

A Study on Drug Utilization and Drug Interaction of Antibiotics in Orthopedic Patients

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Abstract

A study entitled "Drug Utilization Evaluation and Drug Interaction of antibiotics in orthopedic patients" was conducted in the department of orthopedics of a 1000 bedded multispecialty private hospital. The prospective observational study was conducted for a period of six months. A total of 70 cases were collected and study was conducted. The Maximum number of patients were in between the age group of 39-59 years (41%), followed by 25 patients (36%) between the age of 60-90 years, then 16 patients (23%) between 18-36 years. Based on diagnosis, 37 patients (53%) were diagnosed with Fracture, 11 patients (15%) with Osteoarthritis, 2 patients (3%) with Osteomyelitis. The length of stay of the study population was analyzed and it was observed that, 43 patients (62%) stayed less than or equal to 5 days. Among the 70 patients, 45 (64%) were prescribed with one antibiotic, 20 (29%) with two antibiotics and 5 (7%) with 3 antibiotics. Cephalosporin's were prescribed to 53 patients (76%). Drug interactions were identified, with 94 interactions, 47% major, 28% moderate and 25% minor.

Keywords: Drug utilization; Antibiotics; Drug interaction; Orthopedic

Abbreviations: ADME-absorption; distribution; mechanism; excretion; ATC-anatomical therapeutic chemical; CKD-chronic kidney disease; COPD-chronic obstructive pulmonary disease; DDH- developmental dysplasia of hip; DNA-deoxyribonucleic acid; ICU-intensive care unit

Introduction

DUR is an authorized and systematic continuous evaluation of healthcare providers' medication prescribing, pharmacists' dispensing practices, and patients' medication usage. The goal of DUR is to ensure that drugs are used appropriately, safely, and effectively in order to improve patient health status. Predefined criteria for appropriate drug therapy are compared against a patient's or a population's records. Failure to meet these criteria leads to drug therapy adjustments. Besides that, continuous improvement in the proper, safe, and effective use of drugs may further reduce health care costs^[34,32,21]. DUR allows the pharmacist to document and evaluate the benefit of pharmacy intervention in improving therapeutic and economic outcomes while demonstrating the overall value of the pharmacist^[21]. DUR is typically classified into three different categories:

- Prospective
- Concurrent
- Retrospective

Steps in Conducting a Drug Use Evaluation

I)Identify or Determine Optimal Use.

II)Measure Actual Use.

III)Evaluate.

IV)Intervene.

V)Evaluate the DUR Program

VI)Report the DUR Findings

Infections are a major breakthrough for poor prognostic conditions. Controlling infection prevents morbidity or mortality rates accordingly. Thus, to overcome such manifestations, antibiotics can be a major source to regulate health management. Antibiotics have mutual & reciprocal effects. For decades, the problem of resistance has been increasing double fold. The usage of fixed-dose or multiple antibiotic combinations helped overcome the aggregate interventions controlling the infection respectively.

A drug interaction occurs when one substance, typically another medication, influences the effects of a drug when both are taken at the same time. This action can be synergistic (in which the drug's effect is increased), antagonistic (in which the drug's effect is diminished), or a new effect can be produced that neither produces on its own. However, interactions between drugs with foods (drug-food interactions) and even more so between drugs and medicinal plants or herbs (herb-drug interactions) may also exist.

The ideal route of administration of any medication is the one that achieves serum concentrations sufficient to produce the desired effect without producing any untoward effects^[28]. Safest and convenient way of medication administration is achieved by oral route. If the given oral medication achieves tissue and blood concentration to the same extent as that of the intravenous (IV) medication, then there is little therapeutic difference between IV and oral medications^[25]. The available oral formulations in the market are easier to administer, safe and achieve desired therapeutic concentrations, thus making the per oral (PO) route an ideal choice.

Objective

The objective of this study was to assess the drug utilization pattern, drug interaction profile, Prescribing pattern and switch over therapy of antibiotics in orthopedic patients.

Study Site

This study was conducted at a Private corporate Hospital, coimbatore, India. It is a 1000 –bedded multispeciality hospital

Study Design

A Prospective, Cross-sectional, Observational study was conducted to check drug utilization and drug interaction of antibiotics. The consent of the patients was taken and the study was carried out.

Study Duration

This study was conducted for a period of six months.

Study Criteria

Inclusion criteria:

1. Patients who are prescribed with at least one antibiotic.
2. Patient of age ≥ 18 and ≤ 90 years.
3. Patients signing the Informed consent form.

Exclusion criteria:

1. Patients who are allergic to antibiotics
2. Critically ill patients
3. Pregnant women, lactating women

Study Procedure

All the patients admitted to orthopedic wards will be reviewed daily to identify the patients prescribed with antibiotics. Those patients who met the study criteria will be enrolled in the study. A suitable data collection form will be 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 antibiotic, dose, route, frequency, duration of therapy, and other relevant details should be collected by reviewing the case notes, and treatment charts of the patient. All the patients should be monitored from the day of admission till the day of discharge, during the treatment with antibiotic, the patient will be evaluated clinically every day to assess the clinical outcome.

Results and Discussion

- The study population consists of 70 patients with orthopaedic inpatients above the age of 18 years have been participated in the study as per the inclusion and exclusion criteria.

- Among 70 patients, 36 (51%) were male and 34 (49%) were female population. The results reveal that male population is more prevalent than female population.
- Age distribution of the study population was analyzed and found that maximum number of patients 29 (41%) were in the group of 39- 59 years.
- Based on the diagnosis, Fracture was observed to be the most prevalent diagnosis 37 (57%), followed by Osteoarthritis 11 (15%).
- In the current study, Hypertension was observed to be the most prevalent co- morbid condition 14 (32%), followed by Diabetes Mellitus 9 (24%).
- Based on Length of stay in Hospital, 43 (62%) number of prescriptions have maximum number of stay in the hospital followed by 17 (24%) prescriptions. [Table 1]

Table 1

	CATEGORY	NO. OF PATIENTS	PERCENTAGE
GENDER			
	MALE	36	51%
	FEMALE	34	49%
AGE			
	18-38	16	23%
	39-59	29	41%
	60-90	25	36%
NO. OF ANTIBIOTICS PRESCRIBED			
	I ANTIBIOTIC	45	64%
	II ANTIBIOTICS	20	29%
	III ANTIBIOTICS	5	7%
ROUTE OF ADMINISTRATION			
	ORAL	10	14%
	TOPICAL	2	3%
	PARENTERAL	31	44%
	ORAL & PARENTERAL	27	39%
COMMONLY PRESCRIBED ANTIBIOTICS			
	CEPHALOSPORIN	53	76%
	BETA LACTUM ANTIBIOTICS	12	17%

	AMINOGLYCOSIDES	5	7%
PURPOSE OF ANTIBIOTICS			
	PROPHYLAXIS	45	64%
	TREATMENT	21	30%
	BOTH	4	6%
AWaRe CLASSIFICATION			
	ACCESS	1	14%
	WATCH	6	86%
	RESERVE	0	0%
SWITCH-OVER THERAPY			
	IV-PO	27	39%
	IV ADMINISTRATION	43	61%

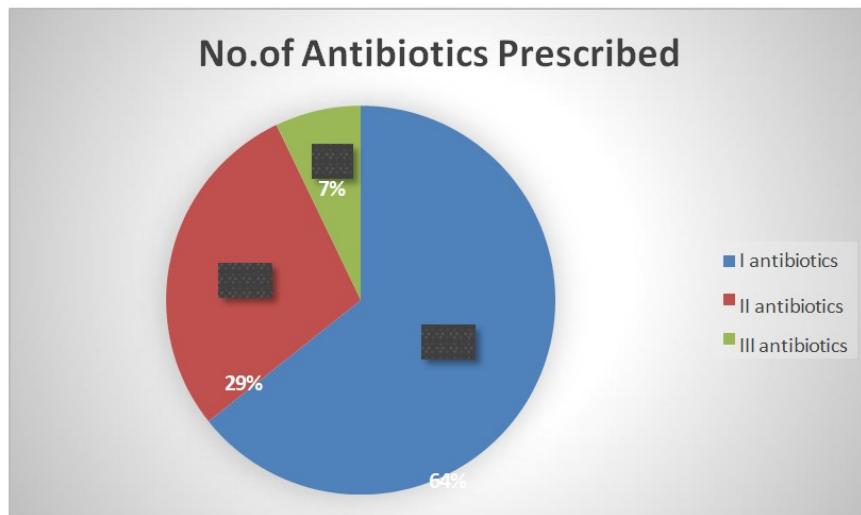


Figure 1

Based on the number of antibiotics prescribed, 45 (64%) prescriptions were prescribed with one antibiotic followed by 20 (29%) prescriptions with two antibiotics and 5 (7%) prescriptions with three antibiotics.

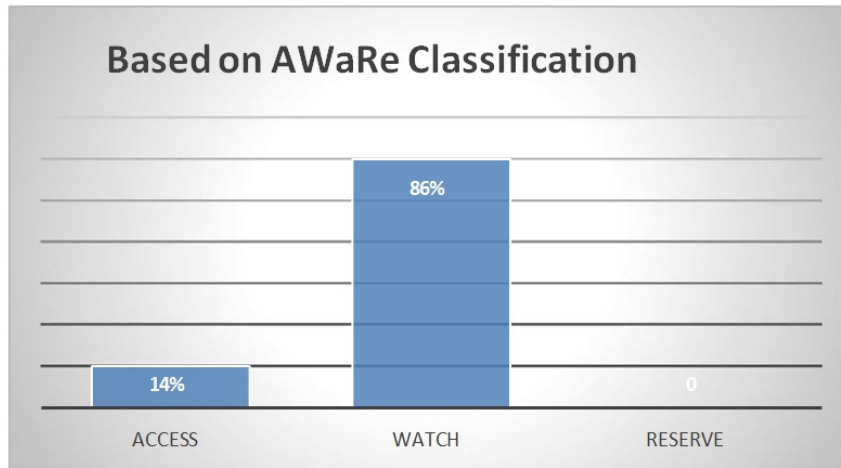


Figure 2

On the whole, a total of 7 antibiotics were prescribed to the patients. According to AWaRe classification, 1 antibiotic belonged to ACCESS category (14%), 6 antibiotics belonged to Watch category (86%) and 0% of antibiotics belonged to the Reserve category.

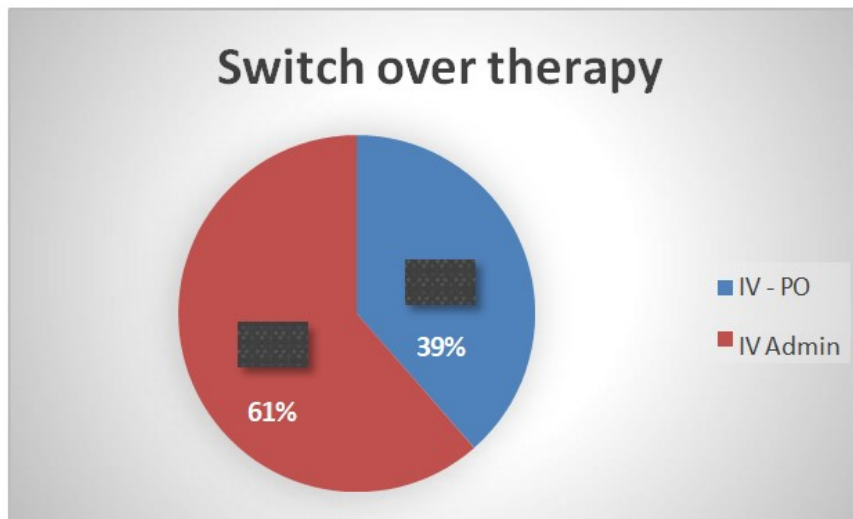


Figure 3

Based on switch over therapy, It was found that most of the prescription had IV discontinuation 43(61%) followed by IV-PO 27(39%).

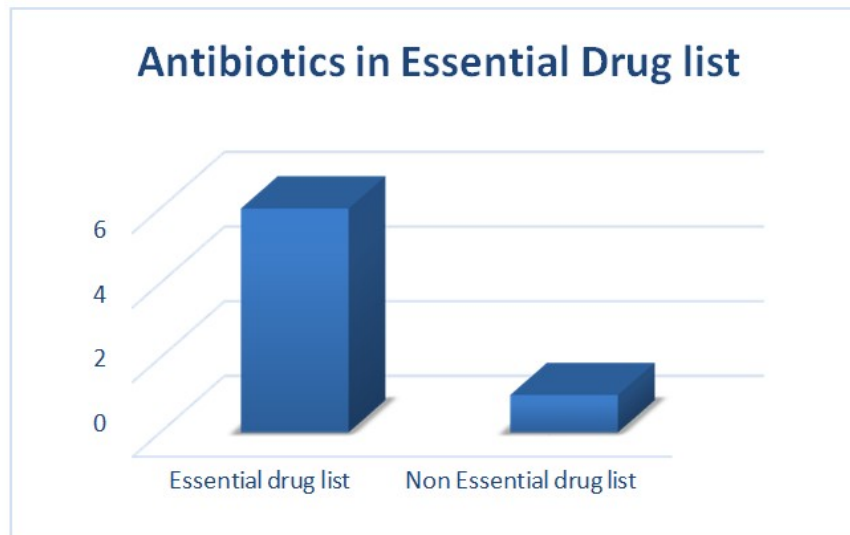


Figure 4

A total of 7 antibiotics were prescribed. Based on Essential Drug List, it was observed that 6(86%) antibiotics were found in Essential Drug List and 1(14%) antibiotic was not included in the Essential Drug List.

- The prescription analysis of drug-drug interaction revealed that 19(27%) prescription had at least one possible drug-drug interaction.
- Categorization of DDIs based on severity reveals that 44(47%) major drug interactions, 26 (28%) moderate drug interactions, 24(25%) minor interactions were observed.
- Based on mechanism of interactions, 24 (26%) pharmacokinetic interaction and 70 (74%) pharmacodynamic interaction were observed.

The patient population was fairly balanced in terms of gender, with 51% men and 49% women. The most common diagnosis among patients was fractures, which accounted for 57% of cases, followed by osteoarthritis at 15%. The largest group of patients (41%) were aged between 39 and 59 years. In terms of co-morbidities, hypertension was present in 32% of patients, while diabetes mellitus affected 24% of the population.

- Regarding antibiotic use, cephalosporins were the most frequently prescribed antibiotics, used in 76% of cases. The majority of antibiotics (52%) were administered via the parenteral route (injections or infusions).
- The most common reason for prescribing antibiotics was prophylaxis, which accounted for 64% of prescriptions. Additionally, monotherapy was the treatment approach in 50% of cases.
- Drug-drug interactions (DDIs) were present in 27% of prescriptions. Among these interactions: 47% were classified as major,
- 28% were moderate, and 25% were minor.
- Most of the interactions were pharmacodynamic (74%), while pharmacokinetic interactions made up 26%.

Conclusion

The current study could assess the prescribing pattern of antibiotics, pattern of antibiotic sensitivity, Drug interactions of antibiotics and other drugs prescribed in orthopedic patients. Most commonly prescribed class of antibiotics in the study, was found to be cephalosporins followed by beta lactam antibiotics. The commonly observed type of drug-drug interactions in the study population was found to be pharmacodynamic. Categorization of drug- drug interaction based on severity revealed that majority of the interactions were major. The drug interactions can be minimized by screening the prescription with Micromedex drug database before dispensing.

Clinical pharmacists and Clinicians need to play vital role in minimizing the antibiotic problems by conducting continual awareness programs regarding up-to-date prescribing guidelines in the hospital and also minimizing the antibiotic resistance. The active participation of clinical Pharmacists in the clinical ward rounds and documentation of Pharmacist observation on prescription in patient folder is highly recommended for safety and drug monitoring.

Also, physicians must have a clear understanding of rational therapeutic use of antibiotics in orthopaedic patients. They must exercise good judgment in selection of the antibiotic regimens. Irrationality can be addressed by use of guidelines, educational activities and surveillance at all level of health care. So, measures should be taken to avoid the inappropriate use of antibiotics.

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