Evaluation of Ceftriaxone Use for Hospitalized Patients in Ethiopia: The Case of a Referral Hospital

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Citation: Sewagegn N, Ayichew G/M, Miskir A, Degarege A, Mohammed O, et al. (2017) Evaluation of Ceftriaxone Use for Hospitalized Patients in Ethiopia: The Case of a Referral Hospital. Ann Case Rep: ACRT-145. DOI: 10.29011/2574-7754/100045

Received Date: 19 May, 2017; Accepted Date: 20 July, 2017; Published Date: 27 July, 2017

Abstract

Background: Microorganisms resistance has grown due to frequent and misuse of antimicrobial agents both in humans and animals resulting in global public health and economic threats. We evaluated the prescribing practices of ceftriaxone at inpatients, FelegeHiwot Referral Hospital in Ethiopia.

Methods: We retrospectively reviewed the prescribing practices of ceftriaxone in 127 inpatients who received ceftriaxone between April 1, 2015 and June 30, 2015. Ceftriaxone use evaluation was based on standards set by World health organization. The criteria used in this evaluation were indication for use; the dose, frequency, duration, contraindication and interaction. The presence of a single error in either of the individual criteria was considered as inappropriate use.

Results: The overall evaluation of use of ceftriaxone was inappropriate in 88 cases (70.0%) which seems higher than other hospitals in Ethiopia. Inappropriate use of ceftriaxone by diagnosis were, acute abdomen 23 (79.3%), pneumonia 19 (67.9%), sepsis 12 (75.0%), trauma 8 (80.0%), obstructed labor 7 (53.9%), elective surgical cases 6 (75.0%), meningitis 4 (44.4%), lower urinary tract infection 3 (100.0%), and others 5 (55.6%). The inappropriate use of ceftriaxone by the different units of inpatients were surgery 41 cases (74.5%), internal medicine 19 cases (65.5%), gynecology and obstetrics 20 (74.1%), and pediatrics 8 (50%). Most of the durations of prescribing showed a high rate of appropriateness which accounts 60 cases (47.2%) of the total inappropriateness followed by frequency 11 (8.7%), interaction 9 (7.1%), indication 6 (4.7%) and contraindication 2 (1.6%) respectively.

Conclusions: Inappropriate prescribing of ceftriaxone was higher compared to other hospitals in Ethiopia. Antimicrobial stewardship in general and prudent prescribing of ceftriaxone in particular is needed to improve its useful life. This research can be extrapolated to other antimicrobials and health facilities for appropriate interventions.

Keywords: Antimicrobial Resistance; Ceftriaxone; Drug Use Evaluation; Ethiopia

Introduction

Antimicrobial resistance is a worldwide concern [1]. Its impact on health and economic outcomes estimated to increase health-care costs to $30 billion annually [2]. Antibiotics are considered among the most commonly prescribed drug classes in developing countries. Rates of antibiotic prescriptions is high, double the World Health Organization (WHO) recommendation of 30 % [3,4]. Frequent and inappropriate prescription of antibiotics is a major public health concern and is related to the development of antimicrobial resistance [5-8]. The most-prescribed antibiotics are the cephalosporins and a high prevalence of inappropriate antibiotic prescriptions [5,9].

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. If therapy is not appropriate, interventions will be necessary to optimize drug therapy. 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, frequency, duration, contraindication and drug interactions). DUE is the same as drug
utilization review and terms can be used synonymously [10]. Previous similar retrospective DUE studies in Ethiopia showed that the use of ceftriaxone is inappropriate[11-13].

In this study, we will evaluate the use of a specific antibiotic “Ceftriaxone” in FelegeHiwot Referral Hospital (FHRH). There is no a study conducted yet on rational use of ceftriaxone in our hospital. Therefore, this study will be used as a base line for this hospital. The following criteria are used to select ceftriaxone:

• It is most prescribed drug (high volume).
• It is injectable and antimicrobial.
• It is used for high risk patients.

Materials and Methods

We retrospectively reviewed the prescribing practices of ceftriaxone ceftriaxone between April 1, 2015 and June 30, 2015 at FHRH, Bahir Dar town, North-West Ethiopia. FHRH is serving a catchment population of over 5-7 million.

A total of 130 patient medical records were reviewed retrospectively by using systematic random sampling technique and only 127 patient medical records contained complete information for evaluation. We adopted a standard structured data collection tool of World health organization and pretested. The criteria used in this evaluation were indication for use; the dose, frequency, duration, contraindication and interaction. The presence of a single error in either of the individual criteria was considered as inappropriate use. The research team consisted of general practitioners, clinical pharmacists and experts.

Statistical Analysis

The data was analyzed and processed by SPSS version 19.0 software for Microsoft window using WHO drug use evaluation criteria with standard treatment guideline of Ethiopia 2014 and national drug formulary of Ethiopia 2013.

Six WHO drug use evaluation criteria were used. These are indication for use, dose, frequency, duration, contraindication and drug interaction.

Results

A total of 127 medical records were reviewed out of these 64(50.4%) were females (Table 1). The majority age groups were 25-34year and 15-24year which accounts 33(26%) and 25(19.7%) respectively and the minority age groups were neonates and infants which accounts 2(1.6%) and 5(3.9%) respectively (Table 2). The most commonly diagnosed diseases were acute abdomen 29(22.8%) followed by pneumonia 28(22.1%) (Table 3).
### Table 4: Distribution of ceftriaxone use by duration of therapy in FHRH, October 2015.

| Criteria          | Frequency | %  |
|-------------------|-----------|----|
| Duration of therapy |           |    |
| Stat              | 6         | 4.7|
| 1 day             | 7         | 5.5|
| 2-7 days          | 89        | 70.1|
| 8-14 days         | 22        | 17.3|
| 15-21 days        | 3         | 2.4|
| Total             | 127       | 100|

As shown in use of ceftriaxone was high in surgical ward 55(43.3%) followed by medical ward 29(22.8%). Analyzing Table 6, showed that 82.7% of patients prescribed ceftriaxone were given it for predefined criteria-11.5% short of threshold (94.2%). Thresholds (benchmarks) are not met.

### Table 5: Distribution of ceftriaxone by daily dosage in FHRH, October 2015.

| Criteria          | Frequency | %  |
|-------------------|-----------|----|
| Daily dosage (g/day) |         |    |
| <1g               | 14        | 11 |
| 1g                | 16        | 12.6|
| 2g                | 91        | 71.7|
| 3g                | 1         | 0.8 |
| 4g                | 5         | 3.9 |
| Total             | 127       | 100|

### Table 6: Distribution of ceftriaxone by daily dosage in FHRH, October 2015.

| DUE criteria | No. of error | Error (%) | Appropriateness (%) | Threshold (%) |
|--------------|--------------|-----------|---------------------|---------------|
| Indication   | 6            | 4.7       | 95.3                | 95            |
| Dose         | 1            | 0.8       | 94.5                | 95            |
| Frequency    | 11           | 8.7       | 86.6                | 95            |
| Duration     | 60           | 47.2      | 40.2                | 90            |
| Contraindication | 2   | 1.6       | 98.4                | 100           |
| Interaction  | 9            | 7.1       | 81.1                | 90            |
| Total        | 89           | 70.1      | Aver. 82.7          | Aver. 94.2    |

### Discussion

Inappropriate prescribing of antibiotics perhaps will have a major effect for early-onset emergency of drug-resistant micro-organisms and adversely an increase cost of antibiotics. Aggregated consumption data in our hospital showed that ceftriaxone is one of the highly prescribed ten items, which is estimated to be 80% of the hospital pharmacy budget. Our hospital is under a continuous effort to improve the useful life of antibiotics through judicious prescribing practice while maintaining a quality patient care to bring better treatment outcomes. Establishing a certain quality team and conducting clinical audit specifically on injectable antibiotics having high volume consumption in our hospital may have very important role to alarm the prescribers and curb threats of anti-microbial resistance.
Depending on aggregated data, our major class of interest is to assess the use of third generation cephalosporins which are prone to empiric therapy by physicians for hospitalized patients due to any suspected bacterial infection. In the context of our hospital ceftriaxone is becoming the most widely used drug of empiric treatment for admitted patients who have sign of systemic infection.

We retrospectively evaluated the level of appropriateness for use of ceftriaxone using WHO drug use evaluation criteria at FHRH in Ethiopia. Our study showed that the appropriate use of ceftriaxone was relatively lower (29.9%) as compared to other similar retrospective studies conducted in TikuranbesaHospital [13] (71.43%), Dessie Referral Hospital [12] (53.8%) and AyderReferral Hospital [11] 35.8% respectively.

This difference may be perhaps because of high empiric use of ceftriaxone for presumed infections (absence of culture and sensitivity test). There might be a variation in intensity of the DTC to implement and monitor anti-microbial policy of restriction for use and enforce the prescribers to comply with the national STG. There may be some variation in operational definition, evaluation period and sample size; and types of services provided. The national STG 2014 is not commonly used as a reference maybe it is not available enough in hard copy for all health care providers.

In this study, the inappropriate use of ceftriaxone was high for the treatment of acute abdomen as prophylaxis and treatment 22.8% followed by pneumonia 22.1%, sepsis 12.6%, obstructed labor 10.2%, trauma 7.9%, meningitis 7.1%, elective surgical prophylaxis 6.3, UTI 3.9% and others 7.1%. This pattern is similar in trend obtained in Ayder referral hospital, high in preoperative prophylaxis 38.8% followed by pneumonia 21.28%.

Most of the inappropriate use of ceftriaxone was high in duration 47.2% followed by frequency 8.7%. This result is similar to Dessie referral hospital which was high for duration 43.3% followed by frequency 24%. But in the treatment of upper GI bleeding, missed abortion, lower UTI and electrical burn, ceftriaxone was used 4.7% incorrectly because the STG of Ethiopia don’t show use of ceftriaxone in these cases are indicated.

In this study, the average mean duration of ceftriaxone use was 5.6 days and in the range of 2-7 days (70.1%) followed by 8-14 days (17.3%) that is relatively lower as compared to TikuranbesaHospital 9.2 days, Ayder referral hospital 7.2 days and Dessie referral hospital 6.8 days respectively.

This difference may be variation in operational definition, for example, ceftriaxone is not found in oral dosage forms, and therefore in this study early parenteral to oral conversion from other classes of antibiotics was considered as inappropriate.

### Conclusion and Recommendation

Inappropriate prescribing of ceftriaxone was higher compared to other hospitals in Ethiopia. Antimicrobial stewardship in general and prudent prescribing of ceftriaxone in particular is needed to improve its useful life. This research can be extrapolated to other antimicrobials and health facilities for appropriate interventions. There are ongoing interventions. We recommend:

- Adhere to the Ethiopian standard treatment guideline 2014 or prepare hospital-based guidelines on the prescribing and use of ceftriaxone
- Provide audit feedbacks to prescribers and other hospital staff on judicious use of antimicrobial agents in general and ceftriaxone in particular.
- Implement antimicrobial stewardship practices in FHRH.
- Involve multidisciplinary team particularly the clinical pharmacists in monitoring of use of ceftriaxone and other antibiotics use.
- Use microbiology lab with culture and sensitivity services and improve health outcomes
- Evaluate post intervention prescribing of ceftriaxone to see the changes and possible scale up.

### References

1. Chong Y, Lee K (2000) Present situation of antimicrobial resistance in Korea. J Infect Chemother 6: 189-195.
2. Cosgrove SE, Carmeli Y The impact of antimicrobial resistance on health and economic outcomes. Clin Infect Dis 36: 1433-1437.
3. Bajis S, Van den Bergh R, De Bruycker M, Mahama G, Van Overloop C, et al. (2014) Antibiotic use in a district hospital in Kabul, Afghanistan: are we overprescribing? Public Health Action 4: 259-264.
4. Alvarez-Uria G, Zachariah S, Thomas D (2014) High prescription of antimicrobials in a rural district hospital in India. Pharm Pract (Granada)12: 384.
5. Lee H, Jung D, Yeom JS, Son JS, Jung SI, et al. (2009) Evaluation of ceftriaxone utilization at multicenter study. Korean J Intern Med 24:374-380.
6. De Wuth K, Schroder H, Meyer E, Nink K, Hoffmann S, et al. (2004) Antibiotic use in Germany and European comparison. Dtsch Med Wochenschr 129: 1987-1992.
7. de Wuth K, Bergner J, Buhner R, Dörje F,Gonnermann C, Haber M, et al. (2004) Antibiotic Use at German University Hospitals (Project INTERUNI-II). Results for Medical Intensive Care, Hematology-Oncology, and Other Medical Service Areas. Med Klin (Munich) 99: 347-354.
8. Wang J, Wang P, Wang X, Zheng Y, Xiao Y (2014) Use and prescription of antibiotics in primary health care settings in China. JAMA Intern Med 174: 1914-1920.
Citation: Sewagegn N, Ayichew Gi/M, Mistik A, Degarege A, Mohammed O, et al. (2017) Evaluation of Ceftriaxone Use for Hospitalized Patients in Ethiopia: The Case of a Referral Hospital. Ann Case Rep: ACRT-145.

9. Saleh N, Awada S, Awwad R, Jibai S, Arfoul C, Zaiteir L, et al. (2015) Evaluation of antibiotic prescription in the Lebanese community: a pilot study. Infect Ecol Epidemiol 5: 27094.

10. Committees: WDat. A practical guide. (2003) World Health Organization, Department of Essential Drugs and Medicines Policy Geneva, Switzerland In collaboration with Management Sciences for Health Center for Pharmaceutical Management Rational Pharmaceutical Management Program Arlington, Virginia, USA: 83-105.

11. Abebe FA BD, Berhe AH, Hishe HZ and Akaleweld MA (2012) Drug use evaluation of Ceftriaxone: The Case of Ayder Referral Hospital, Mekelle, Ethiopia. Int J Pharm Sci Res 3: 2191-2195.

12. Getasew A Ayinalem BKG, Abebe Z Belay, JimmaLinenisa (2013) Drug use evaluation of ceftriaxone in medical ward of Dessie Referral Hospital, North East Ethiopia. International Journal of Basic & Clinical Pharmacolog 2: 711-717.

13. Hospital B (2010) Ceftriaxone drug use evaluation in black lion and police hospitals: 17.

14. Kim JM LY, Ahn H, Kim NJ, Kang MY, Hong SA (2001) National survey of prescribing patterns and usage analysis of antibiotics in Korea. J Korean Soc Chemother 19: 105-195.