



Review on Drug Utilization Assessment of Cephalosporin

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i50A33406

Editor(s):

(1) Dr. Begum Rokeya, Bangladesh University of Health Sciences, Bangladesh.

Reviewers:

(1) Musin Kelel, Addis Ababa Science and Technology University, Ethiopia.

(2) Lynn Maori, State Specialist Hospital, Nigeria.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/76116>

Review Article

Received 28 August 2021
Accepted 02 November 2021
Published 17 November 2021

ABSTRACT

Pediatric is the field of medicine that is concerned with the health of infants, children and adolescents. Globally, many infectious diseases have been controlled in the 20th century by improving People's standard of living through public health campaigns and the use of various antimicrobial agents. Evidence suggests that the manner in which Primary Healthcare centers prescribe drugs has contributed to the high rise in Anti-Microbial Resistance (AMR). The extent of the resistance is determined by the site of antibiotic application and in this study oral usage of antibiotics was found to be the highest contributor to Anti-Microbial Resistance. A systematic review of the published literature on the conduct and reporting of meta-analyses in observational studies was done using databases searched included MEDLINE, Educational Resources Information Center, PsycLIT (<http://www.wesleyan.edu/libr>), Google Scholar, EMBASE, International Pharmaceutical Abstracts and the Current Index to Statistics. It was concluded that most of the articles reported that cephalosporin were widely used antibiotics and therefore its use must be rational; to avoid its abuse which may result to high level of resistance.

Keywords: Pediatric; antimicrobial resistance; meta-analyses; medicine.

1. INTRODUCTION

Excessive use of antibiotics in our societies is prevalent and is becoming a serious public health concern. There are several reports linking antibiotic usage to resistance. To address this problem, assessment of current prescribing pattern of antibiotics needs to be taken with utmost urgency to monitor its appropriate use. Drug use evaluation is an important health issue in an area of Medicine. So, health education of the public as well as hospitals and regulation of pharmacies and antibiotic guidelines in hospitals which can help in managing Drug use Evaluation of TGC'S and minimize the risk of future resistance [1,2].

Evidence has shown an association at an individual patient level between the prescribing of antibiotics in primary healthcare and antimicrobial resistance (AMR) in bacteria at different sites, with the strongest effects in the months after antibiotic consumption, but detectable for up to 12 months [3]. Since 2007, the rates of antibiotic-resistant bacteria-related infections in Europe have continuously increased in comparison with other infections [4] and countries with higher consumption of antibiotics have higher AMR rates [5]. Pakistan is the third highest antibiotic-consuming country among low- and middle-income countries (LMICs) and in 16 years the number of DDDs increased by 65%. The consumption rates were 19.6 DDDs per 1000 inhabitants per day (i.e. 19.6 DIDs) in 2015 [6].

While surveillance data have helped multiple countries to realize and intervene in their high consumption of antibiotics [7], the absence of national surveillance data on consumption and resistance, along with limited laboratory facilities, is a significant hindrance to knowing the correct numbers and designing the best interventions [8].

Antimicrobial resistance is one of the major threats to global health. It occurs due to widespread use of broad spectrum antibiotics empirically. Drug utilization review is performed to assess the use of antibiotics which emphasis on improvement of drug use and provides better patient care [9]. A constant update of antibiotic sensitivity of pathogens of the area, country, or institution helps in interventions that would improve the prescribing pattern and rational use of drugs [10,11].

Irrational prescription is a global problem and it may lead to unsafe treatment, exacerbation of the disease, health hazards and economic burden of disease. One of the robust social problems facing the health care system is Antimicrobials Resistance; in spite of the available reports and, literature on antimicrobial misuse, irrational antimicrobial prescribing practices and inappropriate consumptions has been pronounced [12]. Recently, an uncontrolled rise in infections caused by antimicrobial-resistant pathogens has been reported, resulting in an increase in morbidity, mortality, and healthcare costs [13]. Therefore, there has been a growing worldwide concern with regards to the clinical and economic impact of antimicrobial resistance.

Pediatric is the field of medicine that is concerned with the health of infants, children and adolescents. Globally, many infectious diseases have been controlled in the 20th century by improving living standard, public health sector and with the use of various antimicrobial agents [14]. An appropriate way to define the "accurate" amount of antimicrobial consumptions is only possible by categorizing them according to their anatomical group and therapeutic categories, for a particular population [15].

2. METHODOLOGY

We conducted a systematic review of the published literature on the conduct and reporting of meta-analyses in observational studies. Databases searched included MEDLINE, Educational Resources Information Center, PsycLIT (<http://www.wesleyan.edu/libr>), Google Scholar, EMBASE, International Pharmaceutical Abstracts and the Current Index to Statistics. In addition, reference lists were also examined and the experts in the field of clinical practice were also contacted. The search key words used were "Cephalosporin utilization/ assessment/ review". After search from last five years 104 articles were selected for the mentioned search key words but only 41 were fulfilling the inclusion criteria.

3. LITERATURE SURVEY

Naveen et al. conducted a study on Drug Utilization Pattern of Cephalosporin in general medicine and surgical inpatient department of a tertiary care hospital. The data of enrolled

patients were collected from case records of admitted inpatients during the study period. It was found that out of 110 enrolled patients, males were 54.5% and females were 45.5%. The results analyzed that the prescriptions are more with third-generation cephalosporin than fourth-generation cephalosporin.

The study concludes that 3rd generation cephalosporin is widely used for treating various nosocomial infections [16].

Jacob et al. conducted a prospective observational study for the assessment of Drug Utilization Evaluation of Antimicrobials used in Surgery Department in a Tertiary Care Hospital; to evaluate the culture sensitivity with various antimicrobials and identify the most effective antimicrobial against the organism isolated. A sample size of 181 patients who had undergone the respective surgeries and antimicrobial treatment were selected for this study. On analyzing the study sample receiving antimicrobials, it was found that 84.53% of the population in pre-operative and 35.35% in post-operative conditions received only antibiotics. 15.46% and 64.65 % received a combination of antibiotic and anti-Protozoal as pre-operative and post-operative medications respectively. Analyzing the use of antibiotics on the sample reveals that the majority of patients received Cephalosporin both in pre and post-operative conditions as 70.78% and 82.32% respectively [17].

Mangi et al. conducted study on evaluation of the irrational use of antibiotic in the private clinics of different 7 districts of Baluchistan (seven districts (Dera Bugti, Jhal Magsi, Kharan, Mosakhel, Panjgur, Quetta, Ziarat) Pakistan to assess the antibiotic resistance, in which it was observed it was observed that 16 % male and 15.26% females showed resistance to penicillin, and 40.4% male showed resistance to cephalosporin and 38.75% females were resistant to cephalosporin [18].

Juno et al. conducted study on evaluation of Potentially Inappropriate Medications among geriatrics in public hospitals of Sindh, where data was evaluated on the basis of Beer's criteria, in which it was evident that use of poly pharmacy and PIMs was common and Univariate analysis showed that polypharmacy was highly associated with PIMs [19].

Soman et al. conducted a prospective observational study among 250 inpatients in

surgical ward of a tertiary care teaching hospital. The utilization of cephalosporin was analyzed for using World Health Organization (WHO) core prescribing indicators and defined daily dose per 100 bed-days. The hospital antibiotic policy was used as a benchmark for analyzing compliance of therapy. It was found that the average number of overall antibiotics and cephalosporin per encounter was 2.1 and 1 respectively. Among the total parenteral antibiotics, 63.9% were cephalosporin. Cephalosporin utilization was 2.68 DDD per 100 bed-days. Compliance with all the stated criteria was observed only in 124 (49.6%) patients. It was concluded that the rate of prescribing of cephalosporin had increased evidently which may result in the occurrence of bacterial resistance. A suboptimal rate of compliance recommends a strict monitoring in the usage of cephalosporin with periodical updation of policy [10].

Pradeepkumar et al. conducted study on Assessment of antibiotic prescribing pattern in pediatric patients: A cross-sectional hospital-based survey, where they concluded that Prescription patterns and usage of antibiotics in this study was inappropriate in comparing our results with WHO prescribing indicators. Effective interventions are required to reduce inappropriate antibiotic prescriptions [20].

Dahal et al. conducted a prospective study on drug utilization evaluation of third generation cephalosporin in tertiary care hospital to evaluate prescribing pattern, to identify most common infection treated with third generation cephalosporin and to assess drug related problem. The study duration was six months and 150 cases were collected. It was noticed that the most common prescribed third generation cephalosporin were Ceftriaxone(68%), followed by Cefixime (20.66%) and Cefotaxime(11.33%). It the study it was found that the rate of prescribing the parenteral route (79.33%) was more compared to the oral drugs(20.667%). It was found that the drugs per encounter were 5.8 and third generation cephalosporin per prescription was 1.013. On culture and sensitivity test, only 12% were found to have done it, majority was done in Blood (33.33%) followed by sputum (22.22%), urine (22.22%), saliva (16.667%) and pleural fluid (5.556%) [1].

Baig et al. conducted study on Irrational antibiotic prescribing practice among children in critical care of tertiary hospitals, where they found that the prescribing frequency of Amikacin, Cefixime,

Cefotaxime, Meropenem, Amoxicillin, Vancomycin, Azithromycin, Levofloxacin and Clarithromycin was found above 80% in both hospitals (A and B). Among these, Amoxicillin, Penicillin, Erythromycin and Cephalexin showed higher resistance i.e. 49.2% [21].

Miao et al. conducted study on Inappropriate antibiotic prescriptions among pediatric inpatients in different type hospitals in China, where in they concluded that, There was inappropriate use of antibiotic in hospitalized children including overuse of parenteral administration, overprescribing of antibiotic on URTI and misuse of third-generation Cephalosporins in pediatric inpatients with LRTI. Compared with tertiary freestanding children hospital, the irrational antibiotic prescription of general hospitals and non-tertiary children hospitals were more serious. Management strategy should be implemented on quality improvement of antibiotic use [22].

Govindarajan and Shenoy, conducted a study on Drug Utilization Analysis in an urban tertiary care hospital to assess drug prescribing patterns in pediatric urinary tract infections. The study was a descriptive, retrospective, cross-sectional, and record-based analysis including pediatric patients aged <18 years of either gender diagnosed with UTI. The case record files retrieved from medical records department based on the International Classification of Diseases, 10th Revision (ICD-10) disease coding were analyzed for demographics, and details of drugs including dose and route of administration, frequency, and duration of treatment with antimicrobial used and other concurrent drugs were recorded. Amongst 42 included patients, 14 (33.3%) were males and 28 (66.67%) were females. Third-generation cephalosporin were the most commonly used antibiotics (71.4%) followed by aminoglycosides (35.7%), Amoxicillin Clavulanate (11.9%), fluoroquinolones (7.1%), and miscellaneous (doxycycline, metronidazole, and nitrofurantoin) (9.5%). Ceftriaxone among the cephalosporin and Amikacin among the aminoglycosides were the most commonly used drugs. Intravenous route was the most commonly use route of administration followed by patients who received by both intravenous and oral routes. The average duration of therapy was 4.43 ± 1.9 days. It was concluded that third-generation cephalosporin is used as first-line drugs irrespective of the causative agent for UTI which should ideally be reserved for complicated UTIs. Moreover, existing guidelines also indicate that the duration of antimicrobial therapy should be seven to 14

days. These results highlight the necessity for a remedial education program within the health care system designed to improve pharmacotherapy of UTI [23].

Samba et al. conducted a hospital based prospective observational study to assess the drug utilization of cephalosporin in tertiary care teaching hospital. A total of 120 in-patients of the various departments in the hospital, who were prescribed cephalosporin and those who fulfilled the exclusion and inclusion criteria were selected for the study, which was conducted for 6 months. All the information significant to the study was collected from the case records and discussions conducted with the patients and bystanders during ward rounds, with the support of the doctors, which was analyzed. Out of 120 prescriptions of cephalosporin 102 (85%) were administered through IV route, 13 (10.8) using oral route and 5 (4.2%) using both IV and oral route. From the result analysis, it has been analyzed that among all the cephalosporin generations, most commonly prescribed were 3rd generation cephalosporin's (96.6%). About 76 (65.8%) were prescribed by generic name. From various in-patient departments 39 (32.5%) patients from general medicine and 19 (15.83%) from pulmonology department were taken into the study. It was concluded that 3rd generation cephalosporin were prescribed in majority (96.6%) and were prescribed through IV route. Thus, the cephalosporin as an antibiotic has more clinical values in terms of the availability and thus, they should be used rationally in order to preserve their efficacy and prevent the development of resistance [24].

Samuel et al. conducted a prospective, cross-sectional and observation study to perform drug utilization of Cephalosporin in various departments of tertiary care hospitals. A total of 171 antibiotics prescribed, Cephalosporin contributed for 46.7%. Among Cephalosporin third generation Cephalosporin (83.75%) are predominately used followed by second generation Cephalosporin (15%). Ceftriaxone (42.5%) found to be highly prescribed Cephalosporin. Drugs were mostly prescribed as monotherapy as parenteral dosage forms. Cefoperazone + Sulbactam (22.5%) was the only fixed dose combination (FDC) prescribed. It was observed that Cephalosporin were highly used in general surgery (31%) followed by general medicine (26%), pulmonology (15%) and urology (12%). Irrational use of antibiotics can lead to emergence of resistance [9].

4. CONCLUSION

It is concluded that most of the articles reported use of cephalosporin globally as drug of choice for empirical therapy. It is therefore necessary to focus on its rational use, otherwise chances of antimicrobial resistance will be higher.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

*The peer review history for this paper can be accessed here:
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