

Evaluation of Antibiotics use in Orthopedic Procedures

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ABSTRACT

Background: Appropriate utilization of antimicrobial specialists is imperatively significant from clinical points. Present anti-microbial agents are one of very crucial for clinical consideration and assume a significant job profile, both in prophylaxis and treatment of irresistible illnesses. Not with standing, their abuse is an overall issue with the degree of the issue being more prominent in the developing nations. **Objective:** To observe the utilization of antimicrobials for prophylaxis and treatment among patients who have faced orthopedic medical procedure. **Methodology:** An imminent and observational examination was led on 130 clinical records of orthopedic patients who experienced medical procedure. **Result:** We have selected the data of 130 patients, comprises of 70 male and 60 female patients who underwent the orthopedic medical surgeries. It was observed that the most commonly used antimicrobials classes were cephalosporin's (76.43%) and cefuroxime (67.40%), for prophylaxis and treatment, respectively. It was found out that almost half of cases for prophylaxis were inappropriate whereas around 73.07 % of antibiotics treatment neglected to hold fast

to guidelines. **Conclusion:** Generally, this investigation includes the maximum numbers of patients from open reduction internal fixation (ORIF) and total hip replacement surgeries, respectively. The results of study observed the some degree of inappropriateness to some extent in case of surgical prophylaxis during orthopedic procedures.

Key words: Antibiotics, Surgery, Prophylaxis, Investigation, Inappropriateness, ORIF.

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INTRODUCTION

Antimicrobial operators are one of the significant segments according to clinical thought and assume a critical job in both prophylaxis and treatment, separately. The reports recommend that different things, for example, their availability, assurance and authentic use are significant focuses to be thought of. In many developing nations, the issues identified with abuse of antimicrobial's without specialist's solution are driving reason for against microbial resistance.¹ Prophylactic antimicrobials are comprehensively used in medical procedures and record for liberal enemy of contamination use in various crisis facilities. The inspiration driving Surgical antimicrobial prophylaxis (SAP) is to diminish the irrational use of anti-infection agents in post-surgical infections at or close around the cautious site. By preventing surgical site infections (SSI), prophylactic antimicrobial administrators can decrease hospitalization costs for certain medical procedures that speak to vital inconveniences of Surgical Site Infection (SSI). In this manner, the boorish or capricious use of prophylactic antimicrobial can reduce the incidence of antibiotic resistance.² They affect patient's mortality and morbidity and contribute significantly to economic burden. The use of preoperative anti-microbial agents by adhering to the antimicrobial guidelines is required to reduce both the post-operative infections and emergence of antibiotic resistance.³ The timing, dose and duration of the antimicrobial prophylaxis plays a major role in combatting the antibiotic resistance as its believed to be given approximately 1hr before surgery to have maximum effect and therapeutic action.⁴ Previous investigations have been shown that antibiotics must act dynamically against major foreseen pathogens and more likely than not arrived at adequate focus in the tissue or body liquids in danger when of bacterial difficulties. The requirement for proceeding with anti-microbial prophylaxis of activity, nonetheless, has been unsure.⁵ Earlier similar studies have done all over world which concluded

that there is a high extent of inappropriate antimicrobials use for patients who conceded at surgery ward and these investigations have moreover proposed purposes behind impropriety as an over the top term of treatment, mistaken planning of organization, deficient antibacterial range of the medications utilized and pointless blend of two anti-infection agents.⁶⁻⁹ This issue is advanced to some extent by inappropriate anti-infection agents recommending is conduct and use. Therapeutically wrong, inadequate and monetarily unnecessary utilization of antibiotics is a typical medicinal services framework issue all through the world particularly in the creating comities.¹⁰⁻¹⁶ This examination planned for distinguishing unseemly utilization of medications specially antibiotics for prophylaxis and therapy at surgical ward which fills in as a benchmark information for wellbeing authority and policymaker and it helps in creating systems which regulates the overuse of medicaments and also helps in reducing the economic burden at the clinic level by just following the guidelines during emergency clinic administration.¹⁷⁻¹⁹

MATERIALS AND METHODS

Study site: It is conducted in Tertiary care Hospital specifically in orthopedic ward as the study involves patient's undergone orthopedic surgical procedures.

Study Duration: The study was performed during the period of September 2019 to December 2019.

Study design: It is a prospective and observational study where the sample selection is done by randomization subjects medical records is been analyzed to extract the information.

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Eligibility criteria

Inclusion criteria: The study includes the randomly selected clean and contaminated surgeries Patients undergoing orthopedic surgery, patients of all ages and either gender.

Exclusion criteria: Patients with confirmed microbiological testing indicative of infections diabetic patients, minor incisions and pregnancy cases were not considered in this section.

Sample size: The sample size was selected by using the given formula.

$$N = Z^2 P (1-P) / D^2$$

Where: N represents the sample size required; P is for Prevalence rate of antibiotics; Z stands here for the standard normal confidence at interval of 95% and it equals to value of 1.96. At last the D describes the margin of sampling error tolerated.

Sampling technique: Here, stratified random sampling method was employed as appropriated method to finally get relevant sample.²⁰⁻²¹

Study variables: In present study two types of variables are considered viz rationality of antibiotic surgical prophylaxis as a dependent variable and other factors such as age of the patients, gender and type of surgery, geographical area, antibiotics used and duration of hospital stay as the part of Independent variable, respectively.

Data Collection Tool: A well-defined Performa is designed to get the relevant information desired for study.

Data quality control: To expand precision of this investigation, information assortment position was approved with its objective and grew adequate to achieve the goal of the assessment. This information assortment position was pre-tried on almost 5% of patient's cards from a similar source populace before beginning genuine information assortment and that were also not considered in the present study. Furthermore, ordinary test for fulfillment and steadiness of the information was maintained regularly. The consistency and validation of gathered information was done by using two fold technique of SPSS® software^[22-23].

Data analysis and presentation: Information section and investigation was completed utilizing factual bundle for sociology (SPSS) rendition 20.0. Engaging measurements were utilized for factual examination. The outcome was broke down and exhibited utilizing tables and diagrams. Information accessible was deciphered and talked about with the after effects of comparative investigations.²⁴⁻²⁵

Ethical consideration: A request letter was duly signed from our institute that is Lovely Professional University, Punjab, India and the same has been sent to hospital where we have planned to conduct the study. After prior approval from ethical committee of respected organization to seek permission for conduction of study, the work has been carried out.

RESULT AND DISCUSSION

The study was conducted by considering several parameters. The obtained results are represented in tabular form focusing on each individual parameter. The detailed discussion was carried out in next section. The obtained results are as such following:

Socio- demographic characteristics

A total of 130 patients who has undergone orthopedic procedure are analyzed. The numbers of patients were categorized into four age groups such as between 30-40 years (contributed almost 38.46%), 41-50 years (almost 19.23%), 51-60 years (almost 29.23%) and last was those who have age more than 60 years. It was found that irrationality of the antibiotics were high in 51-60 years of age that is prophylaxis (39.47%) and then for treatment (57.89%), as the complete data is shown in Table 1.

Therapeutic Indication

In present study, various types of surgical procedure such as ORIF, total hip replacement, wound debriment, arthroplasty, implants, closed reduction-internal fixation (CRIF), total knee replacement surgery (TKR) and skin grafting, respectively. It was also found that among all most cases were belongs to only open reduction and internal fixation (ORIF) (43.07%) followed by total hip replacement (20%), as represented in Table 2.

No. of antibiotics prescribed for prophylaxis and treatment

During the study, it was found that cefuroxime, which is a member of 2nd generation cephalosporin family was most commonly prescribed antibiotic. The data suggested that almost its 67.40 and 58.17% followed by amikacin 14.91% and 14.90 for prophylaxis and treatment consumptions were observed, respectively. The detailed data is represented in Table 3.

Antibiotic regimen (Single/ Multiple)

The total number of patients treated with single regimen for prophylaxis and treatment were 76 (58.91%) and 13 (9.15%), respectively. It was also found that treatment regimen had very less percentage of single regimens as compared to prophylaxis. Almost 95 patients (66.90%) have received the two- drug regimen in case of treatments. At the time of three drugs regimen in both cases it around 15 %. But for four drugs therapy, it was observed to be 4 (3.10%) and 14 (9.85%), respectively, as represented in Figure 1.

Table 1: Representation of socio-demographic characteristics along with inappropriateness of antibiotics for orthopedic patients during September 2019 to December 2019.

S.No	Socio-demographic characteristics	Frequency N (%)	Inappropriateness of antibiotic used	
			For Prophylaxis N (%)	For Treatment N (%)
Age group (year)				
1	30-40	50 (38.46)	25 (38.46)	39 (41.05)
	41-50	25 (19.23)	19 (29.23)	24 (25.26)
	51-60	38 (29.23)	15 (23.07)	22 (23.15)
	>60	17(13.07)	06 (9.23)	10 (10.52)
	Total	130 (100)	65 (100)	95 (100)
Sex				
2	Male	70 (53.84)	42 (64.61)	55 (57.89)
	Female	60 (46.15)	23 (35.38)	40 (42.10)

N- is the number of patient

Table 2: Diagnosis of orthopedic patients who underwent surgery at Tertiary care hospital from September 2019 to December 2019.

Diagnosis	Frequency	Percentage (%)
ORIF	56	43.07
Total Hip Replacement	26	20
Wound Debriment	13	10
Arthroplasty	10	7.69
Implants	09	6.92
CRIF	10	7.69
TKR	04	3.07
Skin grafting	02	1.53
Total	130	100

Appropriateness of antibiotics

Appropriateness of antibiotics used for prophylaxis was found to be around 50%. But in case of treatment, adherences to standard guidelines were relatively very less and it was around 27%, as data has been shown in Table 4. We have also tried to represent appropriateness of antibiotics diagrammatically in Figure 2.

Single regimen

As indicated in Table 5, the drug ceftriaxone was found to be the most commonly prescribed antibiotic. According to our results, it accounts for almost 98.75 and 96.5% in favor of prophylaxis and treatments, respectively.

Combination regimen

Various types antibiotics combination regimen were used for prophylaxis such as Ceftriaxone+ Amikacin+ Cefuroxime (20.68%), Metronidazole + Ampicillin+ Cefuroxime (17.24%), Ceftazidime + Amikacin (17.24%),

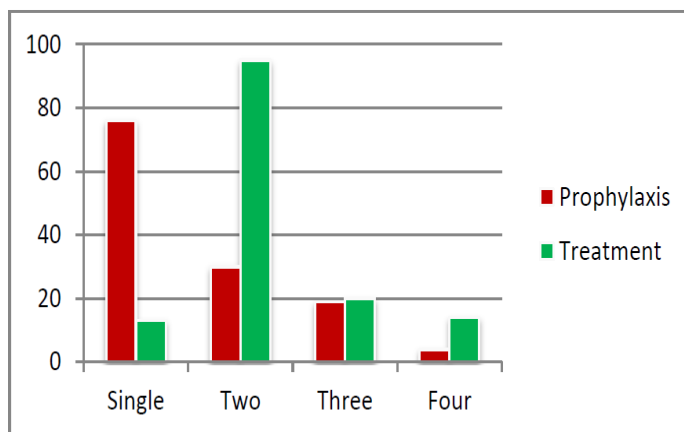


Figure 1: Showing the antibiotic regimen used for prophylaxis and treatment in orthopedic procedures.

Table 3: Representation of Total antibiotics used for surgical prophylaxis and treatment.

Drug name	Prophylaxis	Treatment
	No of patients N (%)	No of patients N (%)
Cefuroxime	122 (67.40)	121 (58.17)
Amikacin	27 (14.91)	31 (14.90)
Metronidazole	10 (5.52)	14 (6.73)
Amoxicillin potassium clavulanate	04 (2.20)	04 (1.92)
Ceftriaxone	05 (2.76)	02 (0.96)
Cefoperazone salbactam	03 (1.65)	02 (0.96)
Cefuroxime/ clavulanic acid	02 (1.10)	28 (13.46)
Levofloxacin	02 (1.10)	01 (0.48)
Linezolid	02 (1.10)	03 (1.44)
Cefotaxime	01 (0.55)	00 (00)
Total	178 (100%)	206(100%)

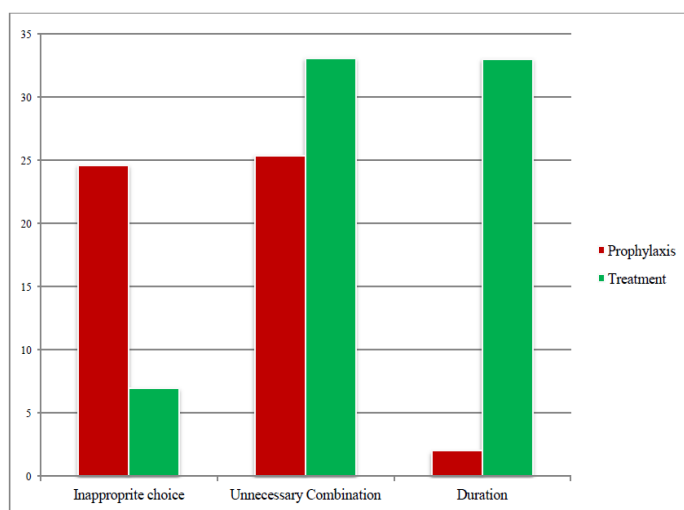


Figure 2: Showing inappropriate antibiotic prescribed for prophylaxis and treatment in orthopaedic procedures

Table 4: Representation of appropriateness of antibiotic in orthopaedic surgery at tertiary care hospital.

Reason for use	Appropriateness	Frequency	Percentage (%)
Prophylaxis	Appropriate	65	50.00
	Inappropriate	Inappropriate choice	32 24.61
		unnecessary combination	33 25.38
		Total	65 50.00
Treatment	Appropriate	35	26.92
	Inappropriate	Excessive duration	40 30.76
		Short duration	03 2.30
		Inappropriate choice	09 6.92
		unnecessary combination	43 33.07
	Total	95 73.07	

Table 5: Antibiotics regimen (single) prescribed for patients at Tertiary care Hospitals September 2019 to December 2019.

Antibiotic used	Prophylaxis No of patients N (%)	Treatment No of patients N (%)	Total N (%)
Ceftriaxone	158 (98.75%)	83 (96.5%)	241 (97.97)
Ampicillin	2 (1.25%)	-	2 (0.81)
Norflaxacillin	-	3 (3.5%)	3 (1.22)
Total	160 (100%)	86 (100%)	246 (100)

Flouroquinoloes + Amikacin (17.24%), For treatment; Ceftriaxone + Cefuroxime (34.04%), Ceftriaxone + Metronidazole+ Amikacin (23.40%), Levofloxacin + Metronidazole+ Amikacin (6.38%), respectively. The detailed related data is shown in Table 6.

Antibiotic Class prescribed

There are large numbers of antibiotics are available in the market. Our results showed that in both prophylaxis and treatments cases, maximum times only cephalosporin's (more then 76%) and Penicillin's (more then 15.51%) were prescribed, as shown in Table 7.

Table 6: Antibiotic combination regimen used for prophylaxis and treatment.

	Antibiotic combination	Frequency	Percentage (%)
For Prophylaxis	Ceftriazone+ Amikacin+ Cefuroxime	06	20.68
	Metronidazole+Amikacin+ Cefuroxime	05	17.24
	Ceftazidine+ Amikacin	05	17.24
	Flouroquinoloes + Amikacin	05	17.24
	Levoflaxacin+ Metronidazole +Amikacin	03	10.34
	Flouroquinoloes +Amikacin+ metronidazole	02	6.89
	Ceftazidine+ Amikacin+ cefixime	01	3.44
	Ceftazidine+ Amikacin+ Cefrixone	01	3.44
	Cefrixone+ cefuroxime	01	3.44
	Total	29	100
For Treatment	Ceftriazone+ Cefuroxime + clavulanic acid	16	34.04
	Ceftriazone+Metronidazole +Amikacin	11	23.40
	Cefoperazone +cefuroxime /clavulanic acid	06	12.7
	Metronidazole+ Amikacin	05	10.6
	Levofloxacin + Metronidazole +Amikacin	03	6.38
	Amikacin+ Ceftriazone	03	6.38
	Levoflaxacin + Amikacin	02	4.25
	Ceftazidine+ Amikacin +Cefuroxime	01	1.45
	Total	47	100

Table 7: Commonly prescribed antibiotic regimen orthopaedic surgery.

Class of antibiotic	For prophylaxis N (%)	For treatment N (%)	Total (%)
Cephalosporin's	133 (76.43)	157 (76.21)	290 (76.31)
Penicillin's	27 (15.51)	31 (15.04)	58 (15.26)
Nitro imidazole	10 (5.74)	14 (6.79)	24 (6.31)
Oxazolidinone antibiotic	02 (1.14)	03 (1.45)	05 (1.31)
Fluoroquinolones	02 (1.14)	01 (0.48)	03 (0.78)
Total	174(100)	206 (100)	380 (100)

CONCLUSION

The present studies have indicated the most of the patients who underwent surgical procedures in the orthopedics section received SAP. In mostly cases, the predominance of ORIF (around 43.07%) followed by total hip substitution were observed. On the other hand, the practice was not associated with standard guidelines due to some issues with inappropriate drug selection and duration of administration was observed in some cases. Prospective and observational examination is

one of major reason as the limitation of this assessment. It is slightly hard to assess how the patients took their medicine and to observe any unfortunate effect of the medicines. Being anticipated assessment additionally made us not to examine significant factors including training level, adherence and calm prosperity pro correspondence and provider and prosperity structure related factors.

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CONFLICT OF INTEREST

The authors declare no Conflict of interest.

ABBREVIATIONS USED

ORIF: Open reduction internal fixation; **SAP:** Surgical antimicrobial prophylaxis; **SSI:** Surgical site infections; **CRIF:** Closed reduction internal fixation; **TKR:** Total knee replacement.

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