

# A Study on Surgical Prophylaxis of Antibiotics in Tertiary Care Hospital, Bangalore, India

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## Abstract

To assess surgical prophylaxis of antibiotics in Tertiary Care Hospital, Bangalore, India. This was a prospective observational study carried out for in-patients in the department who underwent elective surgery; excludes nonselective or emergency surgery. The data collection form was prepared based on the requirements of the study which, included patients' demographic details and their medical and medication detail. The specific types of data necessary for the study were recorded for each patient encountered and entered directly into the form. A total of 150 inpatients were enrolled in the study and their prescriptions were studied for the data collection. All data were entered into a computer spreadsheet: Microsoft Excel and double-checked before the calculations were done. Computations of drug use patterns were carried out as described earlier. Following the literature review, the drug use evaluation for bronchial asthma from this study was compared with those obtained in previous similar studies.

The present study was carried out for six months in a tertiary care hospital in Bangalore. The mean age of the study participants was 27.08% years. A total of 96 males (45.83%) and females (54.17%) were studied. Cefuroxime (31.07%) was the most commonly prescribed followed by cefoperazone sulbactam (23.30%) and amoxicillin-clavulanic acid (16.50%). Fixed-dose combinations were also frequently used among which, meropenem+metronidazole (4.85%) was the most common combination used followed by the Piperacillin Tazobactam + Ciprofloxacin (3.88%) and cefuroxime+amikacin (2.91%). Cefuroxime plus a cefoperazone sulbactam agent was the preferred prescribed postoperative antimicrobial combination; single-agent prophylaxis was used in 95.92% as preoperative agents and 88.35% (91of96) as post-operative and combination agents were used in (4.08%) as preoperative agents and (11.65%) as postoperative in hospital. The study helped to make awareness creation on the antibiotic drugs and the rules were significant intercessions suggested for fitting careful antimicrobial use. We found the significance of all prescribers preserves the handiness of accessible antibiotics through the act of proper antimicrobial endorsing.

**Keywords:** Surgical antibiotic prophylaxis, Ceftriaxone, Cefoperazone, surgical site infections, Sulbactam, Meropenem

## INTRODUCTION

Surgical antibiotic prophylaxis (SAP) is a very brief course of antibiotics initiated closely before the start of operative procedures to reduce postoperative surgical site infections (SSIs) [1]. SSI is one of the significant intricacies of employable strategies and is additionally among the most well-known nosocomial infections [2]. Guidelines dependent on great investigations have demonstrated that suitable surgical antimicrobial prophylaxis is among the successful measures for forestalling SSI [3]. For ideal advantage, deciding the fitting sign, choosing a specialist that covers the feasible microbe on injury contamination, and regulating adequate bactericidal fixations during the entire time frame that the cut is open for the danger of bacterial tainting is required [4]. Previous investigations of antibiotic prophylaxis use have demonstrated a wide variety of consistency to guidelines [5]. Antibiotic determination, timing, and span of antimicrobial prophylaxis utilize indicated high resistance while sign and portion were generally more palatable parameters [6].

An impressive extent of a great many activities on the planet every year are confounded by surgical site infections (SSI) [7]. Mortality rates and medical clinic readmission rates are essentially expanded. Post-medical procedure infections increase the costs incurred by the patient. At the point when an SSI happens, medical clinic readmissions and medical care benefits at home increase [8]. Un-fundamental use of antibiotics and delayed antibiotic prophylaxis (over 48 hours) are essentially connected with the expanded danger of antimicrobial-resistant microorganisms. SSIs were set up

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during the 1960s. The utilization of antibiotics to prevent postoperative infections assumes a significant job in diminishing the utilization of antibiotics to hinder postoperative infections assumes a significant part in decreasing the rate of postoperative infections, length of stay in the clinical facility, cost of therapy, and mortality, and encourages the patient getting back to ordinary life all the more rapidly he frequency of postoperative infections, length of stay in the clinical center, cost of treatment, and mortality, and causes the patient getting back to typical life all the more rapidly [9]. Locally distributed examinations (in Persian) demonstrated that antibacterial is the second most used drug after pain relievers in Iran and the use of these medications in the country shows a positive pattern in the long run. Although it was normal that the new antibiotics diminish the number of death and the rate of irresistible sicknesses, practically speaking, they did not [10]. Indeed, the spread of irresistible illnesses due to bacterial resistance to antibiotics, the emergence and re-emergence of irresistible infections, and deaths from nosocomial infections are generally due to the misuse of antibiotics that is a significant medical issue in the country [11].

In India, not much data is available on the pattern of use of prophylactic antibiotics. Judicious and appropriate use of pre-surgical antibiotic prophylaxis would not only contribute to the prevention of SSI but would also prevent the antimicrobial resistance by avoiding the unnecessary and incorrect administration of antibiotics sometimes beyond 24 h. There is a need to create standard information on the example of the use of prophylactic antibiotics concerning the wrong decision, a season of organization, the span of use, and measurements of antibiotics [12] and the current investigation targets estimating specialist's consistency to all the three boundaries. Suitable preoperative antibiotic prophylaxis (PAP) can diminish SSIs by as much as 80% [13]. This stems from the capacity of antibiotics to restrict the development of sullyng microorganisms. Added benefits incorporate decreased grimness and mortality, abbreviated medical clinic remain, and lessened emergency clinic costs [14]. However, the unseemly use of surgical prophylactic antibiotics can prompt confusion including expanded antimicrobial opposition, diminished adequacy, different unfavorable impacts, and higher clinic costs [15]. Prophylaxis is demonstrated in techniques where there is a high related pace of contamination. These are perfect polluted and debased injuries. It might likewise be demonstrated in certain spotless techniques where the results of an SSI are especially serious. These remember strategies for which prosthetic material or inserts are used [16]. The use of antibiotics within the sight of a messy injury is characterized as treatment of set up disease and is hence not inside the space of prophylaxis.

Surgical site infections (SSIs) incorporate all postoperative infections happening at surgical sites. Regardless of advances in disease control, SSI stays a significant impediment of surgical horizons [17]. Assessment of momentum antibiotic endorsing designs is a significant advance toward advancing

the fitting use of antimicrobial specialists, and in India, there is insufficient data and standard guidelines for antimicrobial prophylaxis. In this way, there is a need to create benchmark information on the example of the use of antimicrobial prophylaxis before suggesting any ideal changes. SSIs are the second most normal nosocomial contamination representing around one-fourth of 2 million emergency clinic obtained infections in the United States annually [18]. To battle SSI, antimicrobials are being recommended, and the idea of prophylactic use of antimicrobials in medical procedures was presented, and it is right now a fundamental segment of the standard consideration all techniques and has brought about decreased postoperative infections [19].

## MATERIALS AND METHODS

This was a prospective observational study conducted in the department of surgery. The study was carried out for 6 months enrolling 96 patients in Apollo Hospitals, Bangalore. All elective surgeries of any age admitted in the surgery department and willing to participate in the study were included. The outpatients, intensive care patients, and patients not willing to participate in the study, and patients with insufficient data in their records were excluded from the study. This was a retrospective study that included analysis of all the prescriptions from case records of all elective surgeries in a tertiary care hospital for one year. This study was undertaken after taking clearance from the institutional ethics committee of the hospital. Inclusion criteria for our study were all elective surgeries aged more than 18 years. The data will be analyzed and interpreted in terms of all parameters in each case of surgery.

## RESULT AND DISCUSSION

In the present study, out of 96 patients, females (54.17%) were frequently admitted to surgical departments in comparison to males (45.83%). This result was similar to the study carried out by GOUVÊA, M et al., which showed that female's predominance over males [20]. Similar results had also been obtaining in studies conducted by McGuckin, et al., which showed female predominance over a male [21]. Similar results had also been obtained in studies conducted by Klevens, et al., and Koc, et al., which showed an increase in the number of female population than males [22, 23]. In contrast to our study, the admissions of female patients in the department were more than male. The present study found that people in the age group of (50–59) years were most common and was found to be 27.08% to visit the surgical department. In another study conducted by Ram, et al. it was found the mean age of patients was  $32.86 \pm 16.46$  years (Range 6-78 years) [24]. The present study can be further illustrated by considering the example of Poonam Sharma, et al. where the mean age of the patient was  $45.33 \pm 19.01$  years [25]. (Table 1)

**Table 1.** Age distribution of the study population

Age group	N	%	Avg. (SD)
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<20	1	1.04	18±0.0
20-29	6	6.25	28.16±3.01
30-39	10	10.42	33.7±2.52
40-49	14	14.58	44.24±4.01
50-59	26	27.08	55.34±5.14
60-69	22	22.92	64.77±6.48
70-79	15	15.63	72.4±3.49
>80	2	2.08	83±0.0

In the present study, most of the surgical cases were osteoarthritis (13.54%) and cancer (10.41%). In another study conducted by Kaur et al., the most common surgeries were cholecystectomy (29%) and exploratory laparotomy (16%) [26]. The present study can be further illustrated by considering the example of Garey, K. W, et al. where cardiothoracic, gastrointestinal, genitourinary, neurosurgical, and orthopedic procedures were the most frequent surgeries performed, accounting for 18.7%, 17.5%, 16.9%, 13.9%, and 11.4% of the surgeries, respectively [27]. In the present study, about 95.92% of patients took a single prophylactic drug and about 4.08% took a combination of two drugs. While individually cefuroxime (31.63%) was the most commonly prescribed antibiotic followed by cefoperazone sulbactam (27.55%) and amoxicillin-clavulanic acid (16.33%). Fixed-dose combinations were also frequently used; among them, meropenem+metronidazole (3.06%) was the most common combination used followed by cefuroxime amikacin (1.02%). Cefuroxime plus cefoperazone sulbactam agent was the favored endorsed antimicrobial mix. Ram, et al. found that the most regularly recommended classes of antibiotics were cephalosporins (42%) trailed by penicillins (34%) [24]. Fifteen unique blends of antimicrobial drugs were utilized. 28 percent of patients (24 cases) got a solitary medication for prophylaxis while 35 patients (41%) got two drugs. Sixteen patients (19%) got three drugs and one got 4 drugs (cefotaxime, metronidazole, ampicillin, and gentamicin) for prophylaxis. In contrast to our result, Klevens, R. M, et al. discovered that antimicrobial choice, cefazolin, vancomycin, and metronidazole, was fitting in the vast majority of the cases aside from gentamicin [22]. Alemkere, et al. found that about 59% of patients took a solitary prophylactic medication and about 39% took a combination of two drugs [28]. In particular, about 84% of the members got ceftriaxone. Metronidazole (35.3%) is the second most endorsed prophylactic antimicrobial followed by ampicillin (19.6%). (Tables 2 & 3)

**Table 2.** Use of antibiotics as single and combination agents

Use of antibiotics	Pre-OP		Post OP	
	N	%	N	%
<b>Single agent</b>	94	95.92	91	88.35
<b>Combination</b>	4	4.08	12	11.65

**Table 3.** Use of pre-operative antibiotics as single and combination

Antibiotics	Number	%
<b>Single-agent</b>	<b>94</b>	<b>95.92</b>
Cefuroxime	31	31.63
Amoxicillin Clavulanic acid	16	16.33
Cefoperazonesulbactam	27	27.55
Piperacilintazobactam	4	4.08
Polymixin B	1	1.02
Metnidazole	2	2.04
Ciprofloxacin	1	1.02
Ertapenem	3	3.06
Meropenem	3	3.06
Cefepime	2	2.04
Vancomycin	2	2.04
Ceftriaxone	5	5.1
Amikacin	1	1.02
<b>Combination</b>	<b>4</b>	<b>4.08</b>
Meropenem + Metronidazole	3	3.06
Cefuroxime + Amikacin	1	1.02

While individually cefuroxime (31.63%) was the most commonly prescribed antibiotic followed by cefoperazone sulbactam (27.55%) and amoxicillin-clavulanic acid (16.33%). Fixed-dose combinations were also frequently used; among them, meropenem+metronidazole (3.06%) was the most common combination used followed by cefuroxime+amikacin (1.02%). Cefuroxime plus cefoperazone sulbactam agent was the preferred prescribed preoperative antimicrobial combination. Paradiso-Hardy, et al. showed that cefazolin was the antimicrobial utilized in 88% (38 of 43) of the revealed preoperative prophylactic regimens; vancomycin was utilized in just 7% (three of 43) of the regimens [29]. The preoperative measurements of cefazolin differed broadly both among territories and inside regions across Canada. Baniasadi et al. detailed that the most well-known antibiotic that the specialists decided for prophylaxis was cefazolin (70%) trailed by clindamycin (22%) and ceftriaxone (12%) [30]. Ram, et al. reported that no preoperative prophylactic antibiotic was recommended in 14 of 20 otorhinolaryngology cases [24] (Table 4).

**Table 4.** Use of post-operative antibiotics as single and combination

Antibiotics	Number	%
<b>Single-agent</b>	<b>91</b>	<b>88.35</b>
Cefuroxime	32	31.07
Amoxicillin Clavulanic acid	17	16.5
Polymixin B	1	0.97
Cefoperazone Sulbactam	24	23.3
Metronidazole	8	7.77

Ciprofloxacin	1	0.97
Ertapenem	3	2.91
Cefepime	2	1.94
Vancomycin	1	0.97
Ceftriaxone	5	4.85
Meropenem	3	2.91
Piperacillin/Tazobactam	5	4.85
Amikacin	1	0.97
<b>Combination</b>	<b>12</b>	<b>11.65</b>
Meropenem + Metronidazole	5	4.85
Cefuroxime + Amikacin	3	2.91
Piperacillin/Tazobactam + Ciprofloxacin	4	3.88

While individually cefuroxime (31.07%) was the most commonly prescribed antibiotic followed by cefoperazone sulbactam (23.30%) and amoxicillin-clavulanic acid (16.50%). Fixed-dose combinations were also frequently used; among them, meropenem+metronidazole (4.85%) was the most common combination used followed by the Piperacillin/Tazobactam + Ciprofloxacin (3.88%) and cefuroxime+amikacin (2.91%). Cefuroxime plus cefoperazone/sulbactam agent was the preferred prescribed postoperative antimicrobial combination. Paradiso-Hardy, et al. showed that Cefazolin was used in 87% (33 of 38) of the various postoperative prophylaxis regimens [29]. Sharma, et al. reported that the most regularly recommended bunch was the third-era cephalosporin (61%) [25]. While independently amikacin (58.5%) was the most usually endorsed individual AMA followed by ceftriaxone (44.55%) and metronidazole (55%). Fixed-portion combinations were additionally oftentimes utilized; among them, piperacillin-tazobactam (20.5%) was the most well-known combination utilized followed by the ceftriaxone sulbactam (13%) and Amoxicillin-clavulanic corrosive (7.5%). Cephalosporin plus aminoglycoside plus an anti-anaerobic agent was the favored endorsed postoperative antimicrobial combination.

**Table 5.** Postoperative doses of antibiotic

Antibiotics	Post OP Dose (mg)	Avg. no. of Post OP doses
Cefuroxime	750-1000	6.48
Amoxicillin Clavulanic acid	625-1200	4.35
Polymixin B	5 lakhs unit	2
Cefoperazone Sulbactam	1500mg	4.8
Metronidazole	500mg	4
Ciprofloxacin	500mg	4
Ertapenem	1000mg	2.6
Cefepime	1000-2200mg	4.5
Vancomycin	1000mg	2
Ceftriaxone	1000mg	3.25
Meropenem	500-1000mg	4.6
Piperacillin/Tazobactam	2250-4500mg	5

Amikacin	500-1000mg	1
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In the present study, prophylactic antimicrobials were used in all of the hospital centers; single-agent prophylaxis was used in 95.92% (94 of 96) as preoperative agents and 88.35% (91 of 96) as post-operative, and combination agents were used in (4.08%) as preoperative agents and (11.65%) as postoperative in hospital. In contrast to our result, Alemkere, et al. discovered that 68 (44.4%) of the patients took antibiotics for 2–5 days, and about a quarter (20.9%) of the patients took for not more noteworthy than a day [28]. About 80% of the antibiotics were begun before a careful cut or more than 50% of the patients took preoperatively, inside one hour of careful cut (**Table 5**).

Paradiso-Hardy, et al. discovered the middle length of antimicrobial prophylaxis was 36 h (range from 8 to 96 h) [29]. Prophylactic antimicrobials, regardless of whether utilized as a solitary agent or in combination, were halted inside 24 and 48 h of medical procedure 43% and 82% of the time, individually. Sharma, et al. detailed that the majority of patients (49%) were endorsed three antimicrobial drugs postoperatively [25]. The length of postoperative prophylaxis goes from 24 h or more in all patients during their hospital remain.

### CONCLUSION

This was a hospital-based prospective observational examination led at a tertiary consideration hospital for a half year to notice the careful prophylaxis of antibiotics. Accessibility and mindfulness creation on the antibiotic drugs and the rules were significant intercessions suggested for fitting careful antimicrobial use. In the patients who got antibiotics, the most widely recognized slip-ups were antibiotic determination followed by delayed prophylaxis (>24 hours) and abundance portion. All prescribers should ration the handiness of accessible antibiotics through the act of proper antimicrobial endorsing. GPs and specialists assume a function in diminishing improper careful antimicrobial prophylaxis by possibly recommending prophylaxis when indicated. SAP is a simple and cost-effective intervention that has the potential to greatly improve perioperative outcomes. Its importance in perioperative care is exemplified by its inclusion in the WHO Surgical Safety Checklist. There are many published guidelines on the subject, albeit with some generally minor differences between them. This is mainly because guideline development depends on many local factors, including patient population, availability of antibiotics, and local resistance patterns. Where available, it is recommended to consult with your hospital’s local guideline. This study demonstrated antibiotics were utilized as prophylactic in pretty much every patient. To battle improper antibiotic use, there is a need to make the SAP rules and to cling to these rules. Additionally, no consistency was noted in the circumstance of administration of prophylactic antimicrobials agents and no rules are being adherence to concerning prophylactic

antimicrobial administration. Albeit most antimicrobial agents were endorsed from the Essential Medicine List, the expense to patients was high because of the solution by brand names. The frequency of contamination in our middle is low. Huge varieties were seen in all the results evaluated, and all the examinations demonstrated a requirement for more noteworthy adherence to rules for careful antibiotic prophylaxis. Extensive proof backings the use of SAP; in any case, there are holes in the proof behind suggestions for the most suitable SAP routine for various surgeries. From this examination, we can reason that in instances of clean medical procedures there is no requirement for prophylactic antibiotics, as there is no measurable centrality, while in clean-polluted cases antibiotic prophylaxis is suggested as it decreases SSI factually huge. Administration in the two hours before medical procedure lessens the danger of wound contamination. The use of SAP was not related to the hazard for postoperative antibiotic-resistant infections in a huge partner of patients with postoperative infections. This gives significant consolation concerning the use of careful antibiotic prophylaxis.

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