most widely used antibiotics for treating common infections [5]. Ceftriaxone is the most commonly prescribed drug due to its high anti-bacterial potency, wide spectrum of activity and low potential for toxicity. Despite its wide spectrum use, there are trends showing the misuse of ceftriaxone [6,7].

Studies conducted to assess appropriateness of ceftriaxone use in America [1], Port of Spain [7] Korea [6], black lion hospital, Ethiopia [8], Addis Ababa police hospital, Ethiopia showed 82%, 62%, 65%, 71%, 63% [9] of inappropriate use respectively. The appropriate use of ceftriaxone in Ayder Referral Hospital study was (35.8%) was close to the result obtained in Port of Spain [10]. In addition, a study performed by reviewing prescription from Dilchora OPD pharmacy at the end of 2009 E.C, to assess medicine use pattern in outpatient setting found that, 71.50% of the total prescription had antibiotics which is far from WHO recommendation (20-30%) [5].

To identify the specific antibiotic, we have done ABC-VEN analysis, and found that, ceftriaxone was the first among the top ten drugs; it utilized 7.8% of the total budget of pharmaceuticals. These findings indicating that ceftriaxone was the top and first frequently prescribing antibiotics in Dilchora Hospital. Therefore, this study was designed to evaluate the use

of ceftriaxone by using performance improvement method that focuses on evaluation and improvement of drug use processes to achieve optimal patient outcomes in overall health care system at Eastern Ethiopian Hospital (Dilchora Hospital).

Materials and Methods

Study design, settings and participants

A retrospective cross sectional study design was used to evaluate the use and appropriateness of ceftriaxone in Dilchora Hospital, Dire Dawa Ethiopia from December 2017-January 2018. The Hospital provides comprehensive curative, preventive and rehabilitative service for around 1,000,000 people living in Dire Dawa and its surrounding community. Data extraction tool was developed using WHO tools.

Sampling procedure

A total of 207 hospitalized patients received ceftriaxone between August 2016-July 2017, and 170 patient's files were complete and available. The rest 37 patient's files were lost and incomplete. They used systematic random sampling method. The data was extracted from patients' medical records during hospitalization in Dilchora Hospital.

Data collection procedures

Data collection format were developed according to WHO recommendation and validated to our context. The tool was tested by taking ten patient medical files and the pre-tested files were excluded from the study. Each case from the patient medication records were evaluated against the STG of Ethiopia for indication, dosage, frequency and duration of ceftriaxone therapy. Supervised by the principal investigators, five diploma nurses collected the data. We gave a half day training for the data collectors. To ensure the quality of data, the principal investigator checked the questionnaire for completeness and consistency daily.

Statistical analysis

The data was processed and analyzed using EX-Cell sheet as per WHO criteria for drug use evaluation as per standard treatment guideline of Ethiopia. Four WHO criteria namely indication for use, dosage, frequency and duration were used to evaluate ceftriaxone use.

Ethical considerations

The ethical clearance of this thesis was approved by Ethical clearance committee of Dilchora Hospital to the start of data collection. Permission was taken from Dilchora Hospital Administration.

Results

Socio-demographic characteristics

Among the 174 patients, 122(70.11%) were female and 52(29.89%) male. Nearly ninety percent (90%) of patients were in the age group of 15-65 years (Table 1).

Most cases of ceftriaxone utilization in Medical ward 74(42.53%); the remaining were gynecology and obstetrics ward 70(40.25%), surgical ward 12(6.90%), pediatric ward 8(4.60%) and others 10(5.74%) (Figure 1).

Distribution of diagnosis and its indication of ceftriaxone

Majority of patients 43(24.71%) were diagnosed CAP and indicated for ceftriaxone and 41(23.56%) patients were used ceftriaxone without indication (Table 2). Majority of patients 71(47.33%) were treated with ceftriaxone for 3-7 days followed by 49(32.67%) for 8-14 days.

Nearly 95% of patients took 2 g ceftriaxone in daily based doses. From the total patients only two of them were took ceftriaxone despite contraindication (Table 3).

Outcome monitoring and documentation

From the total study participants (174), patient clinical vital signs were not recorded in 135(87.59%) patients on daily bases. Only 29(16.67%) and 15(8.62%) of patient charts had CBC within 48 hours and CBC within 2-7 days respectively. Nearly three fourth (3/4) of patient charts had no documented patient outcome (Table 4).

Co-administered drugs

Among the total drugs co-administered with ceftriaxone, metronidazole was the most commonly used medication (Table 5). Among the 174 cases, 140(80.46%) were found to be
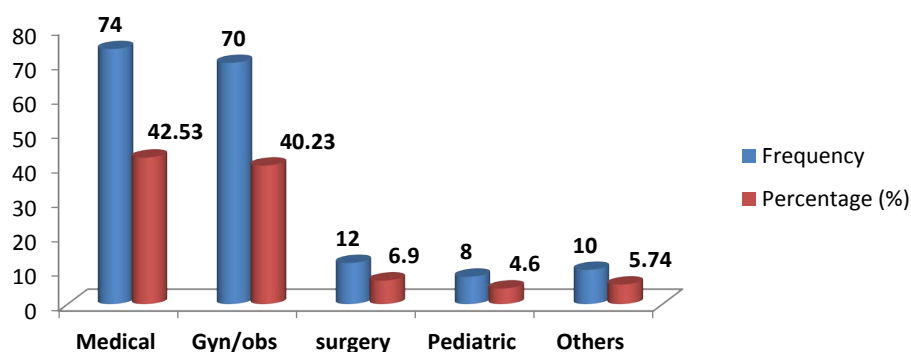
Table 1. *Distribution of patients on ceftriaxone as disaggregated by sex and age inpatient ward at Dilchora Hospital, East Hararge, Ethiopia from August 2016 to July 2017 (n=174 encounters).*

Variables	Frequency	Percentage (%)
Sex		
Male	52	29.89
Female	122	70.11
Age (year)		
<15	15	8.62
15-65	155	89.08
>65	4	2.30
Weight		
Measured	9	5.17
Not measured	165	94.83

Table 2. *Reasons for ceftriaxone use during admission at Dilchora Hospital from August 2016 to July 2017 (n=174).*

Diagnosis at Admission	Frequency	Percentage (%)
Community acquired pneumonia	43	24.71
Caesarian section	33	18.97
CPD/obstructed labor	9	5.17
DVT + CHF + severe anemia + IUFD + APH+ term prom+ pancytopenia + RVI + burn + severe head injury + AFSOL primegravida + (Jaundice + pre-term-1) + (LONS + NEC +EONS-5) (disease without indication)	41	23.56
SBP	12	6.90
UTI	8	4.60
Mastitis + cellulitis + pyomyoscitis	3	1.72
Septic arthritis	3	1.72
p/o BPH/TVP	4	2.30
Upper GI bleeding-prophylaxis	3	1.72
Foot ulcer	3	1.72
AGE	3	1.72
Sepsis	3	1.72
Others	7	5.14

Other=Brain abscess, Necrotizing fasciitis, Inguinal hernia p/o-prophylaxis, Acute appendicitis, Soft tissue injury, Cholilitiasis and brain abscess.

Others=Derma, NICU and Orthopedics.

Figure 1. Distribution of patients on admission inpatient ward at Dilchora Hospital from August 2016 to July 2017 (n=174).

Table 3. *Distribution of indication, duration and dose of ceftriaxone for different cases at Dilchora Hospital from August 2016 to July 2017 (n = 174).*

Category	Frequency	Percentage (%)
Indication of ceftriaxone		
Treatment	95	54.60
Prophylaxis	38	21.84
Not indicated	41	23.56
Duration of therapy		
Stat	2	1.33
1 -2 days	21	14.0
3-7 days	71	47.33
8-14 days	49	32.67
15-21 days	6	4.0
>21 days	1	0.67
Dose of drug		
≤ 1 gm/day	9	5.17
2 gm/day	164	94.25
4 gm/day	1	0.57
Missed doses		
1-2 dose	34	50.0
3-5 dose	20	29.41
6-8 dose	12	17.65
>8 dose	2	2.94
Contra indication		
Yes	2	1.15
No	172	98.85

Table 4. *Distribution of outcome monitoring at Dilchora Hospital from August 2016 to July 2017 (n=174).*

Clinical characteristics	Frequency	Percentage (%)
Clinical monitoring		
V/S at least 3x/day		
Yes	39	22.41
No	135	87.59
Laboratory monitoring		
CBC within 48 hrs.		
Yes	29	16.67
No	145	83.33
CBC within 2-7 days		
Yes	15	8.62
No	159	91.38
Out come		
Documented	47	27.01
Not-document	127	72.99

inappropriate (not according to the Ethiopian STG). While the rest 34(19.54%) were appropriate (Table 6).

Table 5. *Frequently co-administered drugs with ceftriaxone, at Dilchora Hospital from August 2016 to July 2017 (n=174).*

Drugs	Frequency	Percent (%)
Metronidazole	45	13.39
Furosemide	33	9.82
Spironlactone	29	8.63
Azithromycin	21	6.25
Fluconazole	17	5.06
Diclofenac	36	10.71
Tramadol	38	11.31
Propranolol	8	2.38
Feso4	15	4.46
Metoclopramide	14	4.17
Cimetidine	20	5.95
Cotrimoxazole	15	4.46
Anti TB	9	2.68
Other	36	10.74

Table 6. *Distribution of inappropriate use of ceftriaxone based on DUE criteria.*

Clinical parameters	# of inappropriate	Percentage (%)
Indication	41	29.29
Dose	0	0.00
Frequency	29	20.71
Duration	70	50.00

Discussion

In this study, the use of ceftriaxone was found to be appropriate for the justification of use in 34(19.56%) which is much lower than the value obtained in a retrospective study conducted in Black Lion Hospital, Addis Ababa (71.43%) [8], police Hospital, Addis Ababa (73.03%) [9], and Ayder Referral Hospital, Mekelle Ethiopia (35.8%) [10]. This difference might be due to Black Lion Hospital and Police Hospital have adequate man power, well experience staff and well equipped.

According to our study finding, more than 90% of the indicated drugs were taken 2 g/day. Among the total daily dose ordered to be taken by the patients, 68 dosses were missed or not taken by the patient. Most of them (50%) were missed the range of 1-2 dosses. These results showed that there was a poor patient adherence and these types of practice makes poor patient outcome and have a great role in drug resistance.

Concerning to the clinical and laboratory patient monitoring parameter, our study found that; more than 87.59% of patients were not taken their vital sign at least three times per day despite a lot of internship students were available in each wards. The other

laboratory parameter, CBC which is important for diagnosis and response monitoring for utilization for ceftriaxone, was ordered and documented the results only for 16.67% with in the first 48 hours of visit, and only 8.62% patient cases in the next 2-7 days of admission. This indicated that; there was a poor patient care and monitoring system in the hospital.

Conclusion and Recommendations

In Dilchora Hospital prescribers were not sticking to Ethiopian standard treatment guide line (STG). Majority of cases of indication for ceftriaxone was inappropriate and seen with duration of therapy on average 3-7 days. Most of the patient clinical and laboratory results and treatment outcome were not documented. Therefore, we recommend DCH should adhere to national treatment guideline. In addition, DCH should promote the involvement of multidisciplinary team particularly the clinical pharmacists in all wards in monitoring of use of ceftriaxone and other antibiotics use. It is also important to provide audit feedbacks to prescribers and other hospital staff on judicious use of antimicrobial agents and ceftriaxone in particular.

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Authors' Information

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Authors' Contributions

All authors were involved in designing of the study, data collection, data analysis, drafting and critically reviewing the manuscript. All authors read and approved the final manuscript.

Availability of Data and Materials

The dataset supporting the conclusions of this article is included within the article.

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Competing Interests

The authors have declared that no competing interests exist.

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