

Original Article

**PRESCRIPTION PATTERN OF PROPHYLACTIC ANTIMICROBIAL AGENTS USED IN PREOPERATIVE PATIENTS AT A TERTIARY CARE TEACHING HOSPITAL**

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**ABSTRACT**

**Objective:** This study was designed to analyze the prescription pattern of prophylactic antimicrobial agents used in preoperative patients.

**Methods:** A descriptive observational study was done at a tertiary care teaching hospital in Potheri from July to December 2013 after obtaining of Institutional Ethics Committee clearance.

**Results:** Total 284 patients were included in this study, out of which 141(49.6%) were females and 143(50%) were males. In the department of general surgery, the very commonly used antimicrobial agents were cefotaxime (81%) followed by cefoperazone sodium (42%). In the orthopaedics department, the frequently used antimicrobial agents were cefoperazone and sulbactam (39%) followed by cefazolin (29%). Most commonly used antimicrobial agent was cefotaxime (100%) in gynaecology department.

**Conclusion:** Antimicrobial prophylaxis is helpful in declining the frequency of post-operative infections. This study explained about the various antimicrobial agents used prior to surgeries. Practitioners must prescribe an antibiotic based on their hospital antibiotic policy.

**Keywords:** Prophylaxis, Antimicrobial agents, Antibiotics, Surgery, Antibiotic policy

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**INTRODUCTION**

Prophylactic Antibiotic refers to "prevention of infection and its complication by using antimicrobial agents prior to any surgical procedures". In spite of numerous available aseptic precautions, antimicrobial agents, advanced sterilization procedures and operative techniques, the Surgical Site Infection (SSI) is one of the most important crises in the field of surgery [1]. The definition of surgical site infection is that, the occurrence of infection at or near the surgical site within 30 d or a year followed by any surgical procedure [2]. Around two million cases had developed a surgical site infection worldwide [3]. SSI is the second most common nosocomial infection and cause of many post-operative complications [4]. The rate of morbidity and mortality are more in SSI and it increases the expense and duration of hospital stay for the surgical patients [5, 6]. SSI also produces delayed wound healing, augmented use of antibiotics and multidrug antibiotic resistance [7]. The causes for the SSI could be due to poor hygiene, existing infection, anaemia, diabetes, obesity and improper techniques which can be overcome by proper prophylactic antibiotic usage [8]. Surgeries like coronary bypass, hip and knee prosthesis and exploratory abdominal surgeries showed higher rates of SSI [9]. The commonest pathogens isolated were *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella sp. Coagulase-negative Staphylococci*, *Pseudomonas aeruginosa*, *Proteus mirabilis* [8]. Prophylaxis could be defined based on timing of administration of antimicrobial agents and categorized as early operative where it was scheduled before one hour of incision, pre-operative prophylaxis when it was given less than two hours prior to incision and peri-operative prophylaxis, if it was planned at the time of surgery and postoperative prophylaxis given after the completion of surgery [10]. Prophylactic antibiotics should be stopped within 24 h of surgery and within 48 h in cardiothoracic surgeries [5]. The commonest prophylactic antimicrobial agents used are, first and second-generation cephalosporins and vancomycin in patients who are hypersensitive to  $\beta$ -lactam antibiotics [11, 12]. The criteria for a prophylactic antibiotic are, good efficacy against infective microorganisms, achievement of sufficient local tissue levels,

minimal side effects and relatively at a lower cost [13]. The aim of the present is to identify the common antimicrobial agents used prophylactically in various surgeries.

**MATERIALS AND METHODS**

The present study was a descriptive observational study done at SRM Medical College Hospital and Research Centre which was carried out from July to December 2013 after obtaining the Institutional Ethics Committee clearance (415/IEC/2013). Patients, undergoing surgery in the department of general surgery, orthopaedics and gynaecology were included in this study based on inclusion and exclusion criteria's. After getting the oral informed consent from the patient, the data like age, gender, date of admission, diagnosis, co-morbid conditions, date and type of surgery, name and details of prophylactic antimicrobial agents given were analyzed and entered in individual proforma. Follow-up was done for any evidence of postoperative infections. Data were analyzed using SPSS version 17.0 and results were expressed as a percentage.

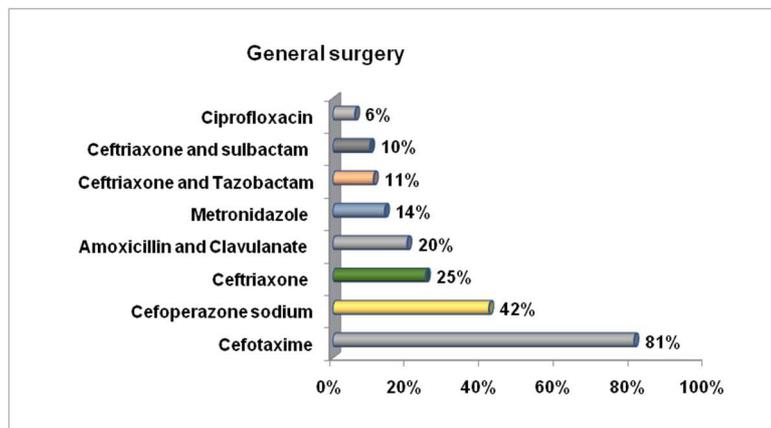
**RESULTS**

A total of 284 patients were included in the study, out of which 141(49.6%) were females and 143(50.4%) were males. In the department of general surgery, the surgeries performed frequently were appendicectomy (21%) followed by hernioplasty (17%), abdominal meshplasty (15%), haemorrhoidectomy (13%), cholecystectomy (9%), lipoma and granuloma excision (7%). In the above conditions, the commonest antimicrobial agents used were cefotaxime (81%) followed by cefoperazone sodium (42%), ceftriaxone (25%), amoxicillin with clavulanate (20%) and metronidazole (14%) (table 1, fig 1).

In the orthopaedics department, surgeries done very often were Open Reduction and Internal Fixation-ORIF (43%), plate and screw fixation (21%), laminectomy and discectomy (10%). In these, the commonest antimicrobial agents used were cefoperazone with sulbactam (39%), cefazolin (29%), cefoperazone sodium (28%), gentamicin (25%) and cefuroxime (20%) (table 2, fig 2).

**Table 1: Types of surgeries and antimicrobial agents used in the department of general surgery**

Name of surgery	No. of cases N=148	Name of Antimicrobial agent
Hernioplasty	29(17%)	Cefotaxime(75%) Cefoperazonesodium(10%) Ceftriaxone and Tazobactam(06%)
Haemorrhoidectomy	21(13%)	Ceftriaxone and Sulbactam(06%) Cefotaxime(71%) Ceftriaxone and Tazobactam(19%)
Abdominal meshplasty	24(15%)	Cefotaxime(62%) Ceftriaxone and Sulbactam(16%) Ceftriaxone and Tazobactam(08%)
Appendicectomy	34(21%)	Cefotaxime(55%) Metronidazole(14%) Ceftriaxone and Sulbactam(08%) Ciprofloxacin(06%)
Cholecystectomy	09(6%)	Cefotaxime(66%) Cefoperazonesodium(33%)
Lipoma and Granuloma excision	07(4.7%)	Cefotaxime(100%)
Skin graft	06(4%)	Cefotaxime(66%) Cefoperazonesodium(16%) Amoxicillin and Clavulanate(16%)
Fibroadenoma excision	06(4%)	Cefotaxime(100%)
Secondary suture	03(2%)	Cefotaxime(100%)
Wound debridement	04(2.7%)	Ceftriaxone(25%) Cefotaxime(25%) Cefoperazonesodium(25%) Amoxicillin and Clavulanate(25%)
Radical Mastectomy	03(2%)	Cefotaxime(100%)
Thyroidectomy	01(1%)	Cefoperazonesodium(100%)
Colectomy	01(1%)	Cefotaxime(100%)



**Fig. 1: Pattern of antimicrobial agents used in general surgery**

**Table 2: Types of surgeries and antimicrobial agents used in the department of orthopaedics**

Name of surgery	Number of cases N=67	Name of Antimicrobial agent
Open Reduction and Internal Fixation(ORIF)	29(43%)	Cefoperazonesodium (31%) Cefoperazone and Sulbactam (27%) Cefazolin (17%)
Plate and screw fixation	14(21%)	Cefoperazonesodium (42%) Cefoperazone and Sulbactam (42%) Cefazolin (21%)
Laminectomy and Dissectomy	07(10%)	Cefoperazone and Sulbactam (85%)
Arthrodesis	05(7%)	Cefoperazonesodium (20%) Cefoperazone and Sulbactam (20%) Cefuroxime (20%)
Implant removal	05(7%)	Cefoperazonesodium (20%) Cefoperazone and Sulbactam (40%) Cefuroxime (20%)
Wound debridement	04(4%)	Cefazolin (50%) Cefoperazone and Sulbactam (25%) Gentamicin (25%)

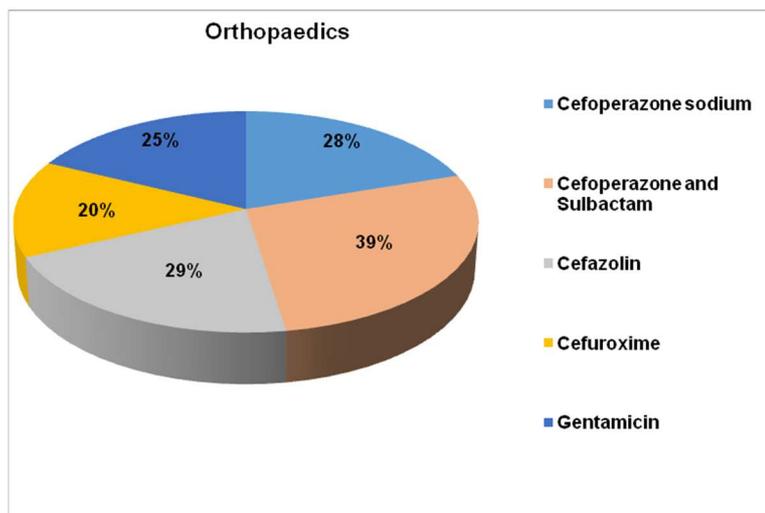


Fig. 2: Pattern of antimicrobial agents used in orthopaedics

In the gynaecology department, the common surgeries done were Total Abdominal Hysterectomy with Bilateral Salpingo Oophrectomy-TAHBSO (43%), vaginal hysterectomy (12%),

laparotomy hysterectomy (5%) and myomectomy (4%), where the antimicrobial agent prescribed was, only cefotaxime (100%) (table 3).

Table 3: Types of surgeries and antimicrobial agents used in the department of gynaecology

Name of surgery	No. of cases N=70	Name of antimicrobial agent
TAHBSO	43(61%)	Cefotaxime(100%)
Vaginal hysterectomy	12(17%)	Cefotaxime(100%)
Laparotomy hysterectomy	05(7%)	Cefotaxime(100%)
Myomectomy	04(5.7%)	Cefotaxime(100%)

**DISCUSSION**

The usage of prophylactic antimicrobial agents has significantly reduced the mortality and morbidity in the postoperative patients. Standard antibiotic prophylactic guidelines recommended the use of these agents prior to surgery. Nowadays, it has been made mandatory to use these drugs to minimize the surgical risk due to infection. The present study was done, to find out the pattern of prophylactic antimicrobial agents that were used in the departments of general surgery, orthopaedics and gynaecology. A total of 284 patients were included in the study. All antimicrobial agents were given one hour prior to surgery. The dose was based on the particular antimicrobial agent. In the department of general surgery, the common surgeries performed were appendicectomy (21%) followed by hernioplasty (17%), abdominal meshplasty (15%) and haemorrhoidectomy (13%). In these surgeries, the common antimicrobial agents used were cefotaxime (81%) followed by cefoperazone sodium (42%), ceftriaxone (25%) and amoxicillin with clavulanate (20%). The first three drugs belong to the third generation cephalosporin. Since the third generation cephalosporin is having a wide spectrum activity, it has become a preferred drug to be used as a prophylactic agent. According to Garcia-Rodriguez JA *et al.*, the frequency of wound infections in the cefotaxime group was less (3.3%) when compared to cefoxitin group(7.6 %) which is a second-generation cephalosporin [14]. Another study by Woodfield stated that, both ceftriaxone and cefotaxime along with metronidazole were highly effective and well comparable in their efficacy [15]. Amoxicillin and clavulanate were mainly used in skin graft and wound debridement in the present study. A study, published in vascular journal explained that, 95% of the organisms cultured from the skin preoperatively were sensitive to amoxicillin/clavulanic acid which has a suitable spectrum and tissue penetration [16]. Ciprofloxacin, ceftriaxone with sulbactam and ceftriaxone with tazobactam were used in appendicectomy, haemorrhoidectomy and hernioplasty surgeries in the present study. The common orthopedic surgeries done were ORIF (43%),

plate and screw fixation (21%), laminectomy and dissection (10%). In these surgeries the preferred antimicrobial agents used were cefoperazone with sulbactam (39%), cefazolin (29%) and cefoperazone sodium (28%). Since the staphylococcus aureus infection is most common in orthopaedic surgeries, above said antimicrobials were commonly used which was confirmed by the protocol, "Antibiotic Prophylaxis to Prevent Surgical Site Infections" by Alan *et al.*, In the present study, cefuroxime was mainly used in implant removal and arthrodesis cases which were also mentioned in the protocol [5]. Injection gentamicin was used in cases like wound debridement against gram negative infection in the present study which was supported by a study done by Adrienne J *et al.*, [17]. The frequent gynaecology surgeries were TAHBSO (43%), vaginal hysterectomy (12%), laparoscopic hysterectomy (5%) and myomectomy (4%). In these surgeries, an antimicrobial agent used was cefotaxime (100%). Cefotaxime was the common antimicrobial agent used as a monotherapy and also combined with the other group of antibiotics in most of the surgeries, specified in a study done by peter *et al.*, [18]. A similar study done by Brethiset *al.*, stated that the use of cefotaxime was 20.7% followed by metronidazole 19.1% [19]. A study by Amol M *et al.*, compared cefotaxime with various groups and defined that, the short course and long course of various antimicrobial therapy did not differ considerably [20]. After the follow-up, none of the patients showed any postoperative infections. The present study emphasized, that the chosen antimicrobials proved to be an effective prophylactic agent.

**CONCLUSION**

Reduction of surgical site infections decreases the postoperative morbidity, mortality and wastage of healthcare resources. Prolonged operative time, wound class, and wound contamination influence the wound infections. Antimicrobial prophylaxis is helpful in declining the frequency of post-operative infections. This study explains about the various antimicrobial agents used in surgeries. Practitioners must implement antibiotic prophylaxis based on the antibiotic policy.

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**AUTHORS CONTRIBUTIONS**

The research work and manuscript writing were done by Kala, the author. Jamuna Rani and Sangeetha Raja were involved with results analysis and correction of the manuscript.

**CONFLICT OF INTERESTS**

Declared none

**Ethical approval**

Approved by Institutional Ethics Committee

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