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Research Article

Drug Use Evaluation And Pharmacovigilance Of Analgesics And Antibiotics Used In Orthopedic Department At A Tertiary Care Hospital

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ABSTRACT

Aim & Objectives: To evaluate the drug use and pharmacovigilance of analgesics and antibiotics used in Orthopedics department at a tertiary care center. Objectives of the study were Prescribing pattern of antibiotics and analgesics, incidence of adverse drug reactions, average drug encounter per prescription, percentage of antibiotics and analgesics use and cost per prescription.

Methodology: It was a prospective observational study. Patients who have been admitted in Orthopedic wards of NRI General Hospital from December 2015 to May 2016 were included. Exclusion criteria includes patients who are not willing to participate in the study, patient who are HIV positive, patients using immunosuppressant and with malignancy.

Results: Out of 343 patients, the incidence of use of antibiotics was found to be 97.66%. The month wise use of antibiotics and analgesics were 98.87%, 99.98% respectively. The use of antibiotics was higher in the age group of 18 - 29 years while it was least in patients aged 80 - 89 years. In our study, 96 (28.65%) patients received combination therapy while 239 (71.34%) patients received monotherapy.

Conclusion: There is a great need for the adoption of various strategies to prevent/minimize the inappropriate use of antibiotics and analgesics in order to improve the quality use of medicines. As many numbers of significant interactions were found, designing and implementation of mechanisms which constantly monitor the potential interactions and adverse drug events is needed.

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INTRODUCTION

Drug Use Evaluation is a performance improvement method that focuses on improving and evaluating medication-use processes with the goal of improving outcome of patient. The prospective review refers to the term Drug Use Evaluation (DUE) and retrospective review refers to the term Drug Utilization Review (DUR). Drug Use Evaluation has defined as a marketing, distribution, prescription and drug use in society. It is a structured, authorized, ongoing system which improves the drug use in a health care system. DUE helps us to know why and how drugs are used. The main goal of Drug Use Review is to assess whether drugs prescribing are rational or irrational. Most of the drug related problems such as adverse drug reactions, drug noncompliance can be prevented by this Drug Use Evaluation Program.[1] It helps to interpret, understand and improve the prescribing pattern, administration of drugs and usage of medications. The aim of drug use evaluation is to facilitate the rational use of drugs in population.[2]The rational use of a drug implies the prescription of a well-documented drug at an optimal dose, along with the correct information, at reasonable price. To discuss about the rational use of drugs, it is necessary to have knowledge about how drugs are being prescribed and used which helps to improve prescribing habits.[3]

Prospective DUE involves evaluating a patient's planned drug therapy before dispensing of medication and allows for resolution and identification of problems before the patient has received the medication. Objectives of DUE were to promote optimal medical therapy, evaluate effectiveness of medication, enhance opportunities, through standardization, to assess the value of innovative medication-use practices from both patient outcome and resource-utilization perspectives, minimize the costs of medication therapy. The elements involved in formulating in DUE include the following: appropriate indication (primary criteria), appropriate dosage (process criteria), appropriate duration of therapy (process criteria), appropriate labs or other measure monitored (process criteria), no contraindication for use (process criteria), adverse effects found while on the drug (outcome criteria), known drug interaction with other drugs prescribed for the patient (process criteria) and the patient's treated condition improve as a result of the drug's use (outcome criteria).[4]

The prescription cost analysis show details of the number of items and the gross ingredient cost of prescriptions.[5] Antibiotics are most commonly prescribed medications in Orthopedics department which are used in Pre-operative and Post-operative conditions. So, that rate of infection has been decreased by prescribing antibiotics as prophylaxis. Prevalence of use of antimicrobial agents in India varies from 24 to 67%. According to Kunins criteria it was identified that prescribing antibiotics were not indicated or inappropriate in use of drugs and dosage according to guidelines. Inappropriate use of antibiotics can result in prescribing errors. If antibiotics are not prescribed rationally, it results in resistance of bacteria and increase in cost of treatment.[6]

Analgesics are the drugs that relieve pain without blocking the nerve impulse conduction. Irrational prescription of analgesics can lead to unwanted side effects.[7] Different types of analgesics like NSAIDs, Steroids, Salicylates and Opioid drugs are used to treat acute and chronic pain in Orthopedics department. Paracetamol and NSAIDs are used to treat mild and moderate pain. Narcotic or Opioid drugs are used to treat moderate or severe pain. The severity and type of pain determines the specific drug or regimen to be used. There was no correct objective marker for pain; only patients can describe quality and intensity of their pain.[8] NSAIDs are most frequently prescribed drugs. About 70% of prescriptions contain NSAIDs. So, prescription audit should be performed in Orthopedics department to analyze the analgesics and antibiotic drugs. By this we can prescribe the medicines rationally and can reduce the adverse drug effects.[9]

METHODOLOGY:

***Study site*:**

This study was conducted at NRI General Hospital, Guntur, A.P, India.

***Study design*:**

This was a prospective observational study, which assessed the current prescribing pattern of antibiotics and analgesics in Orthopedics patients.

***Study duration*:**

The study was conducted over a period of 6 months from December 2015 to May2016.

***Study Criteria*:**

The study was carried out by considering the following criteria:

Inclusion criteria:

1. All the patients who have been admitted in Orthopedic wards of NRI General Hospital from December 2015 to May 2016.
2. Patients of either sex aged.

***Exclusion criteria*:**

1. Patients who are not willing to participate in the study.

2.Patient who are HIV positive.

3.Patients using immunosuppressant and with malignancy.

***Source of data*:**

The patients' demographical data, clinical data, therapeutics data and various other relevant and necessary data were obtained every day from the clinical assessment records, including medical records and other relevant information sources are documented.

***Study procedure*:**

All the patients admitted to Orthopedics wards were reviewed daily to identify the patients prescribed with antibiotics and analgesics. Those patients who met the study criteria were enrolled into the study. A suitable data collection form was designed (Appendix-I) to collect all the necessary and relevant information. The demographic details of the patient such as name, age, sex, clinical data such as diagnosis, clinical condition, therapeutic data such as name of the antibiotics and analgesics their dose, route, frequency, duration of therapy and other relevant details were collected by reviewing the case notes, treatment charts, lab data reports and by interviewing the patients. A note of other concomitant medications consumed was also made. A personal visit was made to all the patients who were included in the study to collect any further information. Their medications were crosschecked with the treatment chart.

All the patients were monitored from the day of admission till the day of discharge. During the treatment with antibiotics and analgesics the enrolled patients were evaluated clinically every day to assess the clinical outcome. The patients were also monitored for any possible adverse effects that had occurred during the course of treatment with antibiotics and analgesics.

DATA ANALYSIS:

All the data was subjected to analysis in order to assess the pattern of utilization of antibiotics and analgesics. The data was analyzed and the percentage value was calculated for the use of different class of antibiotics and analgesics. The nature and extent of use of each class and individual antibiotics and analgesics was also determined. The type of antibiotics used for a particular disease condition in different wards was also determined. The rationality of antibiotic prescription was assessed with respect to various parameters such as indication, dose, frequency and duration of treatment. The prescriptions of all enrolled patients were checked for the appropriateness of use of antibiotics and analgesics.

The rationality/appropriateness of antibiotics and analgesics with respect to various parameters such as indication, dose, frequency and duration was assessed by analyzing the collected data against standard texts, relevant literatures and available antibiotic guidelines. The potential interaction of the antibiotics and analgesics with other prescribed drugs was analyzed by using Micromedex drug interaction checker and other standard references. The interactions were graded under various levels such as mild, moderate and severe. Safety of the prescribed antibiotics and analgesics was assessed by monitoring for adverse drug reactions recorded in the patients' case notes and also by constantly monitoring the patients on daily basis for any such occurrence.

STATISTICAL ANALYSIS:

Frequencies, averages/means, standard deviations and percentages were obtained using Graph pad prism statistical software.

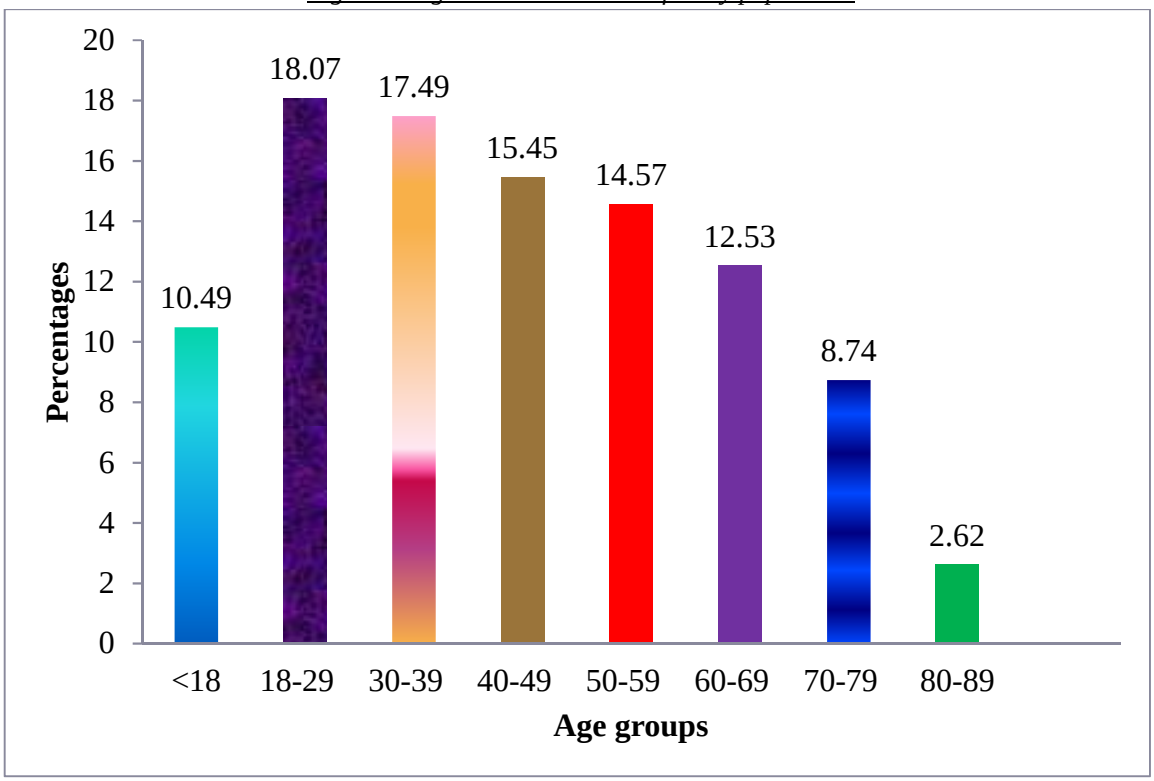
RESULTS:

Demographic profile

TABLE 1: Demographic data of study patients

Demographic Characteristics		Number	Percentage
Age in Years	<18	36	10.49
	18-29	62	18.07
	30-39	60	17.49
	40-49	53	15.45
	50-59	50	14.57
	60-69	43	12.53
	70-79	30	8.74
	80-89	9	2.62
	Total	343	
Sex:	Male	214	62.39
	Female	129	37.68
Co-morbid conditions	None	246	71.72
	1	60	17.49
	2	31	9.03
	3	6	1.74
Number of Medications	2-3	75	21.86
	4-6	268	78.13

Figure 1: Age wise distribution of study population



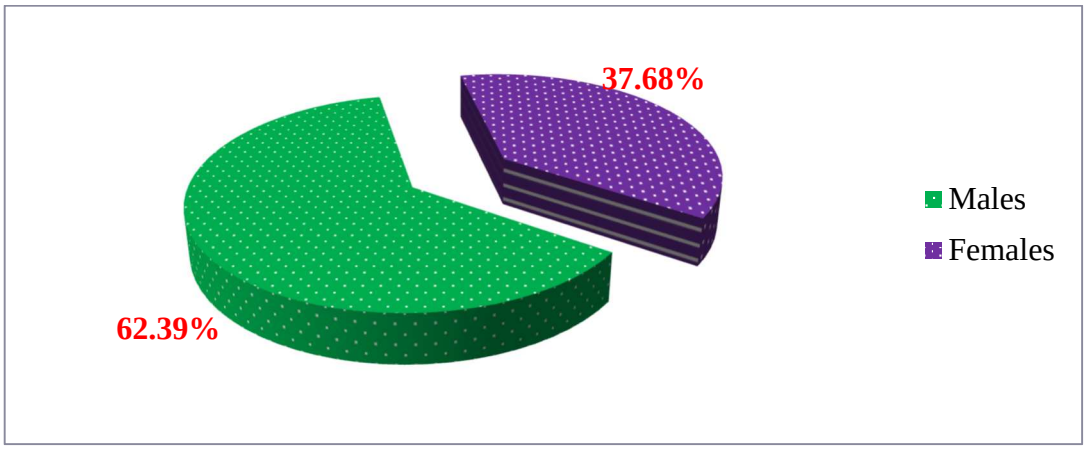


Figure 2: Gender distribution of study population Prevalence of Comorbidities

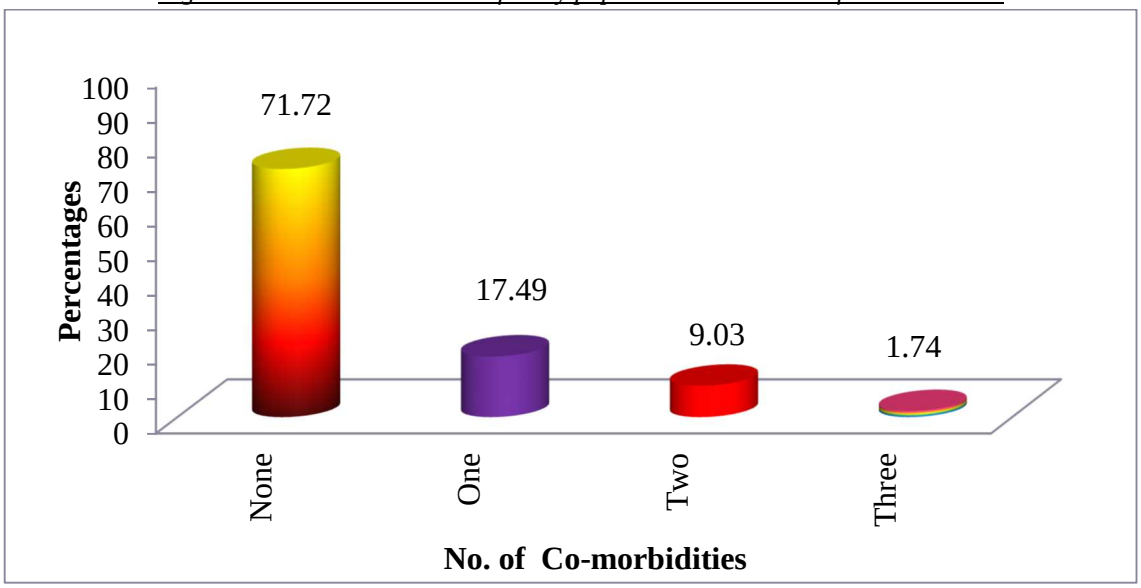


Figure 3: Prevalence of Co-morbid conditions in the study subjects

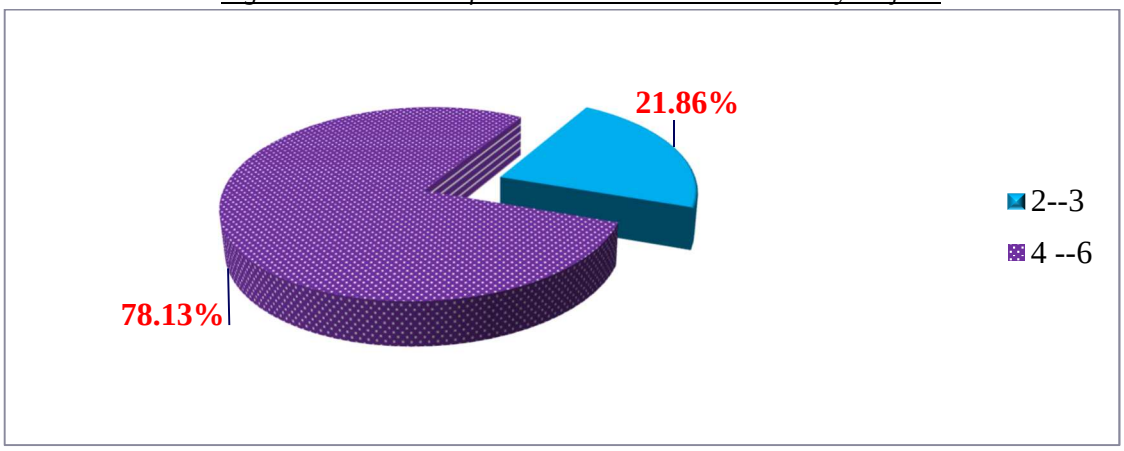


Figure 4: Incidence of Polypharmacy Antibiotic class prescription

Table 2: Antibiotic class prescribed in study subjects

Class of antibiotic	No. of drugs	Percentage
Penicillin's	8	2.33
Cephalosporin's	335	97.66
Fluoroquinolones	10	2.91
Oxozolidones	11	3.20
Aminoglycosides	87	25.36
Macrolides	2	0.58
Nitrofurantoin	1	0.29
Carbapenems	1	0.29
Lincosamides	3	0.89
Nitroimidazoles	69	20.11
Sulfonamides	3	0.87

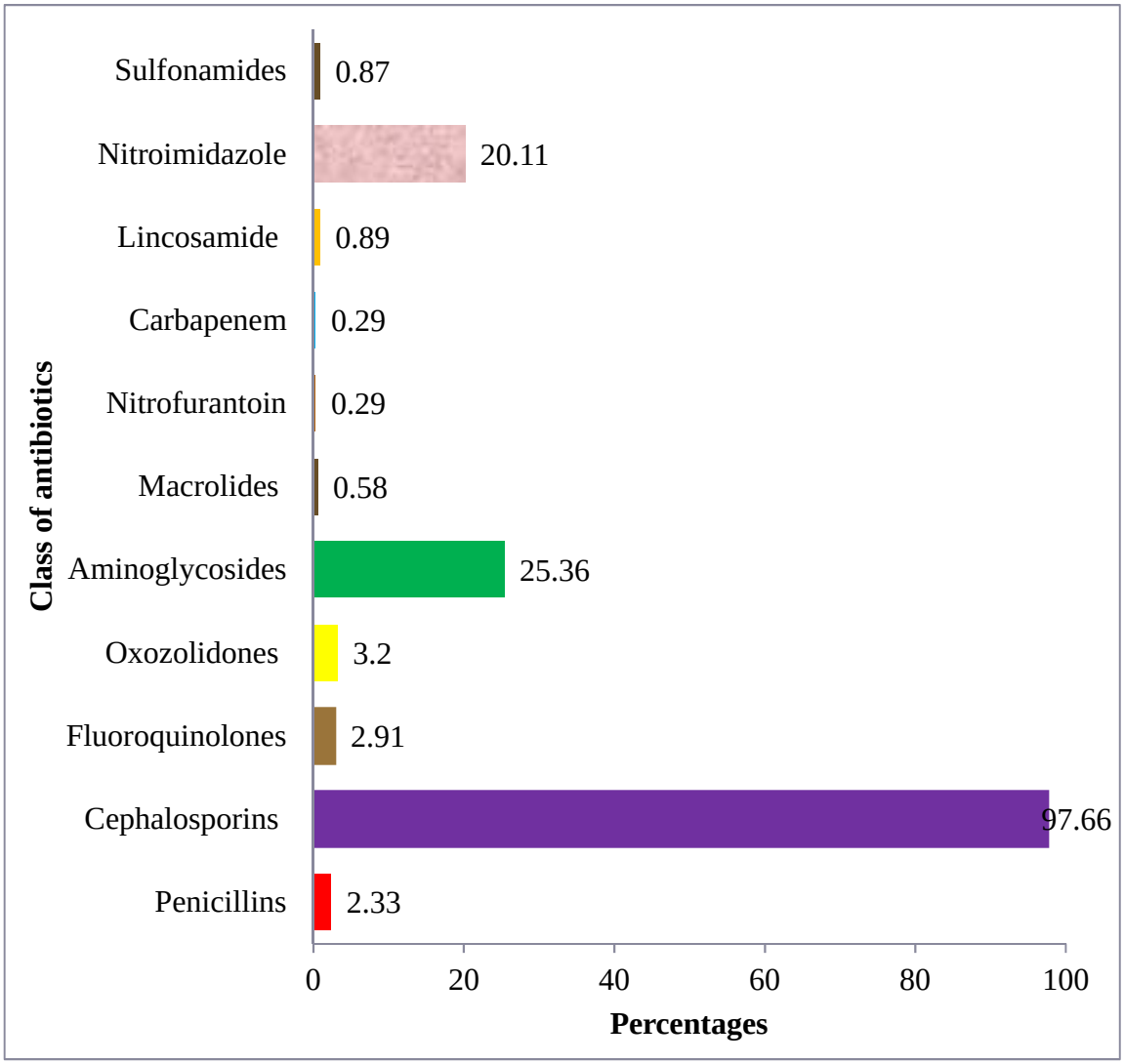


Figure 5: Bar diagram showing prescribing pattern of antibiotic class Monthly usage of antibiotics

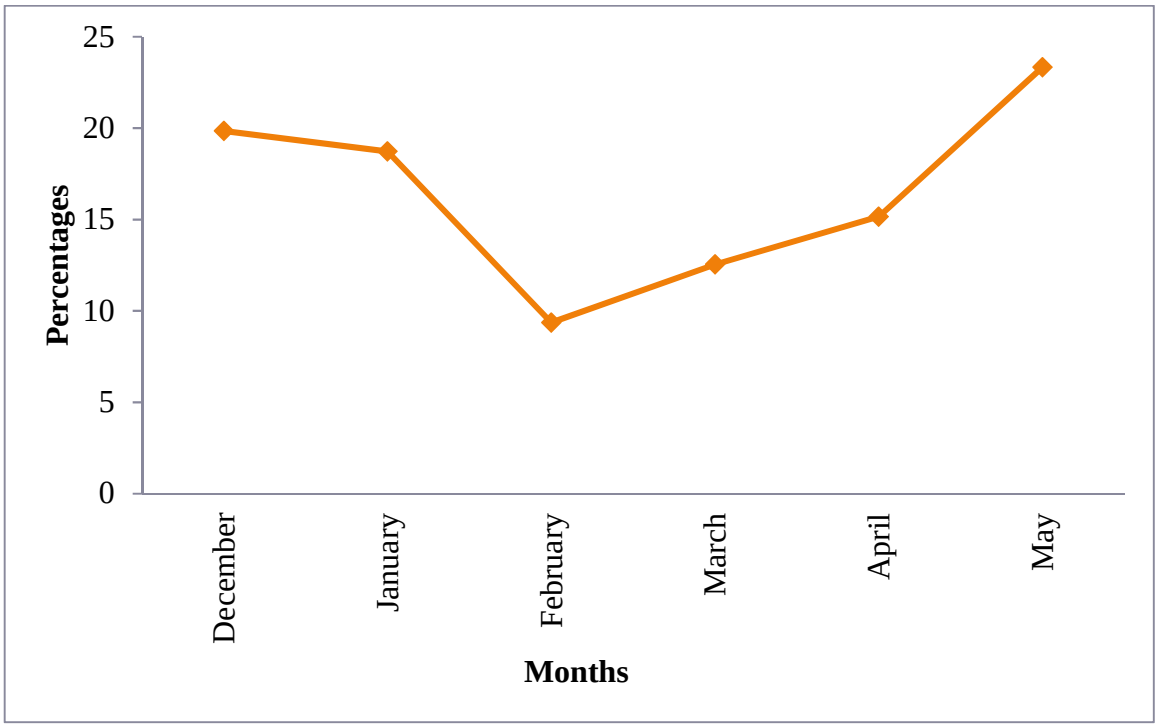


Figure 6: Month wise usage of Antibiotics Pattern of individual usage of antibiotics

TABLE 3 : Pattern of usage of individual antibiotics

Name of the antibiotic	No. of drugs	Percentage
Ceftriaxone	314	91.54
Cefixime	173	50.43
Ceftazidime	99	28.86
Cefpodoxime	2	0.58
Cefotaxime	1	0.29
Ampicillin	1	0.29
Amikacin	88	25.65
Metronidazole	69	20.11
Ciprofloxacin	4	1.16
Norfloxacin	1	0.29
Ofloxacin	4	1.16
Nitrofurantoin	1	0.29
Imipenem	1	0.29
Azithromycin	2	0.58
Levofloxacin	1	0.29
Gentamicin	1	0.29
Clindamycin	3	0.89
Linezolid	18	3.20
Cefoperazone +Sulbactam	18	5.24
Amoxicillin + clavulanic acid	6	1.74
Trimethoprim+ sulfamethoxazole	3	0.89

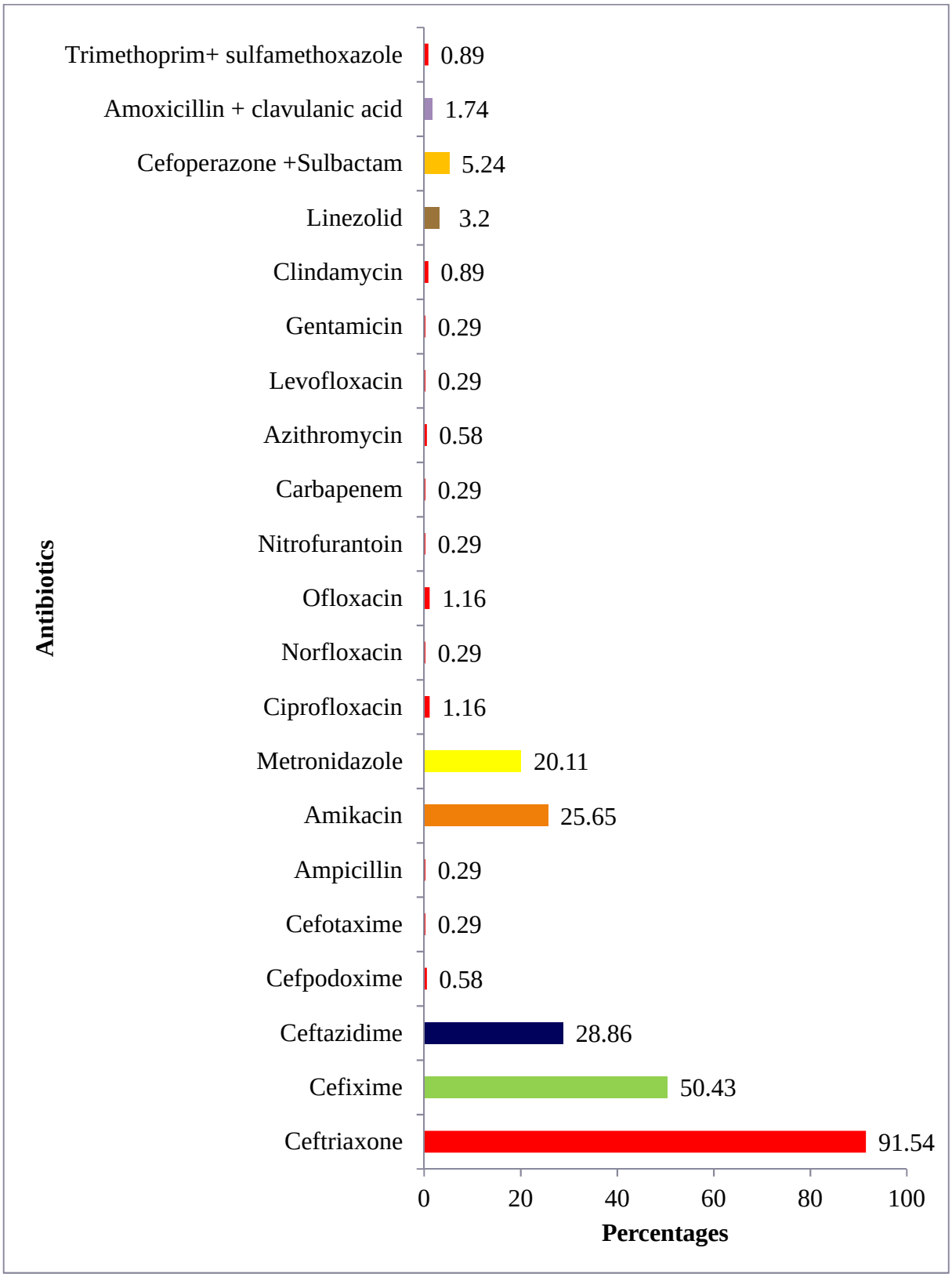


Figure 7: Pattern of usage of individual antibiotics Monotherapy vs. Combination therapy

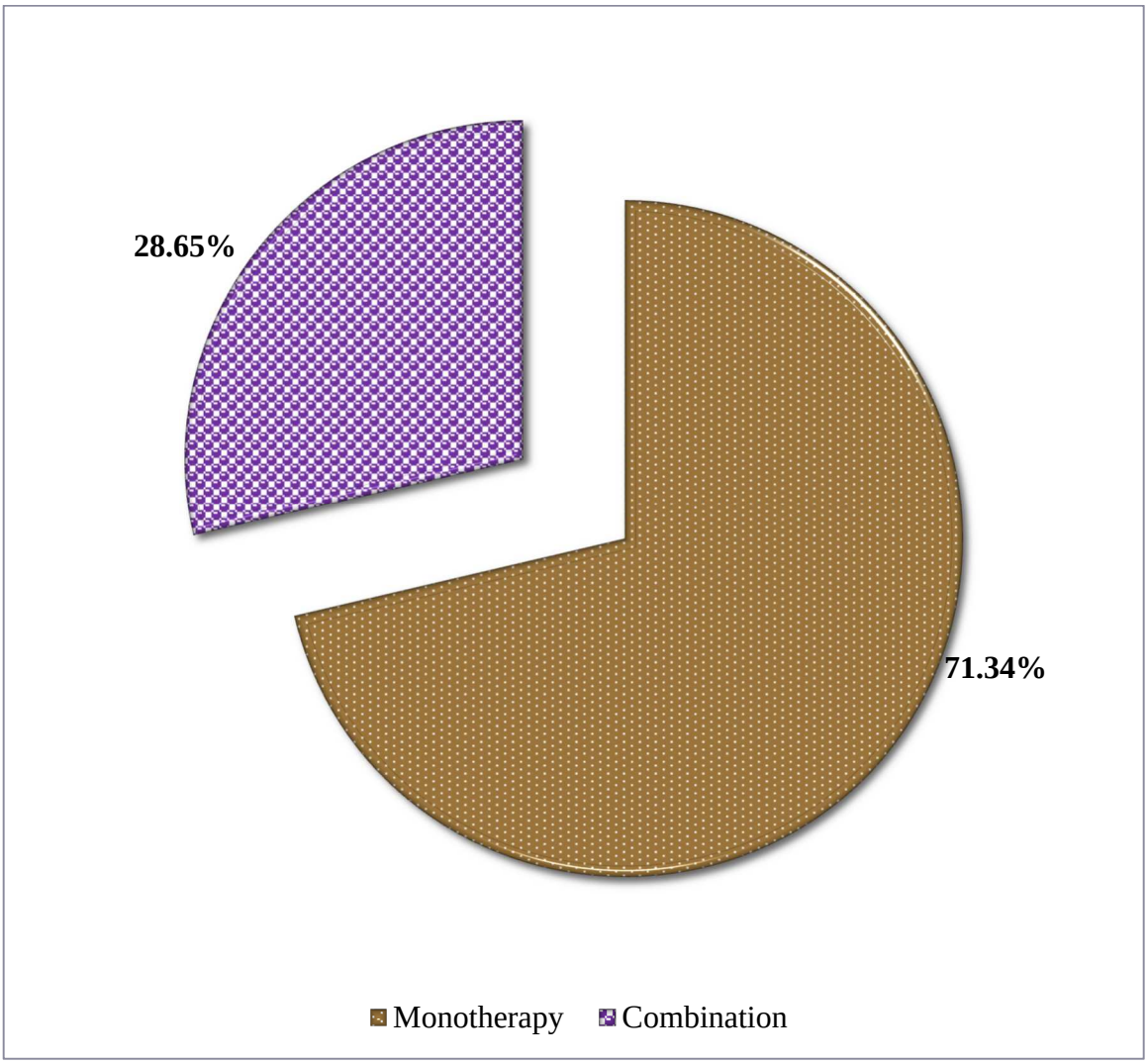


Figure 8 : Percentage of antibiotics prescribed in Monotherapy and Combination therapy Parenteral antibiotics usage pattern

TABLE 4 : Prescribing pattern of parenteral antibiotics

Parenteral antibiotics prescribed	No. of drugs	Percentage
Ceftriaxone	314	62.92
Cefotaxime	1	0.20
Cefoperazone + Sulbactam	18	3.60
Piperacillin + Tazobactum	1	0.20
Ciprofloxacin	2	0.40
Amikacin	88	17.63
Gentamicin	1	0.20
Imipenem	1	0.20
Linezolid	4	0.80
Metronidazole	69	13.82

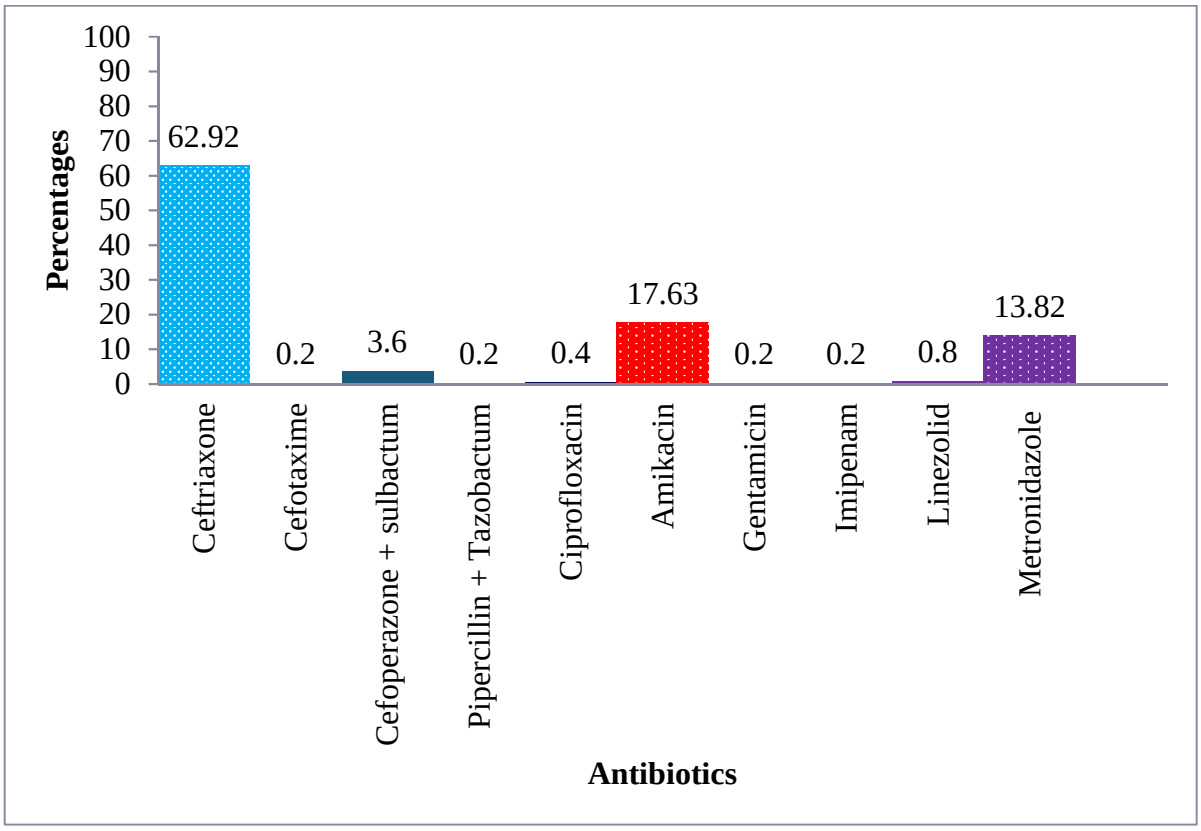


Figure 9 : Bar diagram showing prescribing pattern of parenteral antibiotics Oral antibiotics usage pattern

Table 5 : Oral antibiotics prescribed in study subjects

Oral antibiotics prescribed	No. of drugs	Percentage
Ampicillin	1	0.32
Cefixime	173	56.5
Ceftazidime	99	28.86
Cefpodoxime	2	0.65
Ciprofloxacin	3	0.98
Norfloxacin	1	0.32
Ofloxacin	4	1.30
Levofloxacin	1	0.32
Azithromycin	2	0.65
Linezolid	7	2.28
Clindamycin	3	0.98
Nitrofurantoin	1	0.32
Amoxicillin + clavulanic acid	6	1.96
Trimethoprim + sulfamethoxazole	3	0.98

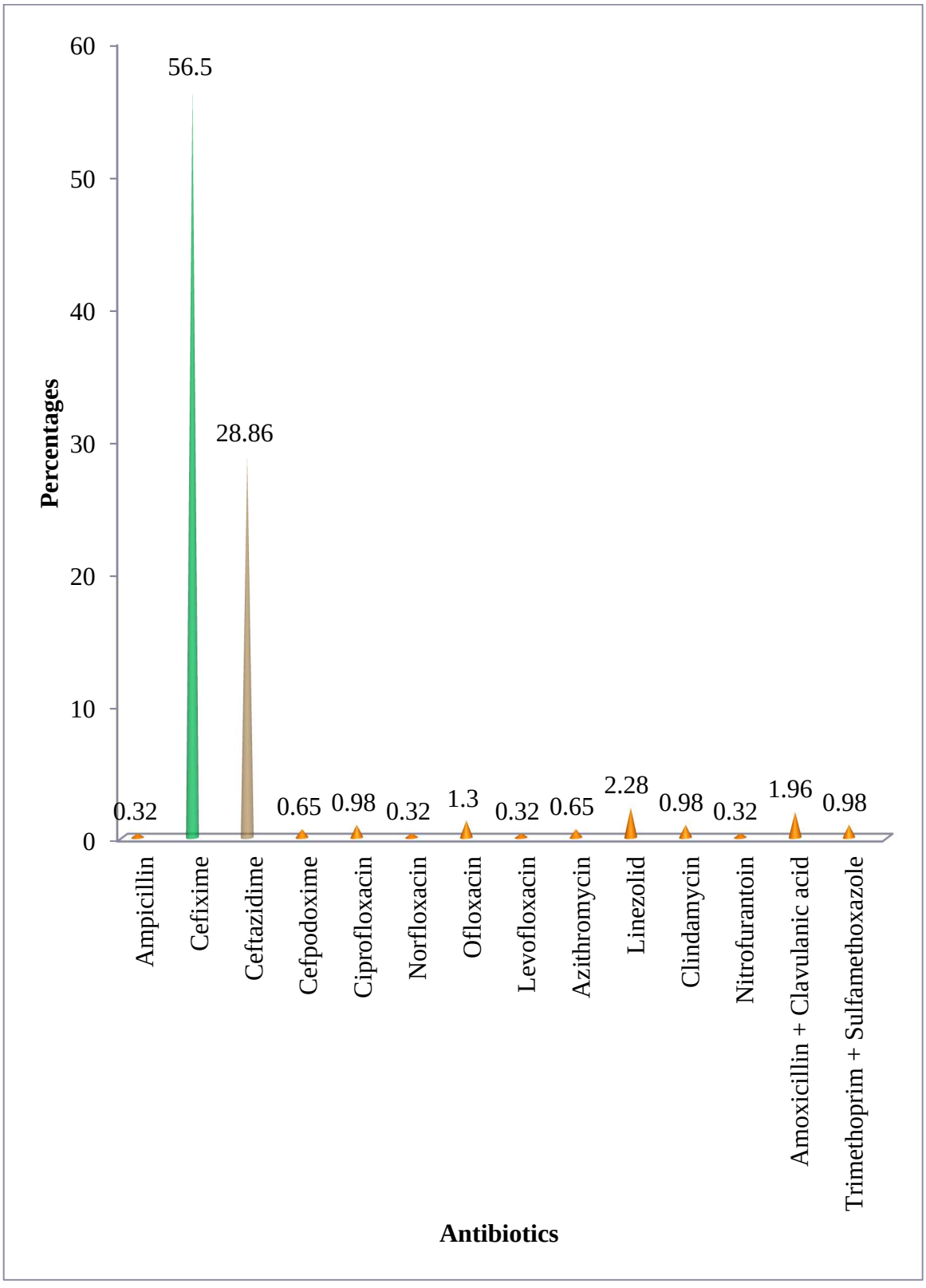


Figure 10 : Oral antibiotics prescribed Parenteral therapy vs. oral therapy of Antibiotics

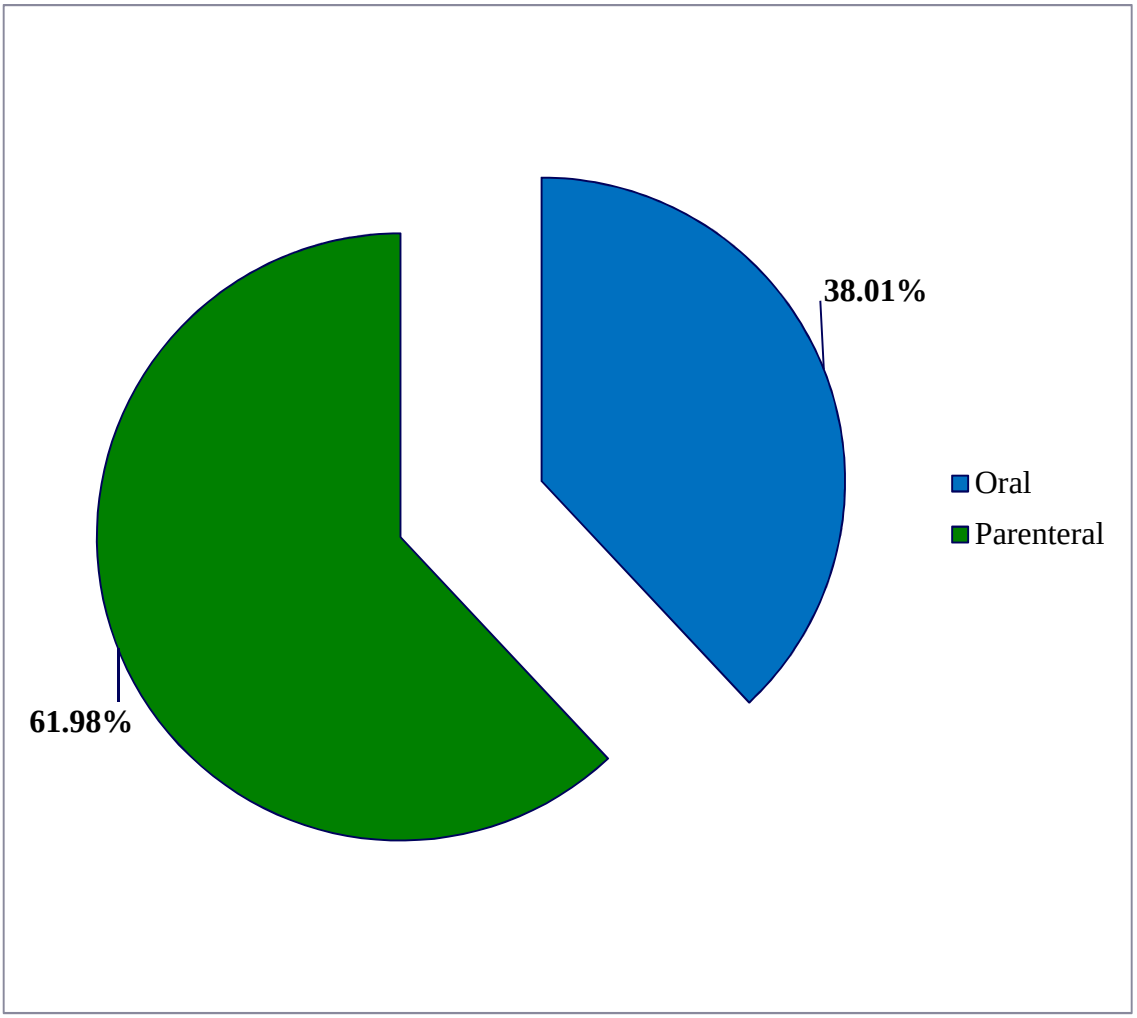


Figure 11 : Parenteral therapy vs. oral therapy of Antibiotics

Antibiotic usage in different clinical conditions

TABLE 6 : Utilization pattern of various Antibiotics prescribed in different Clinical Conditions

Class of Antibiotic	Indication											
	Fracture of radius, ulna and humerus		Fracture of tibia, fibula and femur		Hip fracture		Multiple fractures		Arthritis		Miscellaneous	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Penicillin	1	1.42	3	1.60	0	0	0	0	1	6.25	4	10.25
Cephalosporins	62	88.57	187	100	24	100	7	100	16	100	39	100
Aminoglycosides	16	22.85	53	28.34	5	20.83	4	57.14	1	6.25	7	17.94
Nitroimidazole	10	14.28	42	22.45	4	16.11	3	42.85	0	0	7	17.94
Oxozolidones	2	2.85	11	5.88	0	0	1	14.2	2	12.5	2	5.12
Lincosamide	0	0	3	1.60	0	0	1	14.2	0	0	1	2.56
Fluoroquinolones	3	4.28	5	2.67	0	0	0	0	1	6.25	4	10.25
Macrolides	0	0	1	0.53	0	0	0	0	0	0	1	2.56
Carbapenem	0	0	1	0.53	0	0	0	0	0	0	0	0
Nitrofurantoin	0	0	1	0.53	0	0	0	0	0	0	0	0
Sulfonamides	0	1.42	0	0	0	0	0	0	0	0	1	2.56

Figure 12 : Bar diagram representing various Antibiotics prescribed in different Clinical Conditions Analgesic class prescription

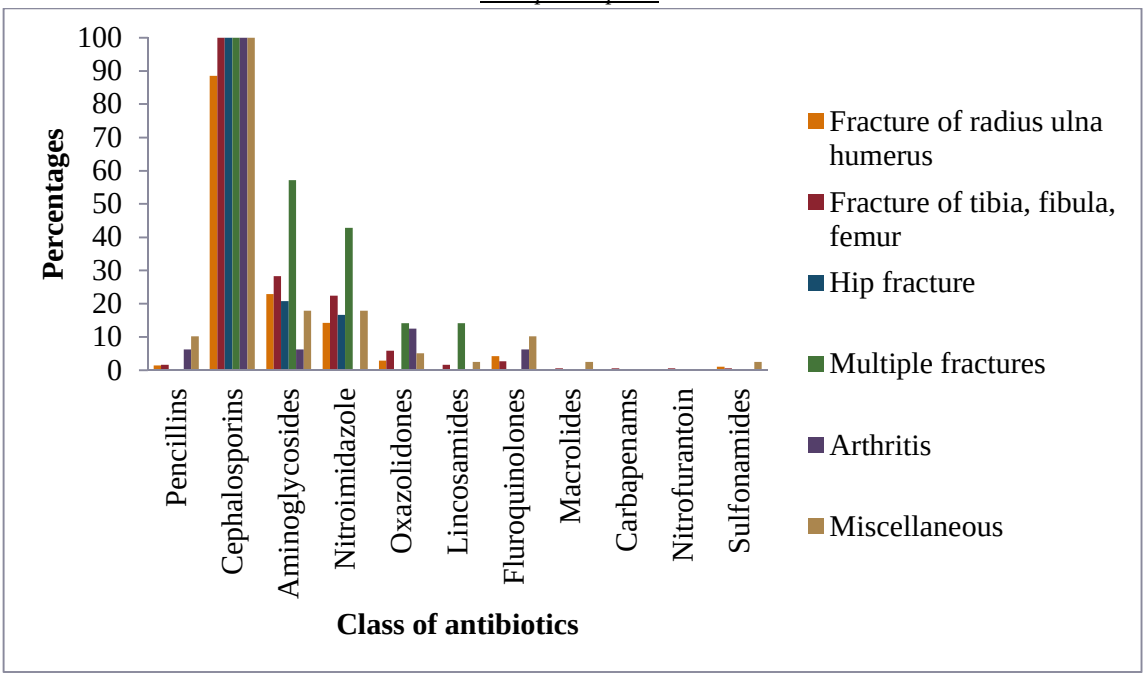


TABLE 7 : Class of analgesics prescribed

Class of analgesic	No. of drugs	Percentage
NSAIDS	164	47.81
Non opioid analgesics	66	19.24
Opioid	1	0.29
Paracetamol	128	37.31
Combination		
Aceclofenac + Paracetamol	278	81.04
Tramadol + Paracetamol	112	32.65

Figure 13 : Bar diagram representing class of analgesics prescribed Monthly usage of analgesics

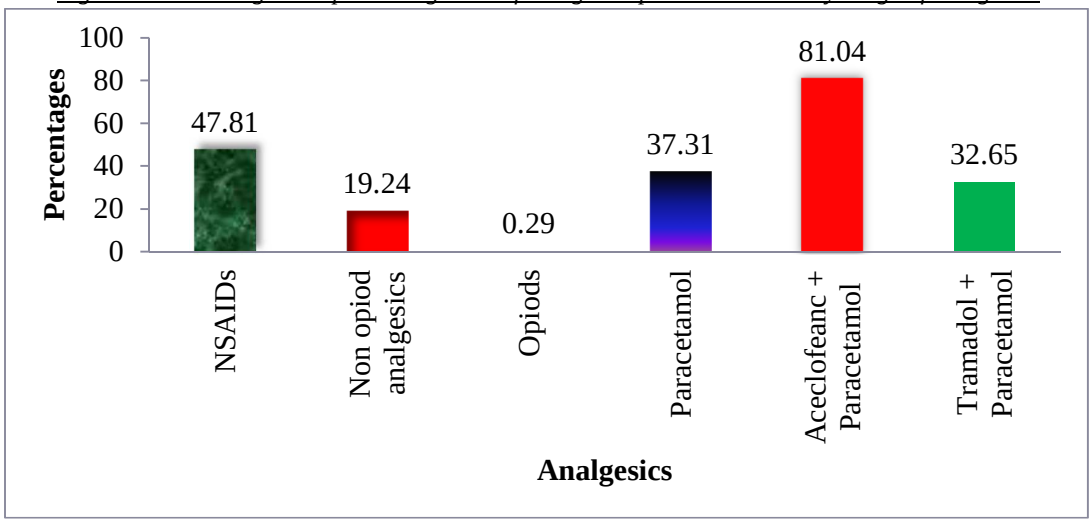


Figure 14 : Month wise prescribing pattern of Analgesics Individual analgesics prescribed

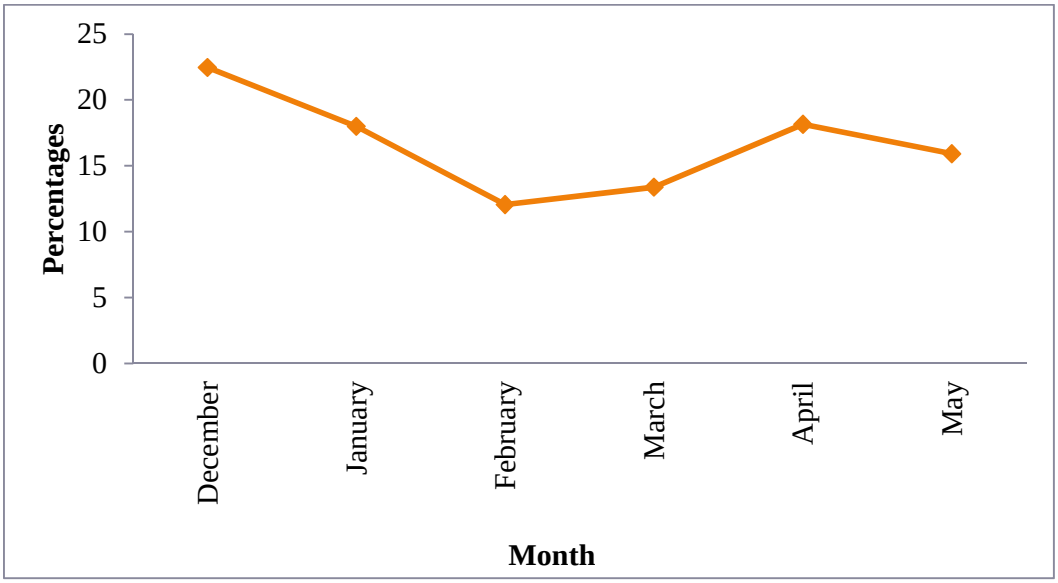


TABLE 8 : Prescribing pattern of individual analgesics

Name of analgesic	No. of drugs	Percentage
Diclofenac	150	43.73
Aceclofenac	2	0.58
Indomethacin	5	1.45
Ibuprofen	5	1.45
Tramadol	66	19.24
Paracetamol	154	44.89
Mefenamic acid	1	0.29
Naproxen	1	0.29
Tramadol + Paracetamol	112	32.65
Aceclofenac + Paracetamol	278	81.04
Diclofenac + Paracetamol	1	0.29

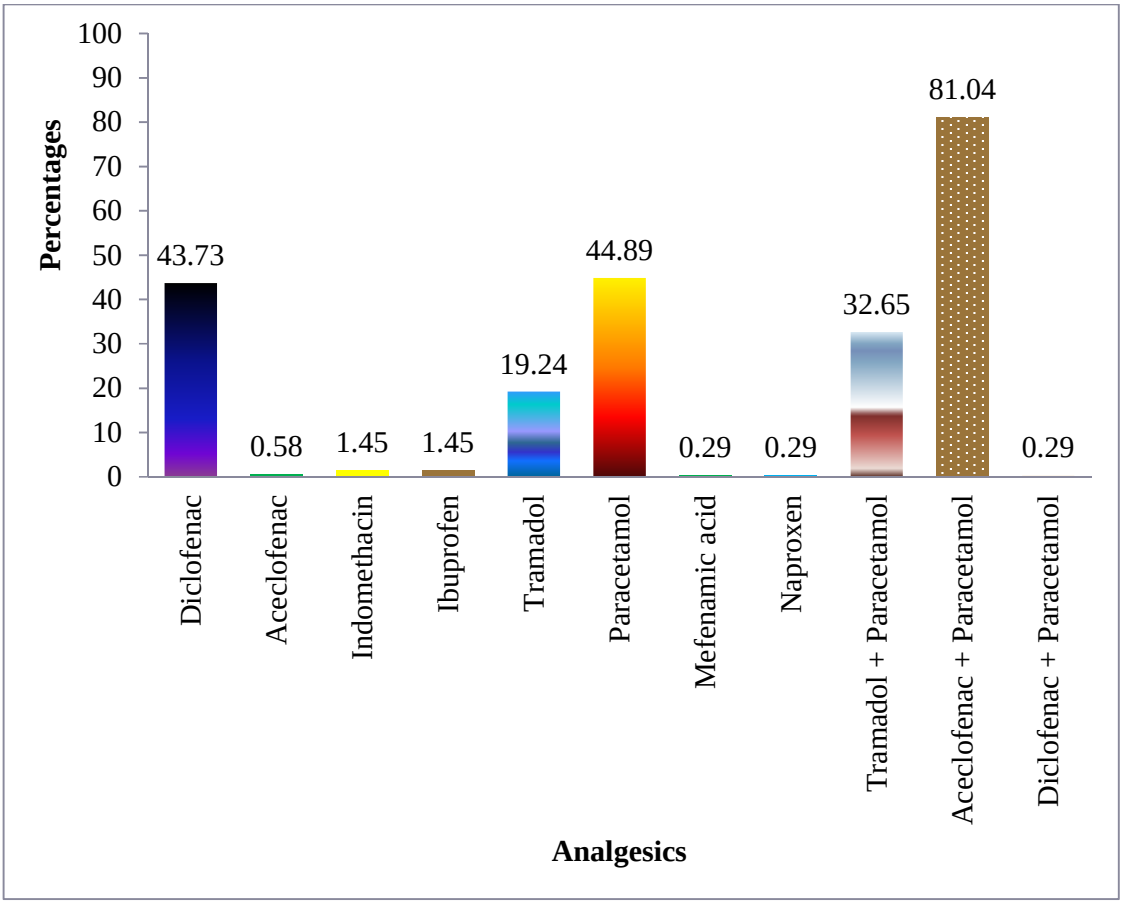


Figure 15 : Pattern of usage of individual analgesics Monotherapy vs. Combination therapy

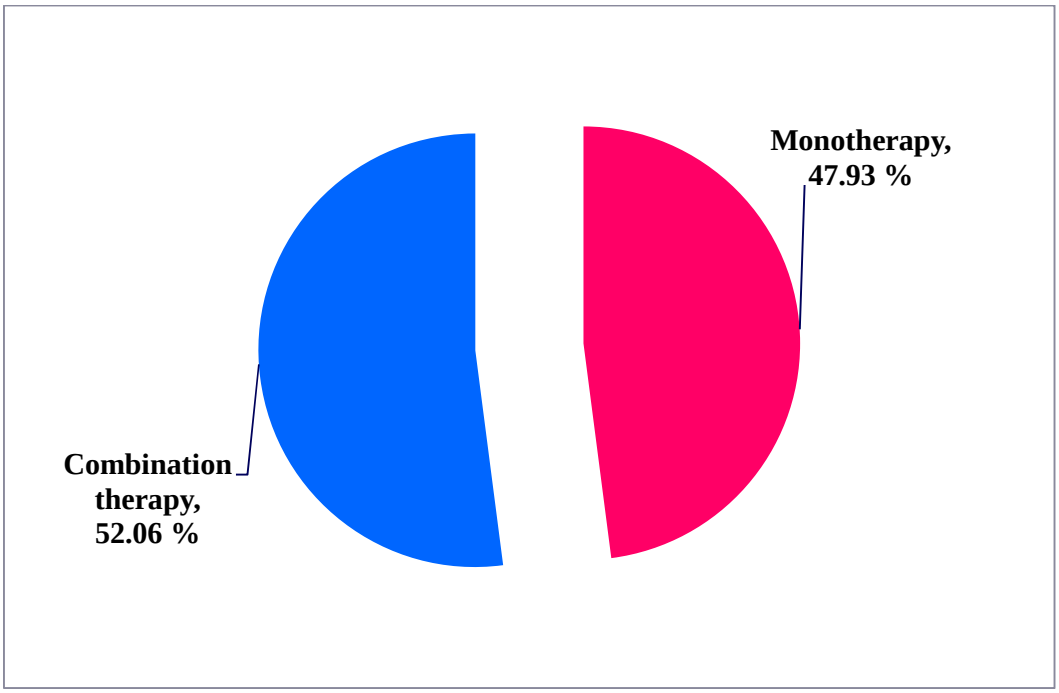


Figure 16 : Percentage of analgesics prescribed in Monotherapy and Combination therapy Parenteral therapy vs. oral therapy of Analgesics

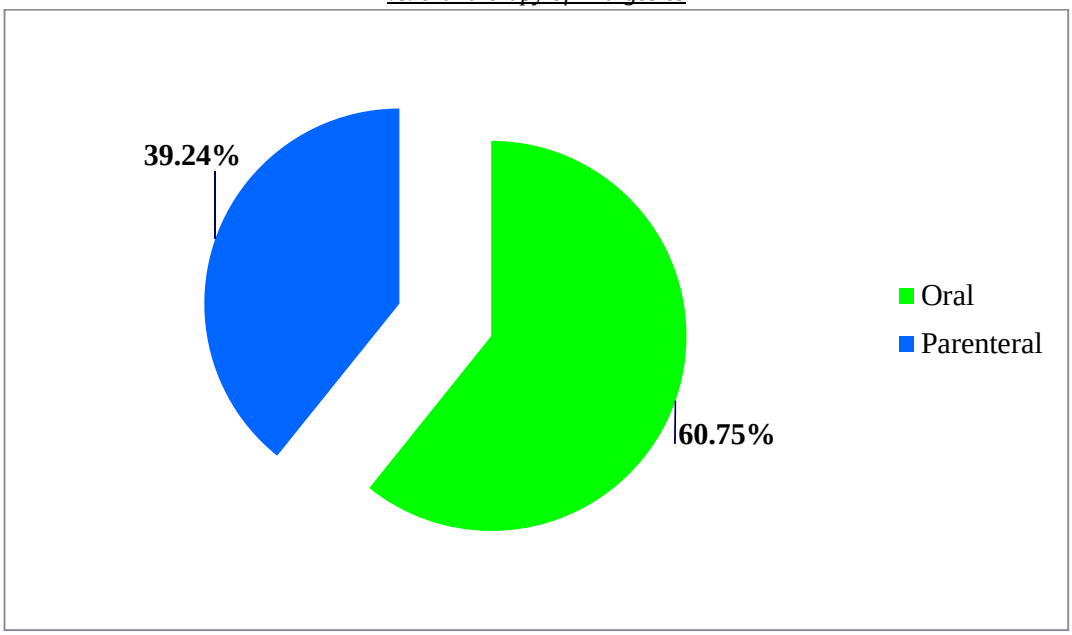


Figure 17 : Parenteral therapy vs. oral therapy of Analgesics Antibiotic prescribing appropriateness in study population

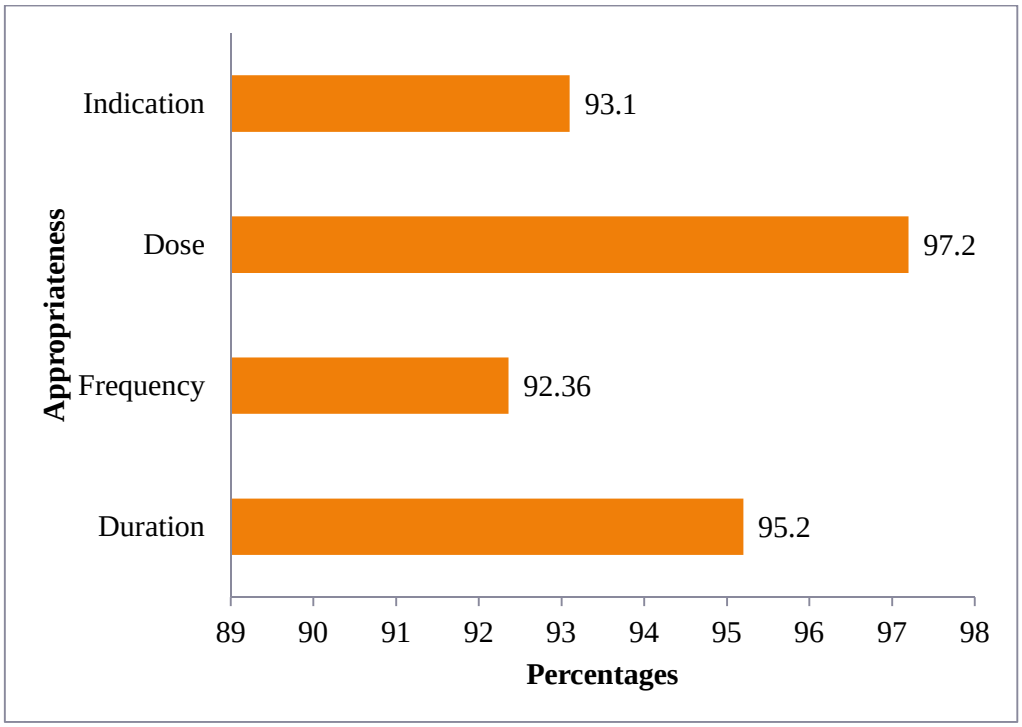


Figure 18 : Overall appropriateness of use of antibiotics Antibiotic prescribing appropriateness in study population

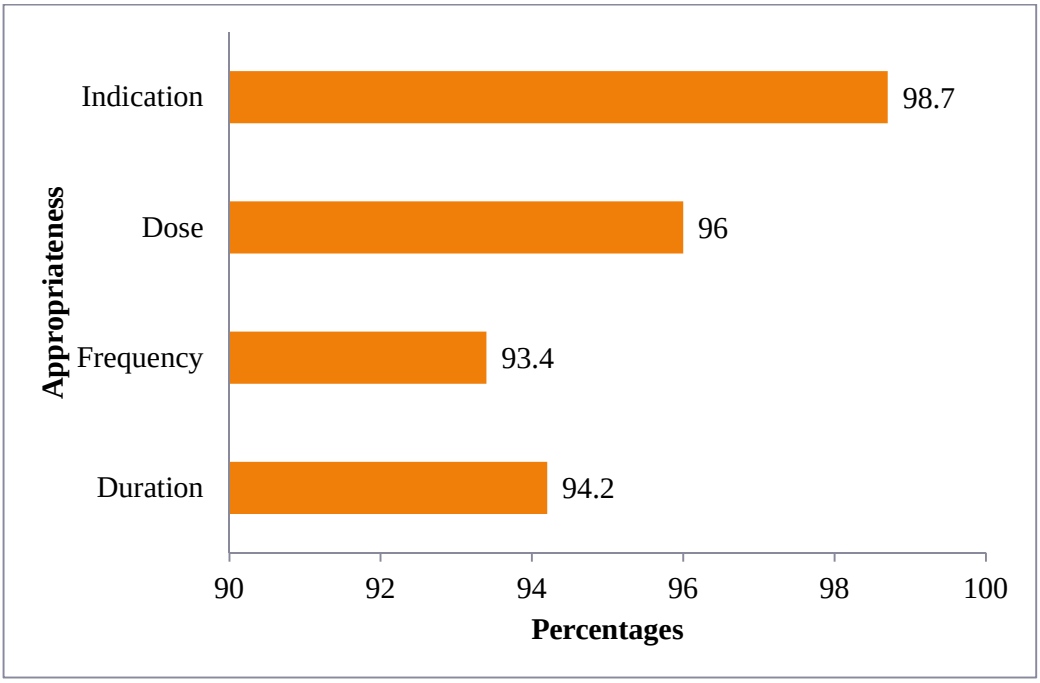


Figure 19 : Overall appropriateness of use of analgesic Antibiotics vs. analgesics comparison according to age groups

Table 9 : Comparison of antibiotic and analgesics utilization in the subjects according to age groups

Age	Antibiotics		Analgesics	
	Number	Percentage	Number	Percentage
<18	45	8.9	51	9.4
18 -29	92	18.2	94	17.5
30 -39	84	16.6	93	17.3
40 -49	91	18	86	16.0
50 -59	79	15.6	77	14.3
60 -69	70	13.8	71	13.2
70 -79	36	7.1	48	8.9
80 -89	8	1.5	17	3.6

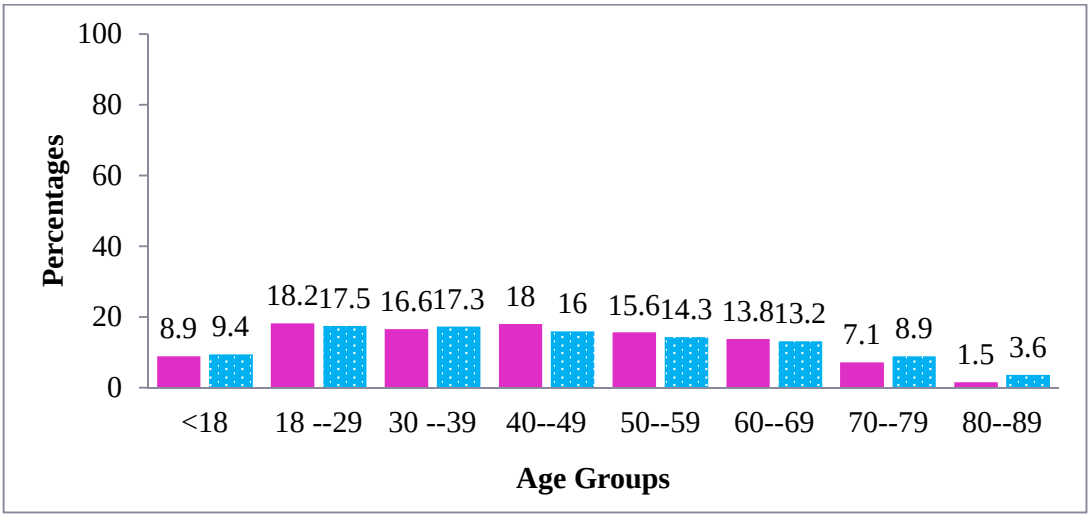


Figure 20 : Bar diagram comparing antibiotics with analgesics usage Incidence of Drug Interactions

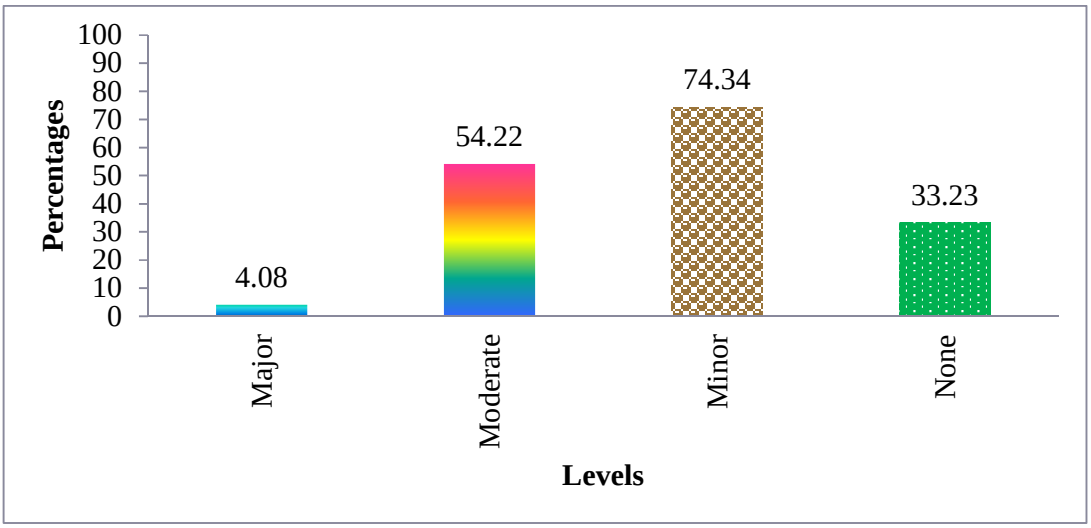


Figure 21 : Levels of incidence of Drug Interactions

Table 10 : Incidence of adverse drug reactions

Drug	Adverse Drug Reaction
Tab. Rifampicin (300 mg, OD)	Gastritis (1)
Tab. Aceclofenac & Paracetamol (100 mg + 500 mg, BD)	Itching and wheals (1)
Tab. Tramadol & Acetaminophen (37.5 mg + 325 mg BD)	Constipation (2)
Tab. Risperidone (2mg, OD)	Headache, Blurred vision, Difficulty in hearing (2)

Table 11 : Pharmacoeconomic analysis: Prescription cost indicators

Cost indicator	Value
Total cost of prescriptions	13,24,433.51Rupees
Average cost of prescription per day (mean and standard deviation)	226.315 ± 299.232
Average cost of drugs per prescription (mean and standard deviation)	3861.322 ± 3669.844
Number of prescriptions <Rs1000.00	45
Number of prescriptions >Rs1000.00	298

DISCUSSION:

In general practice, the therapeutic approach for Orthopedic disease conditions is primarily empirical and the main aim of the clinicians is to treat as specifically as possible. The present study was focused on evaluation of prescribing pattern of antibiotics and analgesics in indoor patient (IPD) of Orthopedics department.

Our study had shown significant differences in the use of antibiotics in different age groups. The use of antibiotics was higher i.e., 18.07% in the age group of 18 - 29 years while it was least in patients aged 80 - 89 yearsi.e., 2.62%. In our study, 8.74 % of patients presented with co-morbidities and majority were in the age group of years 70 – 79. It is obvious that the number of drugs administered will increase with the increase in the number of co-morbidities. Upon evaluation it was observed that Cephalosporins class (97.64%) of antibiotics were widely used, followed by Aminoglycosides (25.36%). In a study conducted by M. Radji et al.,[61] found that Cephalosporins were the most frequently prescribed antibiotic in Orthopedic department. Many studies have reported the higher incidence of use of Cephalosporins. However, this finding of our study is in alike to a study conducted by M. Hassan et al.,[59], M. Radji et al.,[61]. The reason for the increased use of Cephalosporin class of drugs in our study was not only because of its wide coverage but also the influence of individual physicians prescribing habit.

Of the 343 case sheets reviewed, the incidence of use of antibiotics was found to be 97.66%. The reason, antibiotics were prescribed to such a large extent is due to the large number of patients who presented to the hospital with different types of clinical indications. In our study, majority of the patients presented with conditions like Fracture of radius, ulna and humerus, Fracture of tibia, fibula and femur, Hip fracture, Multiple fractures and Arthritis etc. The incidence of use of antibiotics observed in our study coincides with the study conducted by R. Queiroz et al.,[54] wherethe incidence rate was reported to be 81.7 %. In our study there were very little differences in the incidence of use of antibiotics between various conditions, which ranged only from 88.57 – 100 % (Cephalosporins), 28.34 – 57.14% (Aminoglycosides), 6.25 – 10.25% (Penicillin's), 22.45 – 42.85% (Nitroimidazole), 5.88 – 14.2% (Oxozolidones), 2.56 -14.2 % (Lincosamides), 6.25 – 10.25 % (Fluoroquinolones), 0.53 – 2.56 % (Macrolides), 0 - 0.53% (Carbapenems, Nitrofurantoin), 1.42 – 2.56 % (Sulfonamides). This finding may perhaps reveal that the majority of patients admitted were presented with Fracture of tibia, fibula and femur, Hip fracture, Multiple fractures and Arthritis except Fracture of radius, ulna and humerus.The month wise incidence of use of antibiotics and analgesics did not vary much during the study period (Range: 98.87 % to 99. 98%). This finding of our study does coincide with the results of the study conducted by SK. Ubedulla et al.,[88] wherein 15.64% - 40.13 % increase in the antibiotic use was reported over a period of 2 months. This could mainly be due to difference in

the study period between these two studies. Since our study was conducted for 6 months. We observed significant increase in the use of antibiotics and analgesics.

Among the antibiotics prescribed Ceftriaxone (99.54%) was widely used, especially in the treatment of Fracture of radius, ulna and humerus, Fracture of tibia, fibula and femur, Hip fracture, Multiple fractures and Arthritis. Of the total prescriptions, antibiotics were prescribed 94 times to treat fracture of radius, ulna and humerus, whereas in case of treatment of fracture of tibia, fibula and femur, antibiotics were prescribed 307 times. In most cases, the prevalence of a particular infection had an influence on the choice of antibiotic prescribed. However, in few cases physician preference influenced the choices of antibiotic used. For example, cephalosporins were widely used in the treatment of conditions like Fracture of tibia, fibula and femur, Hip fracture, Multiple fractures and Arthritis. Unindicated use of the cephalosporin class of antibiotics has contributed to the increased frequency of use of these agents. The majority of prescriptions were made after taking into consideration the type of infection, area infected, infecting organism, severity of infection and culture sensitivity based on the recommendations made in standard text books and most recent relevant literature. However there were prescriptions that were based on clinical experience.

In our study, majority 62.39% of the patients who received antibiotics and analgesics were male. This was due to the fact that more males than females (males-214, females-129) were admitted for the treatment of fractures which were majorly due to accidents and falls. This finding was similar to a study conducted by B.P Srividya et al.,[91], in which males took a large part of the study population.

In our study, 96 (28.65%) patients received combination therapy while 239 (71.34%) patients received monotherapy. The combination therapy was prescribed with an intention to cover all the possible causative organisms for the particular disease condition especially when the causative organism was not identified. Combination therapy was used in cases where there were multiple infections. Combination therapy was also used in case of infections caused by microorganisms that required multiple drug therapy, as in case of Septic Arthritis, Chronic synovitis. For example a combination of Cefoperazone +Sulbactam, Amikacin, Metronidazole was prescribed in our hospital to control and manage Pre and Postoperative infections, when used alone. Monotherapy was used, when the particular causative organism was known. Monotherapy was used more frequently in patients who were less prone to infections with known causative organism.

In our study, it was observed that parenteral followed by oral therapy i.e., 99.77% was the regimen used more often than oral therapy 67.88% alone for the treatment of infections. Those patients who had severe infections were prescribed with parenteral therapy. Patients were administered with parenteral therapy for their severe conditions. As the patient's condition improved, the parenteral route was changed to oral. Patients with less severe infections were started with oral therapy. Oral therapy was used because it was easy to administer, would cause minimum discomfort to the patient, it would cost less and ensure better compliance to the treatment. Parenteral therapy was used alone when a particular antibiotic prescribed against a particular disease was available only in the parenteral form. The selection of proper route of antibiotic depends on severity of infection and bioavailability. The use of parenteral route was preferred for faster onset of action and for the management of severely disabled and non-co-operative patients. The appropriateness of use of antibiotics was assessed considering parameters such as indication, dose, duration and frequency. The appropriateness of use of antibiotics in Orthopedic ward for indication, dose, frequency and duration was found to be 93.10%, 97.20%, 92.36% and 95.2% respectively. It is likely that appropriateness of prescribing was based on the recommendations of standard texts, evidence based literature and also after considering the culture and sensitivity reports.

In our study appropriateness of use of antibiotics was high for duration and dose compared to a study conducted by Sk. Ubedulla et al.,[88] where it was reported that the appropriateness of use of antimicrobial prophylaxis was low. The most frequently encountered inappropriateness, with regard to use of antibiotics in our study, were due to the use of antibiotics without proper indication, use of antibiotics without doing proper culture and susceptibility testing and also inappropriate choice of antibiotic, inappropriate frequency and over/under dose of antibiotics.

Of the 343 prescriptions reviewed, a total of 229 (66.76%) interactions were identified.

Interactions with significance level Major (4.08%) followed by Moderate (54.22%), and Minor (74.34%). These interactions are probably due to the exposure of the patient to multiple drugs. For example: Rabeprazole decreases the effectiveness of Clopidogrel in preventing heart diseases, Diclofenac and Enoxaparin when taken together may increase the risk of bleeding which were major drug interactions. When Azithromycin is taken with Risperidone there is an increased risk of irregular heart rhythm which is serious and potentially life threatening, Calcium carbonate decreases the effect of Amlodipine which were moderate drug interactions. Ranitidine may potentiate the Hepatotoxicity of Acetaminophen, Calcium carbonate may decrease the plasma concentration of Ranitidine which were minor drug interactions.

These interactions associated with the use of antibiotics, can be avoided by checking for existence and incidence of interaction in standard texts, before a drug is administered and then deciding whether or not it should be added to therapy.

The incidence of causing adverse drug reaction in the Orthopedics ward was found to be 0.01% (n=6). 6 adverse drug reactions were reported during the study period, among these 'moderate' 0.01 % types of reactions. It was compared with a study conducted by V. Siva sankari et al.,[114] where it had shown 11 ADRs but our study had reported only 6 ADRs.

Mild reactions did not require the drug therapy to be withheld or changed in any way, nor did it require treatment or cause an increase in the length of hospital stay E.g.:- rashes, vomiting, diarrhea etc. Moderate reactions increased the length of stay in the hospital and required that the suspected drug should be discontinued or changed E.g.:- Jaundice, erythematous papules etc. Severe reactions like Steven-Johnson's syndrome, anaphylactic reactions etc. required intensive medical care. In almost all cases antibiotics were discontinued as a first line treatment/management. In most of the cases patients were treated either symptomatically or specifically for the adverse drug reaction.

Antibiotic and analgesic prescribing is common in our hospital set up. However the use of antibiotics as a definite therapy was low. Our study revealed, although not to a greater extent, inappropriate use of antibiotics and analgesics. There is a great need for the adoption of various strategies to prevent/minimize the inappropriate use of antibiotics as well as analgesics in order to improve the quality use of medicines. As many number of significant interactions were found, designing and implementation of mechanisms which constantly monitor the potential interactions and is needed.

In our study, total cost of prescriptions was found to be 13, 24, 433.51 rupees in a period of 6 months. Average cost of prescription per day of mean ± standard deviation 226.315 ± 299.232. Mean and standard deviation of average cost of drugs per prescription was 3861.322 ± 3669.844 respectively.

There is a great need for the adoption of various strategies to prevent/minimize the inappropriate use of antibiotics and analgesics in order to improve the quality use of medicines. As many number of significant interactions were found, designing and implementation of mechanisms which constantly monitor the potential interactions and adverse drug events is needed.

CONCLUSION:

The incidence of use of antibiotics in the Orthopedics ward was found to be 97.66%. Cephalosporin (88.57%) class of antibiotics was the most frequently used followed by Aminoglycosides (20.11%). In our study, Ceftriaxone (91.54%) was widely used in the treatment of Fracture of radius, ulna and humerus, while Aminoglycosides (43.47%) was most commonly used in the treatment of Fracture of tibia, fibula and femur. The parenteral followed by oral (99%) route is the most common regimen used to treat infections especially in patients whose conditions are severe. In our study, 72% of patients received monotherapy while 28% of patients received combination therapy. The overall appropriateness of use of antibiotics in patients with regard to indication, dose, frequency and duration of antibiotic therapy was found to be 93.10%, 97.20%, 92.36% and 95.2% respectively. The incidence of interactions, among our study patients was found to be 66.76%. Of the total of 6(0.01%) adverse drug reactions reported. Antibiotic prescribing is common in our hospital set up. However the use of antibiotics as a definite therapy was low. Our study revealed, although not to a greater extent, inappropriate use of antibiotics. There is a great need for the adoption of various strategies to prevent/minimize the inappropriate use of antibiotics and analgesics in order to improve the quality use of medicines. As many number of significant interactions were found, designing and

implementation of mechanisms which constantly monitor the potential interactions and adverse drug events is needed.

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REFERENCES:

1. P.Maheshwari, D. Praveen and V.Ravichandiran, Drug Utilization Evaluation of Analgesics in Tertiary Care Teaching Hospital, International Journal of Frontiers in Science and Technology, 2014, 2(1), 57-65.
2. Pbmvagov.1.Pbmvagov.http://www.pbm.va.gov/vacenterformedicationsafety/tools/MUEToolkit.pdf
3. Whoint. 1. Whoint. http://apps.who.int/medicinedocs/en/d/Js4876e/3.7.html
4. American Society of Health-System Pharmacists. ASHP guidelines on medication-use evaluation. American Journal of Health System Pharmacy, 1996, 53, 1953.
5. Prescribing & Medicines Team Health and Social Care Information Centre, Prescription Cost Analysis England 2014, V1.0.
6. A. Ghosh Amit Kumar, D. Dalai Chanchal Kumar, K. Ajay and R. Madhumita, Drug Utilization Study on Antibiotics Use in an Orthopedics Department of a Tertiary Care Hospital in West Bengal, Journal of Drug Delivery & Therapeutics, 2013, 3(2), 98-103.
7. T. Kumarasingam, S. Revathy and D. Mukherjee, Drug Utilization Pattern of Analgesics among Postoperative Patients in a Tertiary Care Hospital, Der Pharmacia Lettre, 2014, 6 (3), 40-46
8. D. Pranit Shah, R. Vihar Upadhyay, A. Maheshwari and Y. Nikhil, Analysis of Analgesic Drugs Effectiveness in the Orthopedic Patients of Teaching Hospital, World Journal of Pharmacy and Pharmaceutical Sciences, 2016, 5(1), 749-763.
9. R. Asawari, R. Goutham, P. Sanjay andN. Dalvi, Comparative Efficacy of Combined use of Diclofenac with Thiocolchicoside and Diclofenac alone in Orthopedic Patients, International Research Journal Of Pharmacy, 2013, 4(2), 164-166.
10. R. Navarro, Drug Utilization Review Strategies. In Managed Care Pharmacy Practice, 2008, 215 – 229.
11. World Health Organization Collaborating Centre for Drug Utilization Research and Clinical Pharmacological Services, Introduction to Drug Utilization Research, 2003.
12. Amcporg. 1. Amcporg http://www.amcp.org/WorkArea/DownloadAsset.aspx?id=9296
13. Whoint. 1. Whoint. http://www.who.int/medicines/technical.../tbs/11-PG_Drug-Use-Evaluation_final-08.pdf
14. American Society of Health-System Pharmacists, Mission statement of the American Society of Health System Pharmacists, American Journal of Health-System Pharmacy, 2001, 58, 1524.
15. Hamiltoncountypreppersorg.1.Hamiltoncountypreppersorg.http://www.hamiltoncountypreppers.org/Antibiotics_and_Their_Types.pdf.
16. Cunicz.1.Cunicz.http://old.lf3.cuni.cz/studium/materialy/infekce/en_atb.pdf.
17. Emedexpertcom.1.Emedexpertcom.http://www.emedexpert.com/classes/antibiotics.shtml.
18. Orthobulletscom.1.Orthobulletscom.http://www.orthobullets.com/basic-science/9059/antibiotic-classification-and-mechanism.
19. Nihgov.1.Nihgov.http://livertox.nih.gov/NonsteroidalAntiinflammatoryDrugs.htm-1.
20. Wwwnhsuk.1.Wwwnhsuk.http://www.nhs.uk/conditions/anti-inflammatories-non-steroidal/Pages/Introduction.aspx
21. Wwwhseie.1.Wwwhseie.https://www.hse.ie/eng/health/az/A/Anti-inflammatories,-non-steroidal
22. Nhsinform.1.Nhsinformcom.http://www.nhsinform.com/health-library/articles/a/antiinflammatories-non-steroidal/how-does-it-work/
23. Vhpharmscicom.1.Vhpharmscicom.http://www.vhpharmsci.com/vhformulary/Tools/NSAID-Classification.htm.
24. Medscapecom.1.Medscapecom.http://emedicine.medscape.com/article/2172136-overview.
25. Emprcom.1.Emprcom.http://www.empr.com/ultram/drug.
26. Opioidscom.1.Opioidscom.http://opioids.com/tramadol/prescribe.html.
27. Webmdcom.1.Webmdcom.http://www.webmd.com/drugs/2/drug-21823/tramadol acetaminophen-oral/details.
28. Drugbankca.1.Drugbankca.http://www.drugbank.ca/drugs/DB00193..

29. Webmdcom.1.Webmdcom.http://www.webmd.com/drugs/2/drug-57595/paracetamol-oral/details.
30. Drugbankca.1.Drugbankca.http://www.drugbank.ca/drugs/DB09288.
31. http://patient.info/medicine/paracetamol-calpol-disprol-hedex-panadol
32. Tgagovau.1.TherapeuticGoodsAdministration(TGA).https://www.tga.gov.au/community-qa/recommended-paracetamol-doses.
33. GrahamggandScottkf.1.Nihgov.http://www.ncbi.nlm.nih.gov/pubmed/15662292.
34. Drugbankca.1.Drugbankca.http://www.drugbank.ca/drugs/DB00586.
35. Webmdcom.1.Webmdcom.http://www.webmd.com/drugs/2/drug-4284-4049/diclofenac-oral/diclofenac-sodium-enteric-coated-tablet---oral/details.
36. Rxlistcom.1.RxList.http://www.rxlist.com/voltaren-drug/indications-dosage.htm.
37. Webmdcom.1.Webmdcom.http://www.webmd.com/drugs/2/drug-8880-5186/indomethacin-oral/indomethacin---oral/details.
38. Rxlistcom.1.RxList.http://www.rxlist.com/indocin-drug/indications-dosage.htm.
39. Drugbankca.1.Drugbankca.http://www.drugbank.ca/drugs/DB00652.
40. Webmdcom.1.Webmdcom.http://www.webmd.com/drugs/2/drug-2841/pentazocine-naloxone-oral/details.
41. L.Trask.Chapter1.Pharmacoeconomics:Principles,Methods,andApplications.In:DipiroJT,TalbertRL,YeeGC,MatzkeGR,WellsBG,PoseyL.eds.Pharmacotherapy:APathophysiologicApproach,8e.NewYork,NY:McGraw-Hill;2011.
42. JL.Bootman,RJ.TownsendandWF.McGhan,PrinciplesofPharmacoeconomics,3rdEdition,Cincinnati,OH:HarveyWhitneyBooks,2005.
43. KM.Bungay,LA.Sanchez,TypesofEconomicandHumanisticOutcomesAssessments.InGrauerD,LeeJ,OdomT,etal.,PharmacoeconomicsandOutcomes,2ndEdition,KansasCity,MO:AmericanCollegeofClinicalPharmacy,2003:18–60.
44. S.Byford,J.DavidTorgersonandJ.Raftery,CostofIllnessStudies,BritishMedicalJournal,2000,320(7245),1335.
45. J.Changik,Cost-of-illnessstudies:Concepts,Scopes,andMethods,ClinicalandMolecularHepatology2014,20(4),327-337.
46. L.Allison,R.Moss,PracticalApplicationCriticalEvaluationofCost-of-IllnessStudies,Pharmacoeconomics,2011,29(8),653-671.
47. D.Grauer,J.LeeandT.Odom,PharmacoeconomicsandOutcomes,2nded.KansasCity,MO:AmericanCollegeofClinicalPharmacy,2003,103–114.
48. J.Barner,k.Rascati,Cost-benefitanalysis:PharmacoeconomicsandOutcomes,2ndEdition,KansasCity,MO:AmericanCollegeofClinicalPharmacy,2003,115–132.
49. T.Tan-TorresEdejer,R.Baltussen,T.Adam,R.Hutbessy,A.Acharya,D.B.EvansandC.J.L.Murray,MakingChoicesinHealth:WHOGuideToCostEffectivenessAnalysis,4-6.
50. K.Rajarathna,M.Kavitha,M.Vishwanath,R.Swamy,K.Anjali,D.SnehaSeshu,S.HosthotaandA.Muraraiah,EvaluationofWHOPrescribingIndicatorsAmongOrthopaedicInpatientsataTertiaryCareHospital,JournalofChemical&PharmaceuticalResearch,2014,6(8),278.
51. B.Indranil,B.TaniaandA.Mukesh,PrescribingPatterninOrthopedicsOutpatientDepartmentofaMedicalCollegeinIndia,InternationalJournalofBasic&ClinicalPharmacology,2015,4(6),1175-1177.
52. P.R.Shankar,RPai,AKDubeyandDKUpadhyay,PrescribingPatternsintheOrthopedicsOutpatientDepartmentinaTeachingHospitalinPokhara,WesternNepal,2007,5(1),16-17.
53. S.SejutiBithi,Md.MinhazurRahmanKhanandMd.AhsanUllahKhan,DrugUtilizationStudyinOrthopedicUnits:AntibioticsPrescribedinHospitalOut-patientsinDhaka,Bangladesh,InternationalCurrentPharmaceuticalJournal,2014,3(9),318-321.
54. R.Queiroz1,S.RenatoGrinbaum,L.Luciana,G.FernandoandG.Bergsten-Mendes,AntibioticProphylaxisinOrthopedicSurgeries:TheResultsofanImplementedProtocol,TheBrazilianJournalofInfectiousDiseases,2005,9(3),283-287.
55. I.Mehmet,Sk.MustafaDogan,Sk.SeyitAliGumustas,Sk.IbrahimYilmaz,B.Bilir,O.Guler,G.SaracogluandM.Mahirogullari,EvaluationofAntibioticAlternativesThatAreUsedinOrthopedicDepartmentsofTwoDistinctHospitalsAccordingtoRationalUseofAntibiotics,TheJournalofKartalTrainingandResearchHospital,doi:10.5505/jkartaltr.2016.76148.
56. A.Sileshi,T.Admasu,M.FeyissaandW.Shibeshi,EvaluationofCeftriaxoneUtilizationinMedicalandEmergencyWardsofTikurAnbessaSpecializedHospital:AProspectiveCross-sectionalStudy,Bio Med Central PharmacologyandToxicology,2016,17:7.
57. H.Lee,J.Dongsik,J.SupYeomandS.JunSeong,EvaluationofCeftriaxoneUtilizationatMulticenterStud

y,TheKoreanJournalofInternalMedicine,2009,24(4),374-380.
58. P.Mathur,T.Vivek,S.Satyapriya,K.FarooqueandM.C.Isra,ImplementationofaShortCourseofProphylacticAntibioticTreatmentforPreventionofPostoperativeInfectionsinCleanOrthopedicSurgeries,IndianJournalofMedicalResearch, 2013,137,111-116.
59. M.Hassan,O.IbrahimandE.MagdyGuinaidy,SurveillanceofAntibioticUseandResistanceinOrthopedicDepartmentinanEgyptianUniversityHospital,InternationalJournalofInfectionControl,2011,v7:i1doi:10.3396/ijic.V7i1.001.11.
60. J.Meehan,A.Amir,A.JamaliandH.Nguyen,ProphylacticAntibioticsinHipandKneeArthroplasty,TheJournalofBoneandJointSurgery,2009,91,2480-2490.
61. M.Radji,F.AiniandS.Fauziyah,EvaluationofAntibioticProphylaxisAdministrationattheOrthopedicSurgeryClinicofTertiaryHospitalinJakarta,Indonesia,AsianPacificJournalofTropicalDisease,2014,4(3),190-193.
62. Z.Huan,Z.FanjianandC.Ken,SurveyofAntibioticsUsedinOrthopedics,ChinaNationalKnowledgeInfrastructure,2007,02.
63. A.Sharff,P.RichardsandM.Townes,ClinicalManagementofSepticArthritis,CurrentRheumatologyReports,2013,15,332.
64. Z.Yong,H.Zheng,C.HongandX.Lian-hong,EvaluationofUseofAntibioticsinOrthopedicDepartmentinOrthopedics,ChinaNationalKnowledgeInfrastructure,2008,02.
65. M.Yong-lian,X.Yi-wenandF.Sheli,ApplicationofAntibacterialDrugswithMedicationGuideofClinicalPharmacistsinOrthopaedicWard,ChineseMedicalofFactoryandMine,2009,03.
66. X.Yang,Y.Yang-zhen,H.Yong-haoandL.Brendan,PreventiveApplicationofAntibioticsinOrthopedicAsepticOperation,ChineseJournalofNosoconmiology,2005,07.
67. F.Lihong,S.JunandG.Xiaolin,TheValueofGivenAntibioticsRationallyDuringthePerioperationinOrthopedics,ChineseJournalofClinicalMedicine,2006,03.
68. S.Zhenjun,Z.Yali,W.NenpineandZ.Hao,TheRationalityandOccasionofAntibioticsPreventiveApplicationInOrthopedicsOperations,ChineseJournalofAntibiotics,2002,03.
69. X.Zhen,ComparisonoftheEffectofAntibioticsAdministrationinPeri-operativeandPostoperativeOrthopedicsurgery,TheChineseJournalofModernAppliedPharmacy,2003,05.
70. Y.Xiu,O.ZhilianandC.Qiaojie,AnalysisonUsageofPerioperativeAboutAntibioticProphylaxisinDepartmentofOrthopedicsinCenterPeople'sHospital,HebeiMedicine,2010,04.
71. H.AiyongandX.Qiuen,SurveyofBacterialAntibioticsResistanceandAntibioticsApplicationinOrthopedicsInfection,JournalofMedicalResearch,2008,10.
72. W.Wei,G.Rong-guangandL.Hai-bo,ComparisonoftheEffectofAntibioticsAdministrationinPerioperativeandPostoperativeOrthopedicSurgery,ModernPreventiveMedicine,2011,04.
73. Z.JunandT.Cong-qi,TheCorrelationbetweenBoneandJointInfectionstoChangeofAntibioticSpectrum,WestChinaMedicalJournal,2005,01.
74. X.Shu-huaaandX.Cong,AStudyoftheAntibioticsUsedDuringtheOrthopedicsPerioperativePeriod,ActaAcademiaeMedicinaeJiangxi,2006,05.
75. T.S.Padmanabha,K.Bhaskara,G.ManuandT.Chandrakantha,Post-OperativeUtilizationPatternOfAnalgesicsInOrthopedicDepartmentofAnIndianTertiaryCareTeachingHospital,InternationalJournalofCurrentPharmaceutical&ClinicalResearch,2016,6(1),27-31.
76. K.VeronicaFerreiradeAguiar,P.JoseOliveiraCortez,V.EngraciaValenti,F.RochaOliveiraandL.MagalhaesVitorino,PreandPostoperativeAnalgesiaforOrthopedicsurgeries,Rev.dor[online],2015,16(3),166-170.
77. Ee.Ehikhamenor,S.AghoghowaandCc.Azodo,RetrospectiveEvaluationofAntimicrobialPrescribingPatterninaTertiaryHospitalinNigeria,AnnalsofBiomedicalSciences,2010,9(2),49-58.
78. P.R.Shankar,R.Pai,A.K.DubeyandD.K.Upadhyay,PrescribingPatternsintheOrthopedicsOutpatientDepartmentinaTeachingHospitalinPokhara,WesternNepal,2007,5(1),16-17.
79. R.Bhaskar,D.R.Veena,L.Padma,P.AnilKumarandS.Moosaraza,PrescriptionPatternofAnalgesicsinOrthopedicsOutpatientDepartmentataTertiaryCareHospital,InternationalJournalofBasic&ClinicalPharmacology,2015,4(2),250-253.
80. MH.Bourne,AnalgesicsforOrthopedicPostoperativePain,AmericanJournalofOrthopedics(BelleMeadNJ).2004,33(3),12835.
81. C.VillanuevaandPE.Lara,AnalgesicsinOrthopedics,ActaOrthopedicMexicana, 2010,24(2),11422.
82. A.SilvaDiasa,T.RinaldiaandL.GardinBarbosa,TheImpactofPatientsControlledAnalgesiaUndergoin

gOrthopedicSurgery,RevistaBrasileiraDeAnestesiologia,2016,66(3),265-271.
83. T.RussellMigita,J.EileenKleinandM.MichelleGarrison,MPH,SedationandAnalgesiaforPediatricFractureReductionintheEmergencyDepartment,ArchivesofPediatricsandAdolescentMedicineJournal,2006,160(1),4651.
84. R.SeanMorrison,S.Flanagan,D.Fitchburg,A.CintronandL.AlbertSiu,ANovelInterdisciplinaryAnalgesicProgramReducesPainandImprovesFunctioninOlderAdultsafterOrthopedicSurgery,Journaloftheamericangeriatricssociety,2009,57(1),110.
85. R.Tang,H.Evans,A.ChaputandK.Christopher,MultimodalAnalgesiaforHipArthroplasty,OrthopedicsClinic,July2009,40(3),377–387.
86. D.MadalinaAnastase,S.CionacFlorescu,A.Maria Munteanu,T.Ursu,AnalgesicTechniquesinHipandKneeArthroplasty:FromtheDailyPracticetoEvidence-BasedMedicine,AnesthesiologyResearchandPractice,2014.
87. Imakmjcom.1.Imakmjcom.http://www.imakmj.com/articles/PrescribingPatternofAnalgesics.
88. Sk.Ubedulla,N.ChandraSekhar,T.Jayasree,J.ShankarandK.Rohit,PrescriptionTrendsinDepartmentofOrthopedicsatTertiaryCareTeachingHospital,JournalofChemicalandPharmaceuticalResearch,2013,5(11),512-517.
89. M.Afsan,M.M.E.Haque,M.M.AlamandN.Noor,AuditofPrescribingPracticestoEvaluateRationalUseofMedicinesintheOPDofOrthopedicsinaPrivateMedicalCollegeHospital,JournalofShaheedSuhrawardyMedicalCollege,2012,4(2),39-42.
90. D.RashwanandG.FathyEl-Rahmawy,MultimodalAnalgesiaAfterUpperLimbOrthopedicSurgeries:PatientControlledIntravenousLowDoseTramadolAnalgesiaWithorWithoutIntravenousAcetaminophen–Acomparativestudy,EgyptianJournalofAnesthesia,2013,29,231–234.
91. B.P.Srividya,N.S.ShashiKumarandG.Amardeep,RetrospectiveAuditofPrescriptionofDrugsAmongInpatientsofOrthopedicWardsatMedicalCollegeTeachingHospital,Mandya,NationalJournalofPhysiology,PharmacyandPharmacology,2016,6(3),DOI:10.5455/njppp.2016.6.20022016128.
92. B.Jebaraj,S.Maitra,D.KumarBaidyaandP.Khanna,IntravenousParacetamolReducesPostoperativeOpioidConsumptionafterOrthopedicSurgery:ASystematicReviewofClinicalTrials,2013,http://dx.doi.org/10.1155/2013/402510.
93. T.Sharma,S.DuttaandD.C.Dhasmana,PrescribingPatternofNSAIDsinOrthopedicOPDofaTertiaryCareTeachingHospitalinUttaranchal,JournalofMedicalEducation&Research,July-September2006,8(3),160-162.
94. A.Mumm,PreemptiveNon-SteroidalAnti-InflammatoryDrugsforOrthopedicSurgery,SchoolofPhysicianAssistantStudies,2010,225.http://commons.pacificu.edu/pa/225.
95. H.El-Kerdawy,AnalgesicRequirementsforPatientsUndergoingLowerExtremityOrthopedicSurgery,MiddleEastJournalofAnesthesiology,2008,19(5),1013–1026.
96. A.Vallano,J.Llinares,J.M.Arnau,M.Martorell,L.GironaandJ.R.Laporte,ImpactofAnalgesicDrug-UseGuidelinesforTheManagementofPostoperativePain:ADrugUtilizationStudy,InternationalJournalofClinicalPharmacologyandTherapeutics,2003,41(4),165–170.
97. K.Behaeen,N.Sarrafan,S.Nesioonpour,T.GhalamiandM.Soltanzadeh,ComparisonIntravenousPatient-ControlledAnalgesia(PCA)with(Paracetamol+Morphine)and(Paracetamol+Tramadol)forPostoperativePainManagementinOrthopedicSurgeries,ScholarsJournalofAppliedMedicalSciences,2014,2(3A),939-941.
98. J.LoisPizzi,E.JacquesChellyandVanessaMarlin,NursingTimeStudyfortheAdministrationofaPRNOralAnalgesiconanOrthopedicPostoperativeUnit,PainManagementNursing,2013,4(2),1-6.
99. G.FanelliPaoloCherubinoandC.Christian,Opioid UseforChronicPainManagementinItaly:ResultsfromtheOrthopedicInstantPainSurveyProject,Open AccessScientificJournals,2014,6(2),1-6.
100. K.JaeLee,B.WooMin,Ki.CheorBae,C.HyunChoandD.HyunKwon,EfficacyofMultimodalPainControlProtocolintheSettingofTotalHipArthroplasty,ClinicsinOrthopedicSurgery,2009,1,155-160.
101. Y.HongandS.Zhenguo,Peri-operativeUseofAnalgesicsforPatientsUndergoing JointReplacement,EvaluationandAnalysisofDrug UseinHospitalsofChina,2011,04.
102. St.Tanner,S.SpragueandK.Jeray,Users'GuidetotheOrthopedicLiterature:WhatisaCost-effectivenessAnalysis?,IndianJournalofOrthopedics,2008,42(2),126–136.
103. CA.Brauer,PJ.NeumannandAB.Rosen,TrendsinCosteffectivenessAnalysesinOrthopedicSurgery,ClinicalOrthopedics&RelatedResearch,2007,457,42-48.

104. JH.LubowitzandD.Appleby,Cost-effectivenessAnalysisoftheMostCommonOrthopedicSurgeryProcedures:KneeArthroscopyandKneeAnteriorCruciateLigamentReconstruction,Arthroscopy:TheJournalofArthroscopic&RelatedSurgery,2011,27(10),1317–1322.
105. CP.DoughertyandT.Howard,Cost-effectivenessinOrthopedics:ProvidingEssentialInformationtoBothPhysiciansandHealthCarePolicyMakersforAppropriateAllocationofMedicalResources,SportsMedicine&ArthroscopyReview,2013,21(3),166-168.
106. U.BenedictNwachukwuandJ.KevinBozic,UpdatingCostEffectivenessAnalysesinOrthopedicSurgery:Resilienceofthe$50,000perQALYThreshold,TheJournalofArthroplasty,2015,30(7),1118–1120.
107. Sk.SharifiandH.Husham,CostEffectivenessAnalysisinOrthopedicSurgery,YaleMedicineThesisDigitalLibrary,2010,Paper161.
108. JD.Marsh,TB.BirminghamandJR.Giffin,Cost-effectivenessAnalysisofArthroscopicSurgeryComparedWithNon-OperativeManagementforOsteoarthritisofTheKnee,BritishMedicalJournalOpen2016;5:e009949.doi:10.1136/bmjopen-2015-009949.
109. A.Barcelos,P.CelinyRamosGarcia,L.Portela,P.Piva,J.PedroTedescoGarciaandJ.CarlosSantana,ComparisonofTwoAnalgesiaProtocolsfortheTreatmentofPediatricOrthopedicEmergencies,RevistadaAssociacaoMedicaBrasileira,2015,61(4),362-367.
110. M.ChristopherDuncan,K.HallLong,O.Warner,W.PagnanoandJamesR.Hebl,TheEconomicImplicationsofaMultimodalAnalgesicRegimenCombinedwithMinimallyInvasiveOrthopedicSurgery:AComparativeCostStudy,JournalofAnesthesia&ClinicalResearch,1:101.doi:10.4172/2155-6148.1000101.
111. L.Olsson,E.Hansson,I.EkmanandJ.Karlsson,ACostEffectivenessStudyofAPatient-CenteredIntegratedCarePathway,JournalofAdvanced Medicine,2009,65(8),1626–1635.
112. A.TaruIgarashi,M.Akazawa,T.Murata,T.Taguchi,A.Sadosky,N.Ebata,W.Richard,K.Fujii,J.DohertyandM.Kobayashi,Cost-EffectivenessAnalysisofPregabalinforTreatmentofChronicLowBackPaininPatientswithAccompanyingLowerLimbPain(NeuropathicComponent)inJapan,ClinicoEconomicsandOutcomesResearch,2015,7,505–520.
113. S.Huijuan,S.YanChenBaiqing,andL.Yanhua,CostEffectivenessAnalysisofCommonAntibioticsforPreventionofPost-operationInfectionsinOrthopedicAsepticOperations,ChineseJournalofPharmacoepidemiology,2007,02.
V.SivasankariandB.Ramachandra,ADRMonitoringofNSAIDsamongtheIn-PatientsoftheOrthopedicWardinaTertiaryCareCentre:AProspectiveObservationalStudy,JournalofClinicalandDiagnosticResearch,2012,6(1),42-46

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