



## STUDY OF PATTERNS OF PROPHYLACTIC ANTIBIOTIC USED IN SURGICAL PROCEDURES IN TERTIARY CARE TEACHING HOSPITAL

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Received 05/04/2013; Revised 10 April 2013; Accepted 21 April 2013

### ABSTRACT

**Aim and Objective:** This study was undertaken to evaluate the patterns of prescribing antibiotics for the purpose of prophylaxis in surgery to prevent post operational infection.

**Methodology:** A retrospective analysis was performed of 126 prescriptions that received antibiotics for the purpose of prophylaxis of postoperative wound infections after undergoing surgery. Patient's undergone four major surgical procedures from surgery ward of RMMCH are included. Female patients undergoing cesarean and D and C are excluded. This study was conducted for a period of six months (29th July 2012 – 28th December 2012). Data is taken from the medical record for the study. Data about different types of prophylactic antibiotic regimen was collected.

**Conclusion:** The most common surgery in RMMCH is hysterectomy, followed by appendectomy, hernioplasty and prostatectomy. Ampicillin+Cloxacillin was the most commonly used regimen, 12.4% in RMMCH. In RMMCH ciprofloxacin and cefotaxime was also used by 12.4%. Ciprofloxacin and gentamicin (12%) combination was the third commonly used regimen in RMMCH.

**Key words:** Antibiotic prophylaxis, Surgery.

### INTRODUCTION:

Surgical site infections (SSI's) account for approximately 15% of nosocomial infections and are associated with prolonged hospital stays and increased costs. Antibiotic prophylaxis refers to a very brief course of an antibiotic initiated just before the surgery [1]. Improvement of aseptic and surgical techniques and use of antibiotics as prophylaxis resulted in reduction of post-operative wound infections. First generation cephalosporins are majorly used for these procedures as first line drugs especially cefazolin is most widely used drug for this purpose. Patients undergoing surgeries with high chances of postoperative wound infections are usually given this prophylaxis. Intravenous route is most commonly used for this prophylaxis purpose [2]. Although many studies are available to show the effectiveness of antibiotic prophylaxis many inappropriate regimens are being observed in practice. For maximum effectiveness of prophylaxis the administration of drug should be done within three hours after the start of the therapy or else its effectiveness will be reduced, but for maximum effect, it should be given just before or just after the start of the operation [3]. The procedure should be started pre

operatively in many circumstances but usually within 30 minutes of induction of anesthesia. antibiotic prophylaxis for surgery is given *within one hour prior to surgical incision* except for Vancomycin, which is given *within two hours prior to surgical incision* [4]. However, there may be situation where overriding factors alter the normal timing of administration. All these criteria's are developed in reference to international guidelines for considering antibiotic as a prophylactic use to conduct the study. Due to lack of proper guidelines in india the whole current practice is relied upon the current practice by senior doctors along with books and journals. In spite of care administered, it became mandatory in many settings to follow a prophylaxis due to increased chances of postoperative infections. This is also becoming a reason for inappropriate use of antibiotics. As we know that the cephalosporins are the first line drugs for these procedures they are often used in combinations and this type of practice is not only confined to india but can be seen in many developing countries like Nepal. So, this study aims to determine the practice of prophylactic antibiotic in different surgeries in one region of India.

Inappropriate prophylaxis is characterized by unnecessary use of broad-spectrum agents and continuation of therapy beyond the recommended time period. These practices increase the risk of adverse effects and promote the emergence of resistant organisms [5]. Lack of universally acceptable guidelines are due to the differences in the genetic makeup that results in the variety of response and outcomes, as a result these procedures are not well established and standardized leading to differences in practices. A well-established guide lines would help to achieve cost reduction, and moreover, lower adverse reaction risks, infection morbidity reduction, length of stay reduction, and microbial resistance reduction would be expected [6].

**MATERIALS AND METHODS:**

In our study we investigated the guidelines followed for prescribing antibiotics for prophylactic purpose. This study was descriptive, quantitative and retrospective study and collected data of patients undergone surgery in six months (29<sup>th</sup> July 2012 – 28<sup>th</sup> December 2012). This study included Medical records of in-patients of age fall between 18 - 65 years having no surgical history in past 1 month, absence of infection prior to surgery and patient undergoing various surgeries including gastrointestinal surgery, gynecological and obstetrics surgery, ENT surgery, biliary tract surgery, urological surgery etc where antibiotic prophylaxis is recommended by the literatures were reviewed retrospectively. Hospital patient details of all the patients' who had undergone surgery in the study period were noted from the record book of medical record section. Out of all the surgery cases in six months from the RMMCH hospital, 126 cases were collected by the systematic random sampling method. Data about patient, surgery and antibiotic prophylaxis were collected.

**RESULTS:**

This is a descriptive, quantitative, retrospective study. The prescribing pattern of antibiotic prophylaxis for different regimen was investigated in different surgeries of RMMCH hospital in Chidambaram. The data collected include patient demographic details, surgery details and antibiotic prophylactic data. The collected data are recorded and are as follows:

**SURGERIES PERFORMED:**

Four surgeries are found to be mostly performed during the study period and remaining procedures covered only a minor part excluding surgeries associated with other departments. Hysterectomy was the highly performed

procedure followed by appendectomy, hernioplasty and prostatectomy.

**Table 1: major surgeries performed during the study period.**

Sr. No.	TYPE OF SURGERY	PERCENTAGE OF PATIENTS
1.	Hysterectomy	43(34.1)
2.	Appendectomy	34(26.9)
3.	Hernioplasty	20(15.8)
4.	Prostatectomy	16(12.6)
5.	others	13(10.3)

**HYSTERECTOMY:**

In our study we found that the Ciprofloxacin with metronidazole (23.2%), Ciprofloxacin with Cefotaxime (18.6%) Cefotaxime (16.2%) alone were used mostly. Other drugs used include ciprofloxacin with gentamycin, ciprofloxacin alone, ampicillin with cloxacillin, cefotaxime with gentamycin and ciprofloxacin with amikacin.

**Table 2: Regimen of Antibiotic used for Prophylaxis in Hysterectomy**

Sr. No.	N = 43	
6.	Antibiotic	Percentage
7.	Cipro/metronidazole	10(23.2)
8.	Cipro/cefotaxime	8(18.6)
9.	Cefotaxime	7(16.2)
10.	Cipro/genta	6(13.9)
11.	Cipro	4(9.3)
12.	Ampi + cloxa	3(6.9)
13.	Cefotaxim/genta	3(6.9)
14.	Cipro/amikacin	2(4.6)

**APPENDECTOMY:**

Commonly used antibiotic regimen for appendectomy was metronidazole(29.4), ceftriaxone (23.5) and cefotaxime (20.5). These are followed by combinations of metronidazole and ceftriaxone (17.6) and metronidazole and cefotaxime (8.8).

**Table 3: Regimen of Antibiotic used for Prophylaxis in Hysterectomy**

Sr. No.	N = 34	
	Antibiotic	Percentage
1.	Metronidazole	10(29.4)
2.	Ceftriaxone	8(23.5)
3.	Cefotaxime	7(20.5)
4.	Metronidazole + ceftriaxone	6(17.6)
5.	Metronidazole + cefotaxime	3(8.8)

**HERNIOPLASTY:**

The commonly used regimen for hernioplasty in RMMCH was Ampi + Cloxa with Genta (56.3%). Cipro with Genta (25%) is the second mostly used regimen.

Table 4: Regimen of Antibiotic used for Prophylaxis in Herniorrhaphy

Sr. No.	N = 20	
	Antibiotic	Percentage
1.	Ampi + cloxa/genta	11(55)
2.	Cipro/genta	5(25)
3.	Cipro	4(20)

**PROSTATECTOMY:**

Combination of four antibiotics were mostly used, that was, Ampicillin with Gentamycin and Cefotaxim in 50% of cases. Ampicillin with Gentamycin (20%) is the second mostly used regimens.

Table 5: Regimen of Antibiotic used for Prophylaxis in Prostatectomy

S.no	N = 16	
	Antibiotic	Percentage
1.	Ampi + cloxa/genta/cefotaxime	8(50)
2.	Ampi / genta	3(18.7)
3.	Cipro / genta	3(18.7)
4.	Ampi + cloxa/genta/amikacin	2(12.5)

**OTHER SURGERIES:**

The surgeries other than mentioned earlier were included in the category of "Others". In RMMCH mostly used regimen was ciprofloxacin along with cefotaxime and gentamycin (35%), followed by ciprofloxacin alone (25%) and Ampicillin and Sulbactam (20%). For Circumscision, Hymenectomy, Fistulectomy, Oesophagoscopy, Urethrolithotomy, Laminectomy, Laparotomy and Haemorrhoidectomy.

Table 6: Regimen of Antibiotic used for Prophylaxis in others

Sr. No.	N = 13	
	Antibiotic	Percentage
1.	Cipro/cefotaxime/genta	6(35)
2.	Cipro	3(25)
3.	Ampi + sulbactam/genta	2(20)
4.	Cipro/genta	1(10)
5.	Ampi/genta	1(10)

**COMMONLY USED REGIMEN:**

Among all the antibiotics used in surgery department for prophylaxis purpose Ampicillin+Cloxa was the most commonly used regimen, 15%. Cipro/Cefotaxim was also used by 13.4%. Cipro/Genta (12.6%) combination was the third commonly used regimen in RMMCH. Most of the guidelines preferred first generation of cephalosporin (cefazolin) for the antibiotic prophylactic but in our study penicillin was found to be mainly used in hospital.

Table 7: Commonly used regimen in hospital

Sr. No.	Antibiotic		Percentage
	Antibiotic		
1.	Ampi + cloxa		19(15.0)
2.	Cipro/cefotaxime		17(13.4)
3.	Cipro/genta		16(12.6)
4.	Ampi +genta		14(11.1)
5.	Cipro		13(10.3)

**DISCUSSION:**

For Hysterectomy a systematic review of various guidelines recommends for a compulsory antibiotic prophylaxis for patient undergoing hysterectomy and the regimen should consist a single dose of a first generation cephalosporin, then clindamycin, erythromycin, or metronidazole should be used if the patient is found to be allergic to cephalosporins. Availability of different guidelines has created a confusion in electing a choice [7, 8]. The ASHP therapeutic guidelines on antimicrobial prophylaxis in surgery recommended a regimen for women undergoing vaginal hysterectomy, abdominal hysterectomy or radical hysterectomy was a single IV dose of cefazolin 1g or cefotetan 1g at the induction of anesthesia. An alternate was cefoxitin 1g IV at the induction of anaesthesia [9]. The Western Australian Drugs and Therapeutics Committee have preferred option for a vaginal hysterectomy and abdominal hysterectomy was a single agent of cefotetan 2g IV at the time of induction or cephalothin 2g plus metronidazole 500mg IV ending the infusion at the time of induction [10]. So, finally first generation cephalosporins were the choice of an agent for hysterectomy. In general, prophylaxis is considered optional. For hernia repairs entailing the insertion of mesh, prophylaxis is considered desirable since morbidity of infected mesh in the groin is substantial. However, no prospective trials demonstrate the effectiveness or necessity of this practice. If prophylaxis is desired or indicated for these procedures, cefazolin is the recommended agent. The Western Australian Drugs and Therapeutics Committee had recommended the use of gentamicin 2mg/Kg IV at the time of induction for the patient's undergoing prostatectomy [11]. The hospital infrequently met the international published guidelines for antibiotic prophylaxis and compliance varied by type of procedure and also within the procedure. For prophylaxis during appendectomy the guidelines recommends a regimen consisting of metronidazole with cefalothin or cefazolin or gentamycin or cefotetan and previous experiences suggests that prophylaxis is appropriate in appendectomy although difference existed in observed and recommended regimen it can be attributed to the local sensitivity patterns of the organism [12]. However the

effectiveness of the both treatments are not well established. So, the use of metronidazole combination with pencyllins can be justified. Use of prophylaxis in hernioplasty is elective and moreover significant evidence is absent to show the benefits of the prophylaxis and use of cefazolin is recommended based on the guidelines but, in a tertiary care hospital like RMMCH where majority of the patients are economically backward cost effectiveness plays a key role in determining the treatment, prophylaxis for hernioplasty is not recommended as there is very less risk of postoperative infection<sup>[12, 13]</sup>. For prostatectomy the use of cefotaxime is justified as many studies suggested the use of cefotaxime in prostatectomy prophylaxis<sup>[14, 15, 16]</sup>.

#### CONCLUSION:

The potential benefit of antimicrobial prophylaxis is determined by patient factors, procedure factors, and the potential morbidity of infection. Antimicrobial prophylaxis is recommended only when the potential benefit outweighs the risks and anticipated costs (including expense of agent and administration, risk of allergic reactions or other adverse effects, and induction of bacterial resistance). The prophylactic agent should be effective against organisms characteristic of the operative site. Cost, convenience, and safety of the agent also should be considered. The duration of antimicrobial prophylaxis should extend throughout the period when bacterial invasion is facilitated and/or likely to establish an infection. Eventhough prophylaxis has its own benefits it is of no use in low risk patients. Considering the economical situation of the patient it is better to avoid the prophylaxis in patients with low risk of infection and also surgical procedure to be executed is to be considered. In some cases like hernioplasty where there is low risk of infection it is better to avoid prophylaxis. Choice of antibiotic is to be based on the local studies of sensitivity patterns and local guidelines if any are available.

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