



Assessment of Prescribing Pattern of Antimicrobials in Orthopaedic Department of Tertiary Care Teaching Hospital: A Multi-center study

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ABSTRACT

Background: Antimicrobials are among the most frequently prescribed classes of medications used both prophylactically as well as to treat various orthopaedic infections.

Aim: To evaluate prescribing pattern of antimicrobial agents in orthopaedic indoor patients of tertiary care teaching hospital in Hyderabad & Raipur.

Materials and Methods: A Multi- center prospective study was carried over a period of 1.5 years in orthopaedic department of a tertiary care hospital. A total of 500 prescriptions of indoor patients were collected, and analyzed for most common diagnosis, most common antimicrobial used, drugs used from WHO essential drug list and generic drugs used .

Results: The prescribing pattern of antimicrobials was recorded in a preformed proforma. Most commonly prescribed group of antimicrobials was cephalosporins followed by aminoglycosides. Linezolid from cephalosporin and Amikacin from aminoglycosides were the most commonly used drugs. The most common indication was bone fractures followed by soft tissue infections. Most of the drugs were from the essential drug list but no drug was prescribed with generic name.

Conclusion: This study highlights the common prescribing pattern of antimicrobials in our tertiary care teaching hospital. The drugs should be used appropriately from the WHO essential drug list with frequent update of information. The implementation of antimicrobial policy and treatment guidelines should be according to disease pattern of that area and this can be done only with periodic assessment of disease pattern and rational prescribing of the medicine by the clinical pharmacologist in that area.

Keywords: *Antimicrobial agents, World health organization, Policy, Rational.*

INTRODUCTION

Antimicrobials are the substances or compounds which are used to treat infections caused by microorganism any including bacteria, fungi and parasites and are among the most frequently prescribed classes of medications for prophylaxis and treatment of orthopaedic infections. [1-3] inappropriate and indiscriminate use of antimicrobial agents can potentially cause serious morbidity, mortality as well as additional economic burden leading to reduction in the quality of drug and, thereby wastage of resources, increased treatment cost, increased risk for adverse drug reaction and emergence of resistance. [4,5] Existing evidence suggests that there is a causal association between antimicrobial usage in hospital and antimicrobial resistance. [6] Periodic evaluation of their utilization pattern is needed to provide feedback to the prescriber and to promote awareness about their rational usage of drugs. Therefore, a study was conducted to study the pattern of antimicrobials usage in Orthopaedic department because many antimicrobials are being used as prophylactic agents or for treatment of various Orthopaedic infections and life-threatening drug resistance especially to antimicrobials can result due to irrational use of these medicines. With this background, the present study was planned to evaluate prescribing pattern of antimicrobial agents in indoor patients of Orthopaedic department in Hyderabad and Raipur.

MATERIALS AND METHODS

The present descriptive prospective study was planned and carried out over 36 months at tertiary

care teaching hospital by the in collaboration with Orthopaedic department after taking clearance from institutional ethics committee at all three sites. A total of 500 indoor prescriptions were randomly selected for analysis. The data was collected in a preformed proforma in the following format.

Demographic characteristics of the patient selected for the analysis, route of drug administration, diagnosis of the patient, indications for the antimicrobial use, common antimicrobial group used, common drug from different antimicrobial group used, drugs used from the WHO AWARE classification & essential drug list, fixed drug antimicrobial combinations used, duration of antimicrobials used along with degree of appropriateness of antimicrobials were evaluated during the study period.

RESULTS

500 prescriptions were randomly selected from orthopaedic department of respective three hospital. The analysis of the data showed that out of 500 patients 219, 52 & 49 were falling under ACCESS category 429, 220 & 217 were administered antimicrobials from WATCH, The numbers accounting for RESERVE group was also higher in terms of study site 3 which was observed as 33, 42, 53, As per the study observation patients were administered Not recommended class of antimicrobials were found to be 15, 0, & 2 (Table 1.1,1.2,1.3) respectively.

TABLE 1: WHO defined AWARE classification for antimicrobials

TABLE 1.1: Hospital A

AWARE CLASS	PRE-OP	POST-OP	DISCHARGE	TOTAL
ACCESS	61	77	81	219
WATCH	133	167	129	429
RESERVE	9	12	12	33
NR	3	5	7	15

TABLE 1.2: Hospital B

AWARE CLASS	PRE-OP	POST-OP	DISCHARGE	TOTAL
ACCESS	4	24	24	52
WATCH	93	95	32	220
RESERVE	65	84	42	191
NR	6	3	0	9

TABLE 1.3: Hospital C

AWARE CLASS	PRE-OP	POST-OP	DISCHARGE	TOTAL
ACCESS	9	21	19	49
WATCH	87	91	39	217
RESERVE	12	23	18	53
NR	4	9	2	15

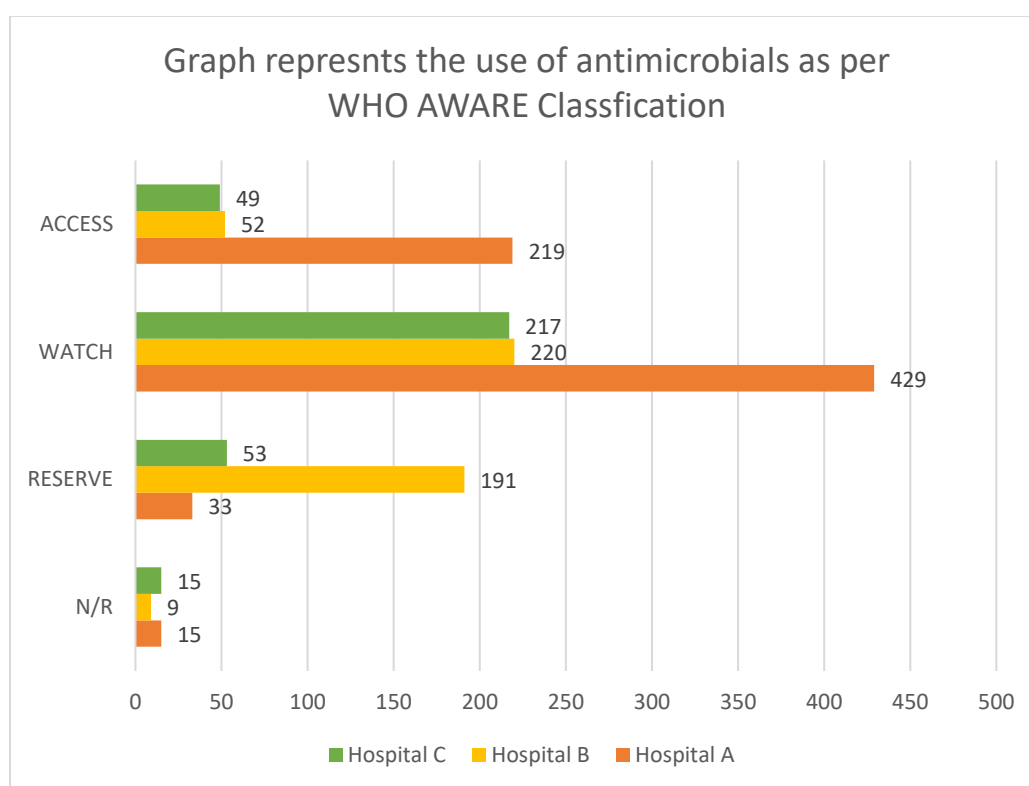


FIGURE 1: Graph represent the use of antimicrobials as per WHO AWARE Classification used in patients involved during the study period.

The study also considered WHO prescribing indicators to access the rationality of antimicrobials administered during the study period in all the three hospitals and observed that the percentage of antibiotics administered were relatively high and there is a degree of variability

observed generic name and parenteral administration of antimicrobials. There is a need to work to adhere the principals of practice form IV to oral conversion and generic name for prescribing the antimicrobials agents.

TABLE 2: WHO prescribing indicators

TABLE 2.1: Hospital A

S.no	Indicators	Percentage
1	Avg no. of drug encountered	9
2	% Of encounter with antibiotic	24.45%
3	% In essential medicine list	94%
4	% Prescribed in generic name	85.4%
5	% Prescribed in Parenteral	73.5%

TABLE 2.1: Hospital B

S.no	Indicators	Percentage
1	Avg no. of drug encountered	7
2	% Of encounter with antibiotic	26.49%
3	% In essential medicine list	97%
4	% Prescribed in generic name	68.9%
5	% Prescribed in Parenteral	71.01%

TABLE 2.3: Hospital C

S.no	Indicators	Percentage
1	Avg no. of drug encountered	8
2	% Of encounter with antibiotic	29.1%
3	% In essential medicine list	97%
4	% Prescribed in generic name	72.9%
5	% Prescribed in Parenteral	77.01%

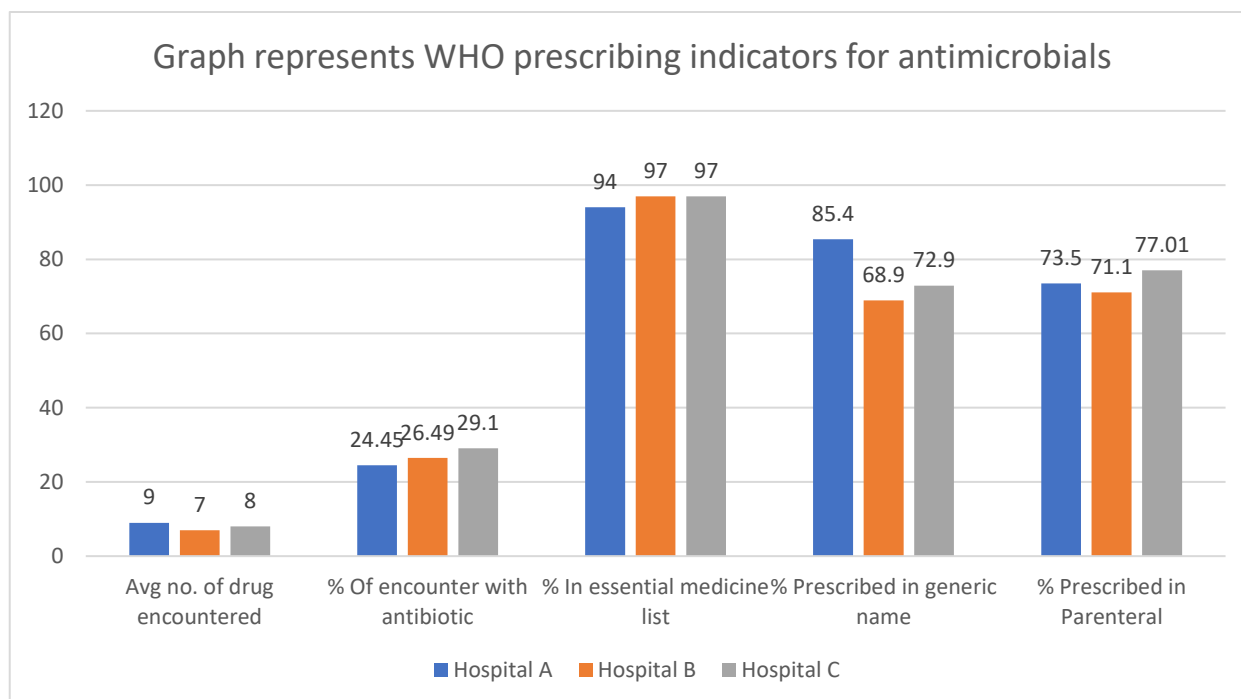


FIGURE 2: Graph represent the WHO prescribing indicators for antimicrobials in patients involved during the study period.

The study aimed to promote the adherence of antimicrobial agents in practice based on WHO AWARE classification and considering the Hospital specific Antibigram if it been implemented at the study site.

The overall observation of the study concluded that there is certain degree of inappropriateness in administration of antimicrobials which must be monitored and strict implications are to be made to curb the over use of antibiotics in tertiary care hospital.

TABLE 3: Compliance of antimicrobial prescription.

TABLE 3.1: Hospital A

S.no	Antibiotic administered	Observation	Frequency
1	Prophylactic	Appropriate	263
		Inappropriate	37
2	Treatment	Appropriate	217
		Inappropriate	83

TABLE 3.2: Hospital B

S.no	Antibiotic administered	Observation	Frequency
1	Prophylactic	Appropriate	75
		Inappropriate	26
2	Treatment	Appropriate	74
		Inappropriate	27

TABLE 3.3: Hospital C

S.no	Antibiotic administered	Observation	Frequency
1	Prophylactic	Appropriate	72
		Inappropriate	28
2	Treatment	Appropriate	63
		Inappropriate	37

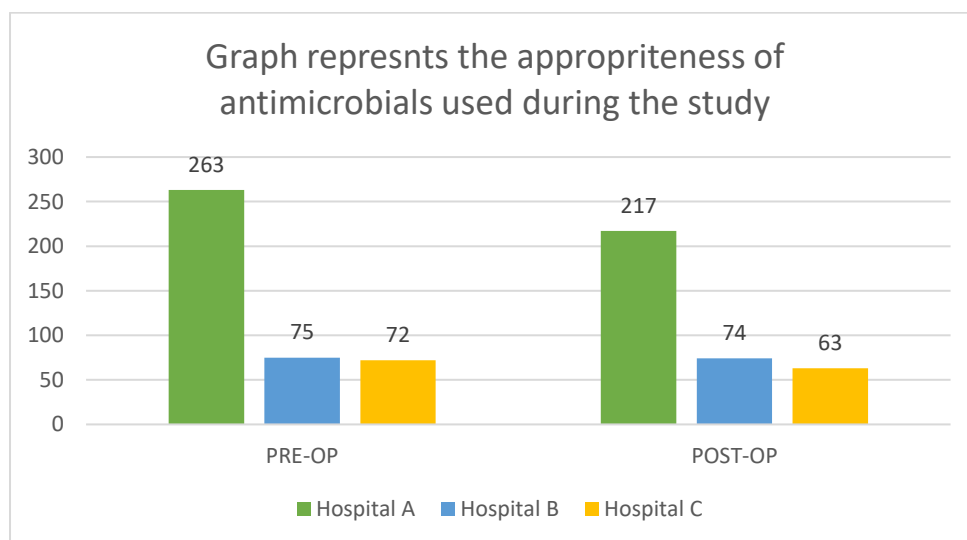


FIGURE 3: Graph represent appropriateness of antimicrobials used in patients involved during the study period.

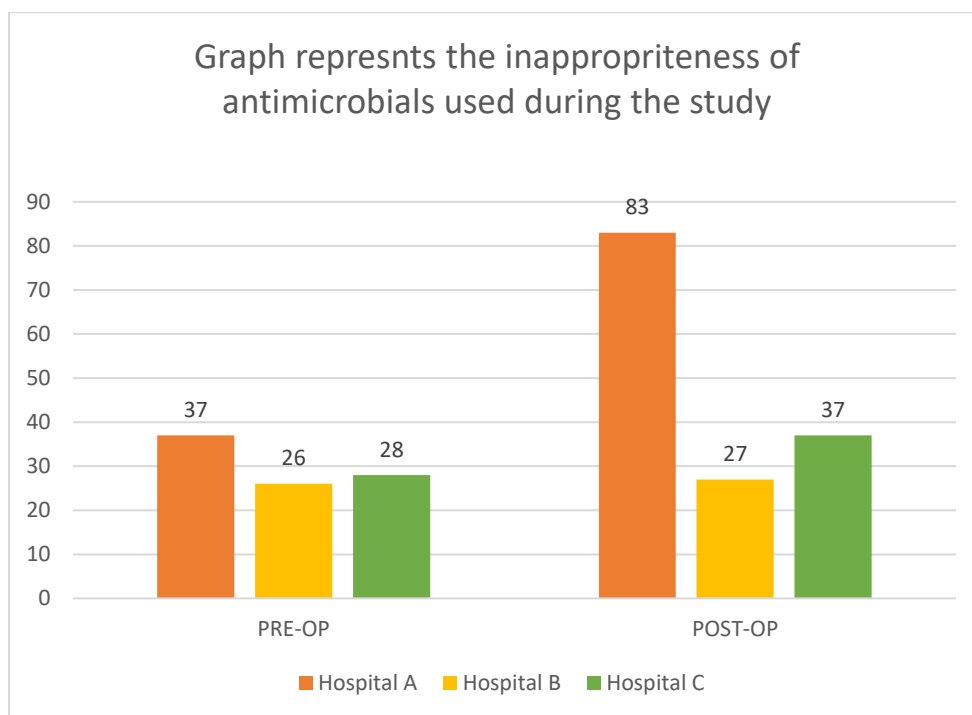


FIGURE 4: Graph represent inappropriateness of antimicrobials used in patients involved during the study period.

The study the observed antimicrobial drug regimen administered to the patients of orthopedic department during the study period and found that most of the prescriptions followed

dual regimen (Table 4.1, 4.2,4.3) the accountability of 3 drug regimen and 4 drug regimen was also considered based on patient individual factors.

TABLE 4: Frequency of combinational therapies.

TABLE 4.1: Hospital A

S.no	Therapy	Frequency
1	Mono therapy	68
2	Dual therapy	163
3	Three drug therapy	58
4	Four drug regimens	11
	Total	300

TABLE 4.2: Hospital B

S.no	Therapy	Frequency
1	Mono therapy	15
2	Dual therapy	55
3	Three drug therapy	24
4	Four drug regimens	6
	Total	100

TABLE 4.3: Hospital C

S.no	Therapy	Frequency
1	Mono therapy	11
2	Dual therapy	58
3	Three drug therapy	27
4	Four drug regimens	4
	Total	100

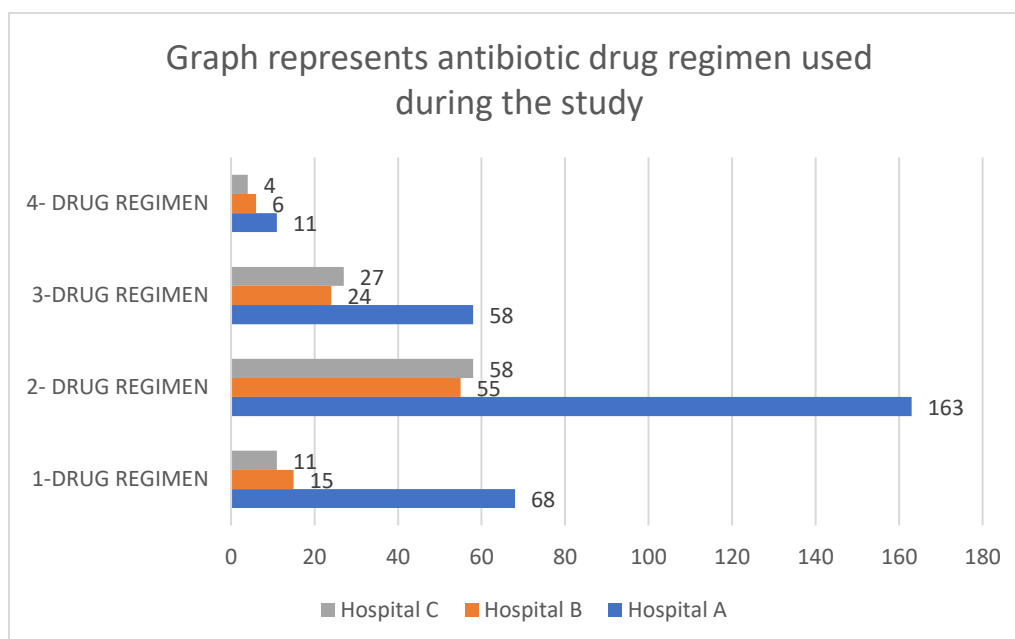


FIGURE 5: Graph represent antibiotic drug regimen in patients involved during the study period.

TABLE 5: Antimicrobials used from WHO essential drug list (2013)

TABLE 5.1: Hospital A

Drug class	Drugs	No. of drugs prescribed	WHO model essential drug list
Penicillin	Ampicillin, cloxacillin	137	Yes
Cephalosporins	Ceftriaxone, ceftazidime	189	Yes
Aminoglycosides	Amikacin	93	Yes
Macrolides	Azithromycin	76	Yes
Antiprotozoal	Metronidazole	57	Yes
Quinolones	Ciprofloxacin	46	Yes
Oxazolidinone	Linezolid	12	No
Cephalosporins	cefoperazine	8	No

TABLE 5.2: Hospital B

Drug class	Drugs	No. of drugs prescribed	WHO model essential drug list
Penicillin	Ampicillin, cloxacillin	37	Yes
Cephalosporins	Ceftriaxone, ceftazidime	89	Yes
Aminoglycosides	Amikacin	53	Yes
Macrolides	Azithromycin	16	Yes
Antiprotozoal	Metronidazole	51	Yes
Quinolones	Ciprofloxacin	41	Yes
Oxazolidinone	Linezolid	64	No
Cephalosporins	cefoperazine	2	No

TABLE 5.3: Hospital C

Drug class	Drugs	No. of drugs prescribed	WHO model essential drug list
Penicillin	Ampicillin, cloxacillin	43	Yes
Cephalosporins	Ceftriaxone, ceftazidime	82	Yes
Aminoglycosides	Amikacin	64	Yes
Macrolides	Azithromycin	11	Yes
Antiprotozoal	Metronidazole	46	Yes
Quinolones	Ciprofloxacin	53	Yes
Oxazolidinone	Linezolid	19	No
Cephalosporins	cefoperazine	8	No

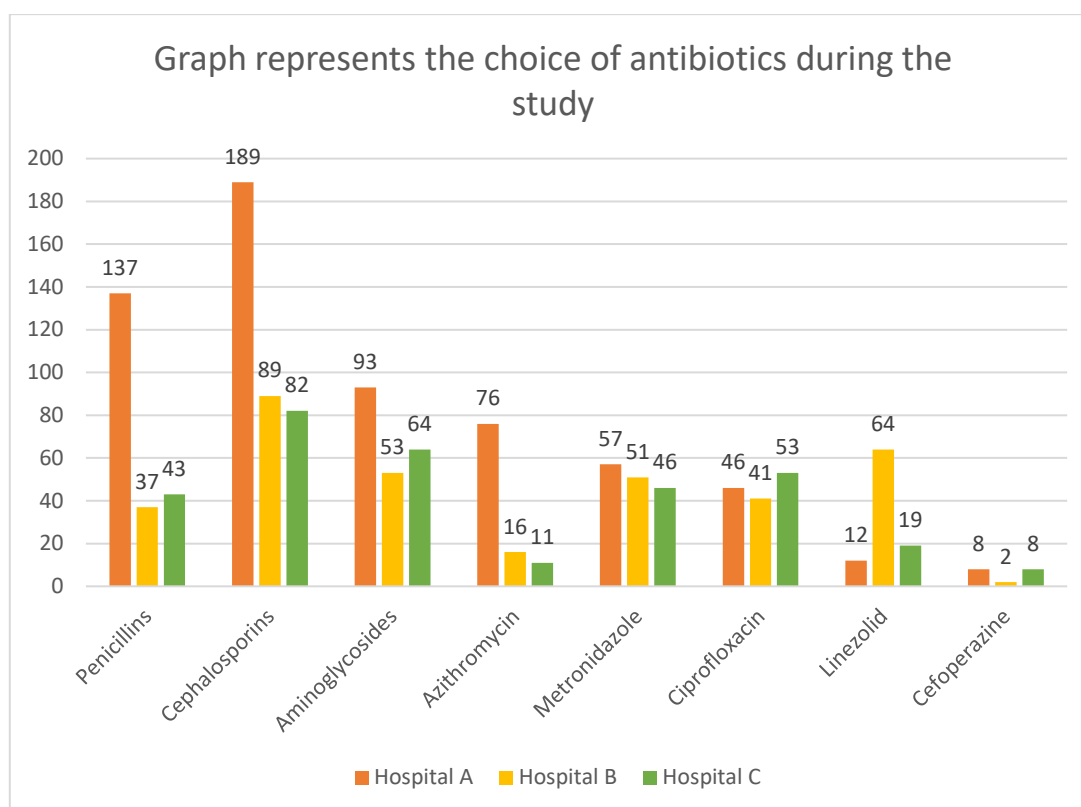


FIGURE 6: Graph represent choice of antibiotic in patients involved during the study period.

Cephalosporin group was the commonly prescribed antimicrobial class in 78% patients followed by aminoglycosides in 56% patients, oxazolidinone in 10%, antiprotozoal in 8% patients, quinolones in 8% of patients, macrolides in 7% patients and penicillin's in 13 % of the patients. Most prescribed individual drug from different antimicrobials group was amikacin in 51% patients from the aminoglycosides and cefoperazone (6%) from cephalosporin. The other commonly used antimicrobials were ceftriaxone, ceftazidime, linezolid, metronidazole, ciprofloxacin and ampicillin-cloxacillin. None of the drug was prescribed by generic names. All the drugs were prescribed with trade names. The drugs in fixed dose combination were cefoperazone with sulbactam in 22% of the patients, ceftriaxone with sulbactam in 21% patients, ceftazidime with sulbactam in 21% patients, ampicillin and amoxicillin combination in 3% of the patients and cefuroxime and linezolid in 22 % of the patients (Table 5.1,5.2,5.3). The drugs which were from the

essential drug list were ampicillin, cloxacillin, ceftriaxone, ceftazidime, ciprofloxacin, metronidazole, and the drugs which were not from WHO essential drug list were cefoperazone, and linezolid; amikacin is a complimentary drug in WHO essential drug list.

DISCUSSION

Infection in bone and joints is a potentially very serious condition and are difficult to treat and can cause significant morbidity and mortality. Most of the cases needs antimicrobial therapy but the irrational use of antimicrobials leads to a number of consequences in term of cost, drug interactions and hospital stay along with increased probability of bacterial resistance toward the commonly used antimicrobials. The present study was done in orthopaedic department where common diagnosis was fracture of bones and soft tissue infection. This is similar to the study where the fractures and accidental trauma cases were the most common diagnosis. [7] A prospective antimicrobial utilization survey performed in our

study showed that the commonest antimicrobial group prescribed was cephalosporins and aminoglycosides. Cefoperazone from cephalosporins in combination with sulbactam and amikacine from aminoglycosides were the most commonly prescribed drugs. [8-10] The other antimicrobials which were prescribed were metronidazole, linezolid, ciprofloxacin, ampicillin and cloxacillin. This is in accordance to the study where ceftriaxone was prescribed in patients (57%) as initial therapy, where as ampicillin, amoxicillin, metronidazole, ciprofloxacin and crystalline penicillin were the 5 most commonly prescribed antibiotics in the study conducted by Shankar et al. [11]

The choice of drugs and the route chosen were appropriate in the majority of cases. All the drugs prescribed were with trade name which is contrary to the study in which 19.3% of drugs were prescribed by generic name. Generic prescribing is to be encouraged especially in developing countries as it works out to be cheaper for the patient and also they reduces the possibility of drug errors. [15,16] The WHO guidelines recommend 100% generic prescription. [17-19]

Linezolid has been used as first line drug in some patients which is only recommended for multidrug resistant cases as per the guidelines.

The present study had certain limitations. The study was carried out over a 1 and half year . Only five hundred from three different sites indoor prescriptions were randomly selected for analysis and these may not have been representative of the patient population. The number of indoor prescriptions was less and Prescriptions pattern of outdoor patients also needs to be analyzed. The patients' knowledge of the duration of treatment, proper time to take the medication was not ascertaining.

Further studies over a longer period of time are required to provide a baseline data of prescribing pattern of drugs in orthopedics because a longer study will have a greater number of patients and the quantitative measurements may be more representative of the population. Such type of studies provides necessary feedback to prescribing registered medical practitioners and

may prove useful to formulate antibiotic policy to policy makers.

CONCLUSION

There is a need to develop strategies to implement the AMS programme in every tertiary care hospital to fight the threat posed by antimicrobial resistance in health care sector and need to update it on regular bases to improve the quality of life of patient and to reduce the economic burden.

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