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Drug Utilization Pattern of Anti Microbial in the Orthopaedics Department: A Hospital Based Prospective Study

[1]Mohamed Sajeed, [2]Nasrin Nisha, [3]Madhura Shirishkumar Bhosale and [4]M.H.R.K. Gupatha Bayya

[1]Department of Orthopaedics, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Tamil Nadu, India
[2]Department of Pharmacology, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Tamil Nadu, India
[3]Department of Pharmacology, Symbiosis Medical College for Women, Symbiosis International (Deemed University), Pune, Maharashtra, India
[4]Department of Pharmacology, Rohilkhand Medical College and Hospital, Bareilly International University, Bareilly, Uttar Pradesh, India

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Corresponding Author
M.H.R.K. Gupatha Bayya,
Department of Pharmacology, Rohilkhand Medical College and Hospital Bareilly International University Bareilly, Uttar Pradesh, India
manikanta05bayya@gmail.com

Author Designation
[1,4]Associate Professor
[2,3]Assistant Professor

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ABSTRACT
Anti microbial are second most prescribed drugs. Inappropriate and over usage of anti microbial will lead to increase morbidity and mortality due to antimicrobial resistance. It will also increase the economic burden to patients. In Orthopaedic department, anti microbial have been used pre-operatively and post operatively to prevent infections due to trauma and surgery. Doctors should prescribe the anti microbial rationally to prevent the risk of adverse drug reaction and anti-microbial resistance. The present study aimed to evaluate the prescribing pattern of anti microbial in the orthopaedics out-patient department and in-patient wards of a tertiary care hospital. The study was conducted in the department of Orthopaedic, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Tamil Nadu. Patients attending IP/OP in the department were included. We collected one month prescription data for analysis. Out all the prescriptions have antimicrobial drugs were recorded and analyzed. Microsoft excel and Statistical Package for Social Sciences (SPSS 20.0) version was used for analysis. A total of 280 prescriptions were randomly analyzed from the Orthopaedic department. Out of these, 143 prescriptions were from Orthopaedic OPD and 137 prescriptions were from Orthopaedic in-patient ward. Parenteral route was the preferred route of administration in IPD and oral route was the preferred route of administration in OPD. The most common indication for antimicrobial prescribing was fracture of bones 186 (66.43%) patients followed by soft tissue infections in 58 (20.71%) patients. Among OPD patients, oral Cefixime (34.97 %) has been commonly prescribed. Among IPW patients fixed drug combination of intravenous Cefoperazome with Sulbactam (25.55 %) has been commonly prescribed. All these drugs were prescribed in brand names. In majority of cases, dual antimicrobial therapy was used in 35 (24.42%) OPD and 132 (96.35 %) IPW patients. Early assessment of irrational use of drugs can be well detected by frequent conduct of prescription auditing. This should be followed by analytical studies to link the drug utilization data to promote rationale use of medicines. There is a need to develop strategies to implement the antimicrobial stewardship (AMS) programme in every tertiary care hospital to prevent antimicrobial resistance in health care sector. This will improve the quality of life of patient and to reduce the economic burden.

INTRODUCTION

Penicillin discovery by Sir Alexander Fleming in 1928 was the beginning of the antibiotic era, which changed the course of modernmedicine[1]. Antimicrobial are used to treat infections caused by microorganisms. They are frequently prescribed for prophylaxis and treatment of orthopaedic infections[2]. Inappropriate as well as indiscriminate use of anti microbial can lead to potentially serious morbidity, mortality, in addition to that adds the adverse effects, economic burden to the patients and emergence of resistance[3]. Existing evidence suggests that there is a causal association between antimicrobial usage in hospital and antimicrobial resistance[4]. World Health Organization (WHO) has also stated that antimicrobial resistance (AMR) is a global health crisis and is one of the greatest challenges for public health[5]. Beta-lactam anti microbial, fluoroquinolones and macrolides are commonly prescribed group of drugs. Combination of two or more antimicrobial has been used in post op patients[6]. Periodic assessment of antimicrobial utilization pattern is needed to provide feedback to the doctors and to promote awareness about their rational usage of drugs. In Orthopaedic department, antimicrobial have been used pre-operatively and post operatively to prevent infections due to trauma and surgery. Hence, we have planned to conduct a prospective study to study the pattern of antimicrobial usage in Orthopaedic department. Severe bone and soft tissue infections and life-threatening drug resistance especially can result due to irrational use of anti-microbial. With this background, the present study was planned to evaluate prescribing pattern of antimicrobial agents in outpatient department (OPD) indoor patients ward (IPW) of Orthopaedic department of a tertiary care hospital in Perambalur. The aim of the study is to assess the prescribing pattern of antimicrobial in the orthopedics out –patient department and in-patient wards of a tertiary care hospital.

MATERIALS AND METHODS

Study Design: Observational study.

Study Duration: 1 month.

Study Settings: Department of Orthopaedic, Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Tamil Nadu.

Inclusion Criteria:

- Both gender.
- Prescriptions with antimicrobial agents.
- Oral and parental antibiotics.
- IP/Op patients.

Exclusion Criteria:

- Repeated patients.
- In proper dose/route of administration.
- Self medication.
- Long term use of antimicrobial agents.

Groups: The study was initiated after approval of Institutional Research Committee and Institutional., Human Ethics Committee. A total of one month prescriptions were collected. The prescriptions fulfill the inclusion and exclusion criteria were selected and divided into two groups.

- **Group-I:** Orthopaedic out-patient department (OPD).
- **Group-II:** Orthopaedic in-patient wards (IP).

Procedure: Based on the inclusion and exclusion criteria prescriptions were collected. Demographic data (age, gender), clinical data (diagnosis), drug related (choice and class of antimicrobial prescribed, duration and frequency of anti microbial administration, dose and route, number of anti microbial prescribed per patient, number of drugs prescribed per patient, drugs used from the WHO essential drug list, fixed drug antimicrobial combinations and any other concomitant medication used) were recorded and analyzed.

Statistical Analysis: The data was expressed in number and percentage. Statistical Package for Social Sciences (SPSS 20.0) version used for analysis. Chi square test applied to find the statistical significant between the groups. P value <0.05 considered statistically significant at 95% confidence interval.

RESULTS AND DISCUSSIONS

Two hundred and eighty prescriptions were randomly analyzed from the Orthopaedic department. Out of these, 143 prescriptions were from Orthopaedic OPD and 137 prescriptions were from orthopedic in-patient ward. The highest number of patients was in age group 41-50 in both OPD and IPW. Out of these 165 (58.93%) prescriptions were males and 115 (41.07%) prescriptions were females. (Table 1,2) Parenteral route was the preferred route of administration in IPD and oral route was the preferred route of administration in OPD. The most common indication for antimicrobial prescribing was fracture of bones 186 (66.43%) patients followed by soft tissue infections in 58(20.71%) patients. Various other diagnoses were osteomyelitis in 7 (2.5%) patients, joint dislocation with external soft tissue infection in 7 (2.5%) patients. (Table 3). Among OPD patients, oral Cefixime (34.97%) has been commonly prescribed followed by fixed drug combination of amoxicillin with clavulanic acid

Table 1: Comparison of Patients Based on Age Between the Groups

Age (Years)	Group-I		Group-II	
	Number	Percentage (%)	Number	Percentage (%)
0-10	14	9.79	13	9.49
11-20	19	13.29	16	11.68
21-30	21	14.69	24	17.52
31-40	20	13.99	19	13.87
41-50	27	18.88	25	18.25
51-60	20	13.99	21	15.33
61-70	22	15.38	19	13.87

Table 2: Comparison of Patients Based on Gender Between the Groups

Groups	Total	Males	Females	Males (%)	Females (%)
Group-I	143	83	60	58.04	41.96
Group-II	137	82	55	59.85	40.15
Group-I and II	280	165	115	58.93	41.07

Table 3: Comparison of Patients Based on Diagnosis

Diagnosis	Number	Percentage (%)
Fracture	186	66.43
Soft tissue infection	58	20.71
Osteomyelitis	7	2.50
Joint dislocations	7	2.50
Miscellaneous	22	7.86

Table 4: Number and Percentage of Commonly Used Anti Microbial in Group-I

Antibiotic	Number	Percentage (%)
Amoxicillin+Clavulanic acid+Clindamycin	20	13.99
Cefuroxime	28	19.58
Amoxicillin+Potassium Clavulanate	35	24.48
Cefixime	50	34.97
Linezolid	10	6.99

Table 5: Number and Percentage of Commonly Used Anti Microbial in Group-II

Antibiotic	Number	Percentage (%)
Amoxicillin+Potassium Clavulanate	40	29.20
Cefoperazone+Sulbactum	35	25.55
Ceftriaxone+Sulbactum	30	21.90
Cefuroxime+Amikacin	16	11.68
Cefuroxime	5	3.65
Clarithomycin+Amikacin	5	3.65
Cefuroxime+Metronidazole	3	2.19
Piperacillin+Tazobactum	3	2.19

Table 6: Number and Percentage of Anti Microbial Prescribed from WHO Model List of Essential Medicines (EML 2021)

Drug	Drug class	WHO (EML 2021)
Clindamycin	Lincosamides	Yes
Cefuroxime	Cephalosporins	Yes
Amoxicillin+Potassium Clavulanate	Penicillins	Yes
Cefixime	Cephalosporins	Yes
Linezolid	Oxazolidinones	Yes (reserve group)
Cefoperazone+Sulbactum	Cephalosporins+Beta lactamase inhibitor	No
Ceftriaxone+Sulbactum	Cephalosporins+Beta lactamase inhibitor	-
Ampicillin+Clavulanic acid	Penicillin+Beta lactamase inhibitor	-
Amikacin	Aminoglycosides	Yes
Cefuroxime	Cephalosporins	Yes
Clarithomycin	Macrolides	Yes
Metronidazole	anti-amoebic	Yes
Piperacillin+Tazobactum	Penicillin+Beta lactamase inhibitor	Yes

Table 7: Number and Percentage of Concomitant Drugs

Concomitant drug	Number	Percentage (%)
NSAIDs	280	100.00
Anti-ulcer	164	58.57
Calcium	153	54.64
Vitamins	98	35.00
Benzodiazepines	43	15.36
Steroids	14	5.00

(24.48%). Among IPW patients fixed drug combination of intravenous Amoxicillin+Potassium Clavulanate (29.20) has been commonly prescribed followed by cefoperazone with sulbactam (25.55). Beta lactam antimicrobial are the commonly used class of antimicrobial used in both OPD and IPW. All these drugs were prescribed in brand names. Triple antimicrobial therapy was used in 20 (13.99%) OPD patients. In majority of cases, dual antimicrobial therapy was used in 35 (24.42%) OPD and 132 (96.35%) IPW patients. (Table 4, 5) Single antimicrobial therapy was used in 88 (61.54) OPD and 5 (3.65) IPW patients.

List of drugs prescribed from WHO List of Essential medicines (EML). Linezolid is a reserve group of drugs used in OPD patients. Beta lactam inhibitors like sulbactam and clavulanic acid has been used, which were not in EML. (Table 6) Concomitant drugs prescribed to patients other than the antimicrobial were non-steroidal anti-inflammatory drugs in 280 patients (100%), anti-ulcer drugs (58.57%), calcium (54.64 %), Vitamins (35 %), benzodiazepines in 15.36 % patients and steroids in 5%. Dual drug therapy was used in majority of (44.64%) patients followed by triple drug therapy (15 %) quadr able drug therapy (15.36%), and five drug therapy (5 %). (Table 7).

Two hundred and eighty prescriptions were randomly analyzed from the Orthopaedic department. Out of these, 143 prescriptions were from Orthopaedic OPD and 137 prescriptions were from orthopaedic in-patient ward. We noticed all patients from in patient ward received parenteral antimicrobial, while all patients in OPD received oral anti-microbial therapy. Ramesh *et al.* and Farook *et al.,* have done a similar study has noted only 60% and 61.7 % of in patients were given injectable antimicrobials in comparison to our study has 51.7 % injectable antimicrobial therapy[7]. This shows the increasing trend of using antimicrobial. Intravenous cefoperazone with sulbactam (25.55) has been commonly prescribedfor fracture of bones in our study. While, Farook *et al* and Shah *et al.,* has observed, injectable Ceftriaxone+Tazobactum (17.08%) and Ceftriaxone+ß-lactamase inhibitor (18%) was commonly prescribed for fracture bones. In common we can see 3rd generation Cephalosporins were the drug of choice[8]. Fixed-dose combinations constituted 35% of prescriptions in Shah et al while in our study it is 66%. Percentage of drugs prescribed by generic name was 50.59% in Farook et al while in our study and Pankaj *et al.,* all drugs were prescribed in brand names. In Pankaj *et al* study it was observed that drugs like ampicillin, cloxacillin, ceftriaxone, ceftazidime, ciprofloxacin, metronidazole were from WHO essential drug list and the drugs which were not from WHO essential drug list were sulbactam, clavulanic acid and linezolid., amikacin is a complimentary drug in WHO essential drug list[9]. In our present study, Clindamycin, Cefuroxime, Amoxicillin, Cefixime, Cefoperazone, Ceftriaxone, Ampicillin, Amikacin, Clarithomycin, Metronidazole, Piperacillin+Tazobactum were the drugs used from WHO essential drug list. Sulbactam and clavulanic acidwere the drugs used which are not included in WHO essential medical list. Linezolid is the reserve drug used in OPD as well as IPW[10-13].

CONCLUSION

Early assessment of irrational use of drugs can be well detected by frequent conduct of prescription auditing. This should be followed byanalytical studies to link the drug utilization data to promote rationale use of medicines. There is a need to develop strategies to implement the AMS programme in every tertiary care hospital to prevent antimicrobial resistance in health care sector. This will improve the quality of life of patient and to reduce the economic burden.

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