Original Article

Drug Utilization Pattern and Drug Interaction Study of Antibiotics Prescribed to Orthopedic Patients in Private Hospital

Nilay Solanki *, Yogini Patel

Ramanbhai Patel College of Pharmacy, Department of Pharmacology, Charotar University of Science and Technology, Changa, Gujarat, India.

Abstract

This study was aimed to determine the prescribing pattern and drug interaction of an antibiotic at a private hospital using WHO recommended indicators. A cross-sectional study was conducted for six months to evaluate drug utilization pattern and drug interaction of an antibiotic prescribed at an orthopedic unit at a private hospital. The drug utilization and drug interactions were studied on a total of 200 prescriptions. The average number of prescribed drugs was found 5.15 per prescription. The maximum number of patients were treated with a single antibiotic. In this study, we observed that most of the patients were at the age range of 61-70 years. In our study, 22% of drugs were prescribed by generic names and 78% were the drugs prescribed by their brand names. The most frequently prescribed antibiotic group was beta-lactam drug. The most common situation was accident in which antibiotics were prescribed in a higher ratio. No serious drug interaction was found. Mostly all the possible drug interactions occur through the pharmacokinetic mechanism. The number of medicines per prescription should be kept in minimum with an eye on therapeutic effect. In other words, rational drug must be strictly followed. Polypharmacy and combination of drugs have to be discouraged to minimize drug interactions.

Keywords: drug utilization pattern, antibiotic, drug interaction, orthopedic patients

INTRODUCTION

WHO (1977) defined drug utilization research as the prescription, distribution, marketing, and drugs use in a society, with a particular focus on the medical and socioeconomic consequences [1]. It can be divided into analytical and descriptive studies. Drug utilization pattern study aimed to analyze the present state and the development of drug usage at various levels of the healthcare systems [1]. Antibiotics are the highest prescribed drugs, and the problem of its overuse is considered as a global phenomenon. In India, the antimicrobial agents use varies from 24 to 67%. As per Kunin's criteria, it was found that 64% of total prescribed antibiotics were either inappropriate or not indicated in terms of drug or dosage and it was made clear that in India, they account for over 50% of the value of drugs sold [2]. Antibiotics are frequently prescribed medicine in orthopedics unit. The antibiotics are prescribed both as prophylactically or to treat current infection. Infection is a very prevailing problem in the orthopedic surgery because of its continuing incidence, clinically important and serious sequels, and the treatment being very difficult and expensive. The rate of infection has been reduced by antibiotic prophylaxis, but many patients are still affected each year based on the increasing number of implants used [3]. Antibiotics can reach implants only by diffusion from the surrounding tissues since they are avascular. Infections which have an implant cannot be cured simply with antibiotics and in this regard the surgical removal of the implant is required [2].

Objective:

The objective of this study was to assess the drug utilization pattern and drug interaction profile of antibiotics prescribed to patients at the orthopedic hospital.

METHODOLOGY

Address for correspondence: Nilay Solanki, Ramanbhai Patel College of Pharmacy, Department of Pharmacology, Charotar University of Science and Technology, Changa, Gujarat, India.
E-mail: nivyrx @ gmail.com

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Study site
This study was conducted at Private Hospital, Nadiad, Gujarat, India. It is a 100-bed tertiary care hospital.

Study design
This was a cross-sectional observational study, which assessed the prescribing pattern of antibiotics and drug interactions profile from that prescriptions.

Study duration
This study was conducted for a period of six months.

Study criteria
Inclusion criteria were being treated with at least one antibiotic, and being admitted to a general ward.

Exclusion criteria were being pregnant and being lost to follow-up.

Ethical approval
The study protocol was prepared and presented to the Ethics Committee of Rathi Hospital. The protocol has been approved by IEC-HR (RPCP/IECHR/PG/2014-15/R20).

Study procedure
All the patients admitted to general wards were reviewed daily to identify the patients prescribed with antibiotics. Those patients who met the study criteria were enrolled in the study. A suitable data collection form was designed to collect all the necessary and relevant information. The demographic details of the patient such as name, age, and sex; clinical data such as diagnosis, and clinical condition; and therapeutic data such as the name of the antibiotic, dose, route, frequency, duration of therapy and other relevant details were collected by reviewing the case notes, and treatment charts of the patient.

All the patients were monitored from the day of admission till the day of discharge. During the treatment with antibiotic, the patients were evaluated clinically every day to assess the clinical outcome. Drug interaction was also assessed from the treatment chart through Medscape drug interaction checker.

Statistical analysis
The data was collected and added to Microsoft Excel through its descriptive analysis done. Drugs were classified according to WHO ATC classification. Different parameters were given as a percentage. Drug interaction was found using Medscape drug interaction checker.

Result and Discussion
In the present study, out of two hundred patients, 115 (57%) patients were females and 85 (43%) were males. Opposite result was observed in one study where out of 104 patients, 73 (70.2%) were males compared to 31 (29.8%) who were female patients. The age of the patients ranged from 1- 90 years in which the majority of the patients (74=37%) were in the age group of 61-70 years followed by 3(2%) in the age group 80-90 years (Table 1).

Table 1: The demographic profile of patients

Variables	Values (%)
Total number of prescriptions	200
Female	115 (57%)
Male	85 (43%)
Age range	
Below 40	9 (4%)
41-50	25(12%)
51-60	44(22%)
61-70	74(37%)
71-80	45(23%)
81-90	3(2%)
Total number of drugs	1031
Number of drug/prescription	5.15
Number of antibiotic/prescription	1.09

The similar result was obtained in a study conducted by Ghosh AK et al. [2] which showed that out of 410 patients, 220 (53.65%) were males and 190 (46.55%) were females. This characteristic showed that the percentage of females suffering from infection was less than males. The study conducted by Bithi SS et al. [3] showed the patients ranged from 6 to 82 years that almost in half of the patients the highest prevalence of diseases was above 30 years old (They were mostly at the age range of 31-60 years). This may be possible due to the degeneration process of bone or the vulnerable age of patients. Average number of drugs prescribed per prescription was 5.15, and the average of antibiotics prescribed per prescription was 1.09. Out of 1031 drugs prescribed, 22% of drugs were prescribed by generic names and drugs prescribed by their brand names were 78%. In a similar study in which that antibiotics were prescribed to 200 patients, the highest percentage of patients (182 =91%) were prescribed with one antibiotic and (18=9%) patients were prescribed with two antibiotics (Table 2).

Table 2: The prescription pattern of antibiotics

Variables	Value (%)
Mono antibiotic therapy	182 (91%)
Combination antibiotic therapy	18 (9%)
Antibiotics prescribed as	
Brand name	78%
Generic name	22%

Similar results were obtained in a study conducted by Singha J et al. [4] where out of 159 antibiotic prescriptions, the average number of antibiotics per prescription was 1.26, the average number of drugs per prescription was 2.92 and 60% of patients had received the single antibiotic. The average number of drugs per prescription is an important parameter while doing a prescription audit. The similar findings were reported by Khan FA et al. [5] which is more than double the average number recommended by WHO and in several countries (Indonesia, Niger, Nigeria, India, and Ghana) the

prescriptions were for three or more drugs [6] which were matched with our study results.

In our study, the most common conditions like accident cases were 64 (31%), chronic osteomyelitis cases were 51 (25%) followed by Osteoarthritis cases 39 (20%), post-operative cases 31 (16%), and acute osteomyelitis cases 15 (7%). This study showed that accidental cases were in majority. The common symptoms observed were joint pain, fever, swelling around the affected bone, redness, fracture, tenderness, and nausea.

Cefixime 83(41%) and cefuroxime 68 (34%) were found to be the highest prescribing drugs, Cefoperazone 19(10%), Amikacin 23(9%) and ceftriaxone 13(4%) are the second highest prescribing drugs among the patients, followed by ampicillin 12(6%). Most commonly prescribed antibiotics drugs were found to be beta-lactam and cefixime (J01DD08) (Table-3) was the pioneer one.

Table 3: The antibiotic usage pattern with ATC code

Sr No	ATC Code	Name of antibiotics
1	J01DD08	Cefixime
2	J01DC02	Cefuroxime
3	J01DD62	Cefoperazone
4	J01GB06	Amikacin
5	J01DD04	Ceftriaxone

It was chosen because it is the only oral 3rd generation cephalosporin which has the equivalent efficacy with injectable drugs (Figure 1).

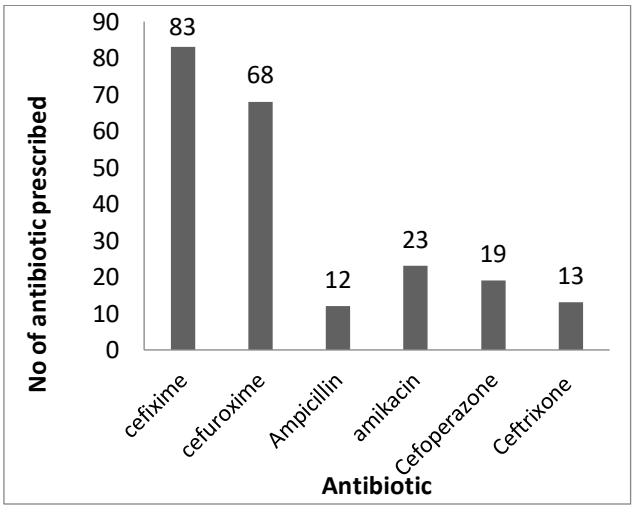

Figure 1: The commonly prescribed antibiotic drugs

Another cephalosporin was also prescribed and mentioned with its ATC code (Table-3). In orthopedics, bone-related infections were highly prevalent. Most of the antibiotics were given through intravenous 163 (81%) route followed by oral route 19 (10%). Similar results were observed in a study where most common antibiotics used in prophylaxis and treatment were amoxiclav, cefuroxime, and ceftriaxone injections [7]. In another study carried out by Ghosh et al. [2], it was showed that beta lactam antibiotic was prescribed more in which Ceftriaxone was the common antibiotic drug among beta-lactam group. A Study by Singha J et al., showed that ceftriaxone was the most commonly prescribed antibiotic (43.49%). In addition, 43.10% of patients received antibiotics, and 74.35% of patients received injectable form of drugs [4]. The drugs prescribed other than antibiotics were NSAIDS, Antiemetic, vitamin supplements, Proteolytic enzyme, and Proton pump inhibitors (Table 4).

Table 4: The most frequently prescribed adjunct therapy other than antibiotics

Sr No	Other drugs prescribed	Percentage
1	Diclofenac	20%
2	Ranitidine	17%
3	Polybion	16%
4	Ibuprofen/Paracetamol	15%
5	Biosuganril	13%
6	Ondansetron	8%
7	Pantoprazole	6%
8	Rabenprazole	5%

In another study, it was showed that complainers of severe pain had received paracetamol, ibuprofen, diclofenac, and tramadol. The tetanus toxin injection was also given as prophylaxis in 27.9% of cases against poisoning from the entry of foreign bodies. Metoclopramide and promethazine are medications given to relieve nausea and vomiting [7].

44 (73%) prescriptions had the potential for possible drug interactions out of 200 prescriptions. The maximum number of drug interactions in prescriptions was 5 and minimum number of interactions was three. Out of 660 possible drug-drug interactions, 444(67%) were significant drug interactions, 216(33%) were minor drug interactions, and no any serious drug interaction was found (Figure 2 and 3).

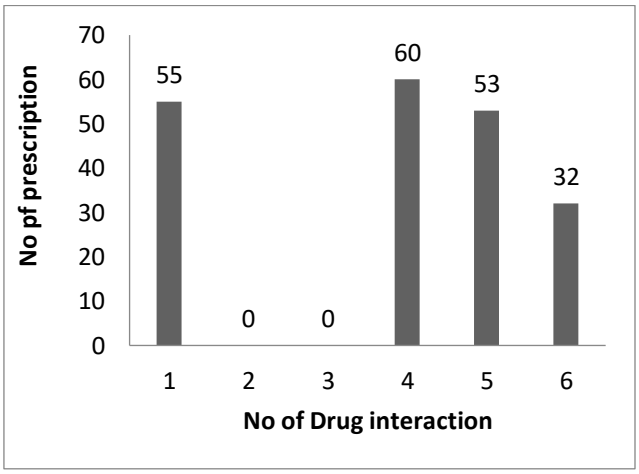

Figure 2: The number of drug-drug interaction (DDI) per prescription

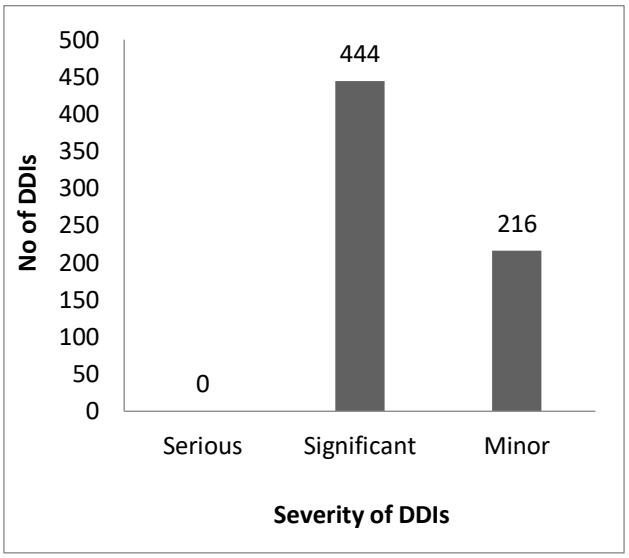

Figure 3: The severity of drug interaction

There were 660 drug interactions occured in 200 prescriptions. Out of them, 613 were Pharmacokinetic and 47 were Pharmacodynamic drug interactions (Figure 4).

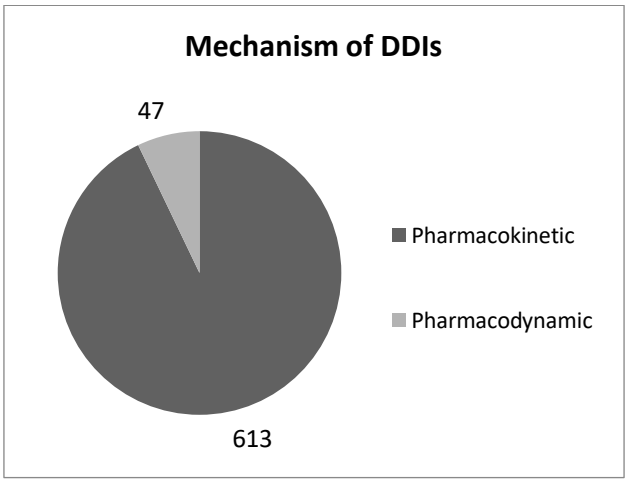

Figure 4: Distribution of drug interaction based on mechanism

Conclusion

Accident cases were the most common condition in our study followed by Osteoarthritis. In our study, 22% of drugs were prescribed by generic names. Prescribing medicines by generic names would help in less expensive treatment. The number of medicines per prescription should be kept in minimum. The average number of antibiotics must be kept in the limit as per WHO criteria; in other words, the rational use of antibiotics must be strictly followed. No serious drug interaction was found. Mostly all the possible drug interactions occur through the pharmacokinetic mechanism.

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