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Original Research Article

Prospective Observational Assessment of the Pattern of Antibiotics use for Surgical Prophylaxis Site Infections: A Multi-Centric Study

Mehre Darakhshan Mehdi[1], Md. Umar Abdullah[2], Mehre Afshan Mehdi[3], Nishant Verma[4]

[1]Associate Professor, Department of pharmacology, ESICMCH, Bihta, Patna, Bihar, India

[2]Senior Resident, Department of Urology, IGIMS, Patna, Bihar, India

[3]Senior Resident, Department of Obstetrics and Gynaecology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India

[4]Senior Resident, Department of Pharmacology, ESICMCH, Bihta, Patna, Bihar, India

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Corresponding author: Dr. Mehre Afshan Mehdi

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Abstract

Aim: To investigate the pattern of antibiotic use and the most common at different tertiary care centers.

Methods: A multi-centric prospective observational study was undertaken over a period of one year. The source population was all inpatients admitted to the hospitals and undergone surgery, whereas the study population was all patients who had undergone operation and admitted to surgical ward at different centers during the study period.

Results: Nearly half of patients (51.8%) stayed in hospital for more than 7 days before surgery was conducted. More than half of patients (54.3%) who underwent operation had clean contaminated wounds at the time of surgery and the mean duration of operation was 2.20 ± 1.44 h. One hundred thirty-six (85%) of the operations were elective surgery. The majority of patients received ceftriaxone-1gm 135 (84.3%). The most commonly prescribed regimen among the combination regimens was ceftriaxone-1gm plus metronidazole-500mg 20 (12.5%).

Conclusion: The current practice of the surgical antimicrobial prophylaxis in our hospital seems to be reasonable and comparable to the standard guidelines, with regards to the timing of administration and the intraoperative redosing. As a follow up to this survey, a prospective observational study may be undertaken to find out the effect of the prevalent pattern of the surgical prophylaxis on the occurrence of post operative wound infections.

Keywords: Pre and postoperative antimicrobial prophylaxis, surgical prophylaxis, antibiotic

Introduction

Surgical Site Infections (SSI) are a common complication associated with surgery, with reported incidence rates of 2-20%. It is also the second most common cause of nosocomial infections [1]. Surgical antimicrobial prophylaxis refers

to a very brief course of an antimicrobial agent which is initiated just before surgery, to prevent infections at the surgical site [2]. It is one of the most widely accepted practices in surgery. However, despite the evidence of the effectiveness and the publication of guidelines for the antimicrobial prophylaxis, its use is often found to be suboptimal [3]. Approximately 30-50% of the antimicrobial use in hospitals is now for surgical prophylaxis. However, between 30-90% of this prophylaxis is inappropriate [4].

Appropriate antibiotic prophylaxis has been shown to be effective in reducing the incidence of surgical site infections. Selection of an appropriate antimicrobial agent (AMA) depends on the pathogen most likely to cause an infection [5]. In prolonged surgeries, however, further antibiotic doses may be needed to maintain the drug levels. Re-administration should also be considered in the event of prolonged or excessive intraoperative bleeding [6].

SSIs can have a devastating impact on the patient's course of treatment and is associated with increased treatment intensity, prolonged length of stay and higher costs [7]. A study in the United States of America suggested that programs that reduce the incidence of surgical site infections can substantially decrease morbidity and mortality and reduce the economic burden for patients and hospitals [8].

Another well-documented approach is to use pre and postoperative antimicrobial prophylaxis. From patients that received antimicrobial prophylaxis 30–90% are inappropriate; most antimicrobials are either given at the wrong time, wrong dosage and wrong strength which results in increased antibiotic usage, increased costs, prolonged hospitalization, super infection, antimicrobial resistance and reduction of surgical antimicrobial prophylaxis (SAP) used [9, 10].

Hence, we aimed to investigate the pattern and most common regimen of antibiotic used in different tertiary care centers of India.

Material & Methods

A multi-centric prospective observational study was undertaken over a period of one year. The source population was all inpatients admitted to the hospitals and undergone surgery, whereas the study population was all patients who had undergone operation and admitted to surgical ward at different centers during the study period.

Inclusion and exclusion criteria:

All surgical patients who had operated during the study period and hospitalized up to 30 days were considered as eligible for the study. However, patients from other wards of the hospital (internal medicine, intensive care unit, emergency) and patients who died or left before third postoperative days and those not voluntary to participate were excluded from the study.

Data collection:

Written consent was taken from each participant before participating in the study. Socio-demographic characteristics of the patients, surgery-related information (site of surgery, duration of surgery, previous history of surgery, surgery type, hospital stay after surgery, wound class and occurrence of SSI after surgery within 30 days), antibiotic used (preoperative and postoperative antibiotic used, duration of antibiotics after surgery) were collected using data abstraction tool from patient's medical chart. Antimicrobial use evaluation was done according to Center for Disease Prevention and Control (CDC) criteria for using antimicrobials in surgical site infection (SSI) prevention and treatment [11].

Data entry and analysis:

Data was entered into and analyzed by SPSS version 20.

Results:

During the study period, a total of 160 were selected for the study.

The age of the patients ranged from 20 to 86 years with a mean of 35.189 ± 19.31 years. 17.5 % and 36.8 % patients were smokers and alcohol drinkers respectively (Table 1).

Nearly half of patients (51.8%) stayed in hospital for more than 7 days before surgery was conducted. More than half of patients (54.3%) who underwent operation had clean contaminated wounds at the time of surgery and the mean duration of operation was 2.20 ± 1.44 h. One hundred thirty-six (85%) of the operations were elective surgery. (Table 1).

Among 160 patients, more than two-third of (79.3%) patients received preoperative antimicrobial prophylaxis. 61.8% patients received antimicrobial prophylaxis for greater than 24 h after surgery. The majority of patients received ceftriaxone-1gm 135 (84.3%). The most commonly prescribed regimen among the combination regimens was ceftriaxone-1gm plus metronidazole-500mg 20 (12.5%). Amikacin-500mg was administered in 5 (3.1%) of the patients (Table 2).

Table 1: Socio-demographic and clinical characteristics of patients at surgical wards (N = 160)

Socio-demographic and clinical characteristics	**N**	**%**
Gender		
Female	62	38.7
Male	98	61.2
Age in years		
< 30	33	20.6
30–50	56	35
> 50	71	44.3
Residence		
Urban	88	55
Rural	72	45
Cigarette smoking		
No	132	82.5
Alcohol intake		
No	101	63.1
Yes	59	36.8
Preoperative blood transfusion		
No	121	75.6
Yes	39	24.3
Systemic steroid use		
No	136	85
Yes	24	15
Preoperative hospital stay (days)		
>7	83	51.8
<7	77	48.1
Co-morbidities		
Cardiovascular disease	38	23.7
Hypertension	16	10
Diabetes mellitus	5	3.1

HIV/AIDS	7	4.3
Infectiona	11	6.8
Multiple co-morbidities	10	6.2
Othersb	8	5
Wound class		
Clean	39	24.3
Clean contaminated	87	54.3
Contaminated	21	13.1
Dirty	13	8.1
Surgery type		
Emergency	24	15
Elective	136	85
Previous surgery		
No	119	74.3
Yes	41	25.6

Infection a: infections other than SSIs. Others b include cancer, psychotic disorders, asthma, and epilepsy

Table 2: Practice and appropriateness of surgical antimicrobial prophylaxis in surgery patients (N = 160)

Practice of antimicrobial prophylaxis (AMP)	**N**	**%**
Preoperative AMP provision		
Yes	127	79.3
No	33	20.6
Preoperative provided antibiotics		
Ceftriaxone	135	84.3
Ceftriaxone and metronidazole	20	12.5
Ampicillin	5	3.1
Time of administration of preoperative AMP (h)		
≤1	41	25.6
>1	79	49.3
Duration of postoperative AMP (h)		
≤ 24	18	11.2
>24	99	61.8
Indication of AMP		
Indicated and administered	92	57.5
Not indicated and not administered	41	25.6
Indicated but not administered	8	5
Not indicated but administered	19	11.8

Discussion:

The most commonly prescribed drug for AMP was ceftriaxone, followed by metronidazole, and it is comparable to study done in Brazil [12]. For surgical prophylaxis, it is important to select an antimicrobial with narrowest antibacterial spectrum to reduce the emergence of resistance and as for covering the most likely contaminating microorganisms for that type of surgery [13].

The combination of amikacin/ metronidazole with the third generation cephalosporins was noted in 30% and 32% of the pre and the postoperative cases respectively. Metronidazole has shown

benefit and it has been recommended as a combination in the surgical prophylaxis, to provide an adequate anaerobic cover [11]. A number of antimicrobial trials which had compared a variety of broad-spectrum single agents with aminoglycoside- based combinations, showed no significant differences in their efficacy [14]. Therefore, the routine addition of an aminoglycoside to other agents which have a broad-spectrum gram-negative coverage, such as the 3rd/4th generation cephalosporins, has been shown to provide no additional benefit [15].

Results from two large studies highlight the fact that single dose antibiotic prophylaxis is not associated with an increased rate of SSI when compared to multiple dose regimens.[15,16] Persistence of tissue concentrations past the period of surgery and recovery from anaesthesia doesn't improve efficacy and increases toxicity and cost of therapy.[17,18]

In general, single-dose prophylaxis or prophylaxis ending within 24 h after operation is recommended by guidelines [3]. Prolonged postoperative dosing of antibiotics does not provide additional benefits and is associated with increased risk of adverse events and induction of antimicrobial resistance [3,6].

Conclusion:

The current practice of the surgical antimicrobial prophylaxis in our hospital seems to be reasonable and comparable to the standard guidelines, with regards to the timing of administration and the intraoperative redosing. As a follow up to this survey, a prospective observational study may be undertaken to find out the effect of the prevalent pattern of the surgical prophylaxis on the occurrence of post-operative wound infections.

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