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Antimicrobial utilization study in the department of surgery in a tertiary care teaching rural hospital

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ABSTRACT

Introduction

The purpose of surgical prophylaxis is to reduce the incidence of surgical site infection (SSI) with minimal alteration of normal microbial flora of the host and minimal adverse effects.

Methodology

In present study 200 patients have been included from Surgery Department over six month period.

Result

The common antimicrobials prescribed were third-generation cephalosporins (90.5%), followed by aminoglycosides (58%). Commonly prescribed individual antimicrobial agents were amikacin (58%), ceftriaxone (45%), metronidazole (40%) and cefixime (13%) and the common combination used were amoxicillin + clavulanic acid (21%), cefoperazone + sulbactam (18%), ofloxacin + ornidazole (16%), ceftriaxone + sulbactam (12.5%) and piperacillin + tazobactam (11%).

Conclusion

Cephalosporins and aminoglycosides were the most commonly prescribed prophylactic antimicrobial agents. Prophylactic antimicrobial agents should be prescribed appropriately using standard guideline.

Keywords: Antimicrobial agent, Drug Utilization, Cephalosporin, Aminoglycoside

INTRODUCTION

Antimicrobial agent (AMA) to designate synthetic as well as naturally obtained drugs that attenuate microorganisms [1]. The use of

antimicrobial agents to prevent infection is known as antimicrobial prophylaxis [2]. Antibiotics are one of the commonly used drug category in surgical procedures [3]. The importance of antimicrobial agents is magnified in the developing countries,

where infective diseases predominate. The purpose of surgical prophylaxis is to reduce the incidence of Surgical site infection (SSI) with minimal alteration of normal microbial flora of the host and minimal adverse effects. So the antimicrobial agent administration should be so timed that peak blood levels occur when clot is forming in the surgical wound, and it should be present throughout the procedure. Thus, most of the oral antimicrobial agents are given before 1 hour of incision, whereas i.v. administration just before/after anaesthesia best ensures effective blood levels of the antimicrobial agents during surgery. The common antimicrobial agents administered for 5 days in surgical procedures are: Cefazolin, Cefoxitin, ceftizoxime, Metronidazole, Amoxicillin + Clavulanate, Ciprofloxacin, Cefixime, Amikacin, etc. [1]

Surgical antimicrobial prophylaxis (SAP) refers to very brief course of an antimicrobial agent, which is initiated just before all elective operations [4]. Postoperative prolonged and inappropriate usage of antimicrobials increase the incidence of antimicrobial resistance [5]. Use of antimicrobial agents inappropriately strongly suggests the need for antimicrobial drug utilization studies in form of audit of the antimicrobial therapy [6]. To promote the appropriate use of antimicrobial agents, assessment of current antibiotic prescribing patterns is needed. Thus, before recommending any desired

modifications there is a need to generate the baseline data on the pattern of usage of antimicrobial prophylaxis [7]. So, the present study was conducted with the aim to examine and assess the prescribing pattern of antimicrobials among patients undergoing surgical procedure in a tertiary care hospital in India.

MATERIAL AND METHODS

A prospective observational study was carried out over a 6-month duration in the Department of General Surgery, PIMSR, Limda, Vadodara, Gujarat, with prior approval from the Institutional Ethical Committee. A total of 200 patients were included in the study. Demographic profile, disease pattern, profile of medicine, essentiality and rationality of medicines and appropriateness of use of medicines were analyzed. Appropriate statistical methods like chi-square test, population test or t-test were employed to analyze data throughout the study. “p” value equal to or less than 0.05 were considered as significant.

RESULTS

A total of 200 cases were studied of which majority 90 (45%) of the patients were in age group of 31–65 years and 130 (65%) patients were male (Table 1).

Table (1) Socio- demographic characteristic of study

Age	Percentage (%)
1-10	8.5
11-30	24
31-65	45
Above 65	22.5
Gender	
Male	65
Female	35

The most common surgical procedure was appendectomy in 24.80% of the procedure done

followed by hernia repair (18.60%). Fig.1 shows common procedures performed.

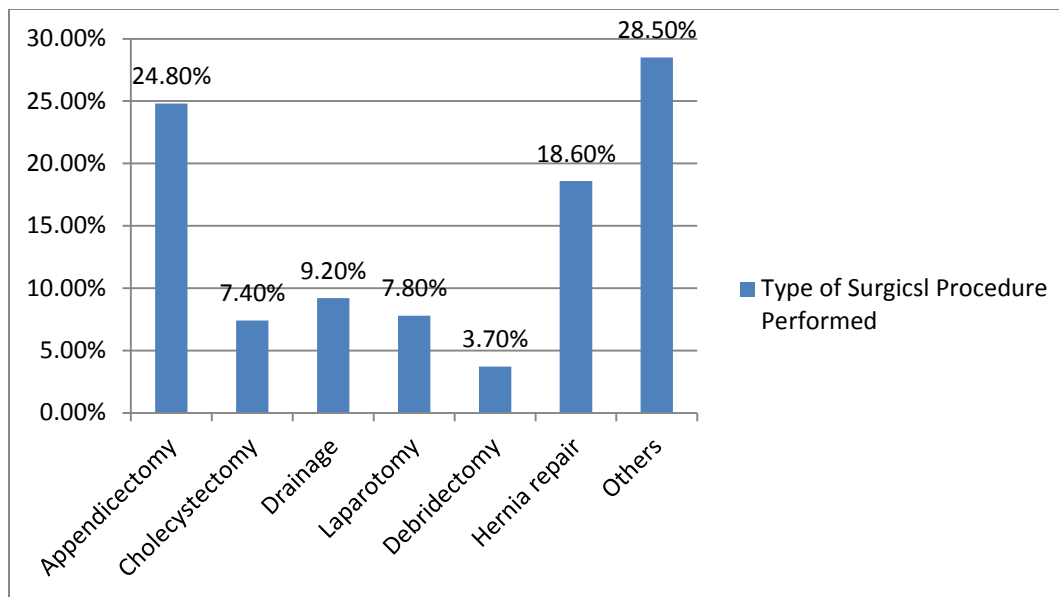


Fig (1) Type of surgical procedure performed in Surgery Department

Prophylactic antibiotics were given in all patients. Single antimicrobial drugs were prescribed in majority of the patients (55%). The common antimicrobials prescribed were third-generation cephalosporins (90.5%), followed by aminoglycosides (58%). The most frequently prescribed antimicrobial was ceftriaxone in 150 (75%) patients [Table 1]; of which 30 (15%) patients were prescribed ceftriaxone as fixed-dose combination of ceftriaxone-sulbactam. Other antibiotics like amikacin and metronidazole were added postoperatively. Third-generation cephalosporin (80%) was the most commonly prescribed group. Most commonly prescribed individual antimicrobial agent was amikacin (58%) followed by ceftriaxone (45%), metronidazole (40%) and cefixime (13%). Fixed-dose combinations also were frequently used; among them the most common

combination used was amoxicillin + clavulanic acid (21%) followed by the cefoperazone + sulbactam (18%), ofloxacin + ornidazole (16%), ceftriaxone + sulbactam (12.5%) and piperacillin + tazobactam (11%) [Table 3]. The preferred prescribed postoperative antimicrobial combination was cephalosporin with an aminoglycoside and an anti-aerobic agent. Postoperative prophylaxis duration ranges from one day or more in all patients during their hospital stay. Patients were given antimicrobial agents throughout their stay in hospital; 5 days were average duration of Postoperative prophylactic antimicrobial administration. Of the total drugs prescribed, 46% and 32% were prescribed from the Essential Drug List of India and WHO List of Essential Drugs and 55% drugs were given rationally. 70% antimicrobial agents were given appropriately.

Table (2) Group and types of Antibiotics prescribed preoperatively

Antibiotic Group	Antibiotics	Number of Patients (%)	Alone (%)	As FDC (%)
Cephalosporins	Ceftriaxone	150 (75)	120 (60)	30 (15)
	Cefixime	10 (5)	-	-
Nitroimidazoles	Metronidazole	45 (22.5)	45 (22.5)	-
Aminoglycosides	Amikacin	72 (36)	72 (36)	-
	Gentamycin	6 (3)	-	-

Table (3) Antibiotics prescribed postoperatively

Antibiotic group	Antibiotics	Alone (%)	As FDC (%)
Cephalosporins	Ceftriaxone	90 (45)	25 (12.5)
	Cefotaxime	3 (1.5)	-
	Cefixime	26 (13)	-
	Cefuroxime	1 (0.5)	-
	Cefoperazone	-	36 (18)
Penicillins	Piperacillin	-	22 (11)
	Amoxicillin	-	42 (21)
Aminoglycosides	Amikacin	116 (58)	-
	Gentamycin	6 (3)	-
Nitroimidazoles	Metronidazole	80 (40)	-
	Ornidazole	-	32 (16)
Fluoroquinolones	Ofloxacin	8 (4)	32 (16)
	Levofloxacin	4 (2)	-
	Ciprofloxacin	12 (6)	10 (5)
Imipenem	Meropenem	5 (2.5)	1 (0.5)

DISCUSSION

The objective of the study was utilization of antimicrobial drugs in pre and post operative patients in the general surgery department of the PIMSR. In this study, majority of the patients [180 (90%)] received preoperative prophylactic antimicrobials which is similar to study of sharma et al. [8, 9]. Most of the patients (55%) were prescribed single preoperative antimicrobial. Cephalosporins were the commonly prescribed antimicrobial agent group followed by the aminoglycosides and anti-anaerobic agent, i.e., metronidazole. This results corresponding to the other studies, which also showed that cephalosporins as most commonly prescribed antimicrobials [6, 10, 11]. Ceftriaxone was the most commonly prescribed antimicrobial agent among the cephalosporins in our study similar to that in another study sharma et al and ayele et al [8, 9]. The recent guidelines recommend the use of first-generation cephalosporins such as Cefazolin as surgical antibiotic prophylaxis [4, 12] but local resistance pattern and surgeon's own experience at hospital setting might influence the choice of antimicrobial [8]. In our study use of two and three antimicrobials is more. Most commonly used three antimicrobial agent combinations was cephalosporin, amikacin, and metronidazole which is similar to the study of ayele et al [9], although there is paucity of data which shows that addition of aminoglycoside gives any

additional benefit. In the present study preoperative patients received antimicrobial agents one hour before the procedure. Existing guidelines recommend that single dose of antimicrobial with long enough plasma half-life is sufficient as surgical antimicrobial prophylaxis, and it should not be given longer than 24 h [4]. The number of antimicrobials prescribed postoperatively were more as compared to preoperatively in our study. Postoperatively, two or more antimicrobials were prescribed in 80% of patients, three antimicrobials were prescribed in 45% of patients. Aminoglycosides were commonly prescribed followed by cephalosporins in postoperative antimicrobial choice. Amikacin was given in 58% of patients in combinations with other antimicrobials and ceftriaxone to 45% of patients. Cefoperazone-sulbactam, amoxicillin-clavulanic acid and piperacillin-tazobactam was given to 18%, 21% and 11% of patients. Antimicrobial agents were most commonly given through parenteral and oral route with an average duration of 5 days. Many other studies have also documented the prolonged use of postoperative prophylaxis of antimicrobials [10, 11]. Newer antimicrobial agents such as meropenem, imipenem, linezolid were also used postoperatively, findings are similar in terms of overuse of antibiotics in other studies [6, 11]. Of the total drugs prescribed, 46% and 32% were prescribed from the Essential Drug List of India and WHO List of Essential Drugs

and 55% drugs were given rationally. 70% antimicrobial agents were given appropriately. Reducing the infections after surgery is important but prolonged administration of antimicrobials not only leads to the emergence of resistant microbial strain but also increases the incidence of antimicrobials associated adverse effects and also the cost of the treatment [13]. Widespread use of AMAs may lead to emergence of multidrug-resistant microorganisms, which is the biggest health-care issue, we are facing globally.

CONCLUSION

Cephalosporins and aminoglycosides were the most commonly prescribed prophylactic

antimicrobial agents in the present study. Prophylactic antimicrobial agents should be prescribed appropriately using standard guideline. Implementation of antibiotic stewardship programs in hospitals, monitoring of prescription and drug utilization patterns should be done periodically to increase the therapeutic efficacy, decrease the adverse effects, and provide feedback to the prescriber to ensure rational use of medicines.

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