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Original Article

PATTERN OF SURGICAL ANTIBIOTIC PROPHYLAXIS IN A TERTIARY CARE HOSPITAL OF BANGLADESH

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Abstract:

Background: *Surgical Site Infection (SSI) is a common form of hospital-acquired infection and major cause of postoperative illness accounting for approximately a quarter of all nosocomial infections. As a result, surgical antibiotic prophylaxis is now considered essential to conventional surgical procedure in order to reduce surgical site infections and improve postoperative recovery. The misuse and overuse of antibiotics has led to an increase in treatment costs and the emergence of antimicrobial resistance. The goal of the study is to identify the pattern of prophylactic antibiotic prescriptions for different surgical operations.*

Materials and methods: *A retrospective observational study was conducted among 600 patients undergoing different surgeries in a tertiary care hospital of private setting in Dhaka, Bangladesh from July 2023 to December 2023. The demographic data, types of surgery, types of therapy, choice of antibiotic along with dosage formulations were collected.*

Results: *Out of 600 patients, 245 (41%) were male and 355 (59%) were female. Highest bulk of patients were from Department of General Surgery (47.5%), followed by Department of Obstetrics & Gynecology (24.16%) and Department of Otolaryngology (16.7%). Surgical prophylactic antibiotic was used in all 600 patients, and all antibiotics were given in intravenous route (100%). Almost 505 patients (84.2%) had received ceftriaxone as antimicrobial agent. Ceftriaxone with metronidazole or gentamicin and Cefuroxime with metronidazole or amikacin drugs combination were given to 75 (12.5%) and Cefuroxime, Amikacin, Metronidazole drugs combination were given to 20 patients (3.3%). 3rd generation cephalosporin, Ceftriaxone, was the most commonly prescribed antibiotic as monotherapy (94.3%), followed by 2nd generation cephalosporin, cefuroxime (4%).*

Conclusion: *Ceftriaxone was the preferred antibiotic for surgical prophylaxis. Existence of an antimicrobial guideline along with antibiotic stewardship program in every hospital could be helpful for prescribers to play role in containment of antimicrobial resistance.*

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Surgical Site Infection (SSI); Antibiotic prophylaxis; Ceftriaxone; Combination therapy; Monotherapy; Surgical operations;

Introduction

Roughly quarter of nosocomial infections are wound site infections, which are a significant cause of postoperative sickness. Surgery-related antibiotic prophylaxis should be emphasized as an addition to excellent surgical practice, not as a replacement. Selection of antibiotics should be determined by the most common surgical-site pathogens and also should

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consider the characteristics of the ideal agent.[1] In order to avoid surgical site infections, Surgical Antimicrobial Prophylaxis (SAP) involves the first administration of a short course of an antimicrobial drug before surgery.[2] According to the U.S. Centers for Disease Control and Prevention (CDC) hospital-associated infections contribute to 99,000 deaths each year. Surgical-Site Infections (SSIs) are the third most frequent type of nosocomial infection (14-16%).[3,4] Globally, SSI has a 2.5% to 41.9% prevalence rate, and it is higher in developing countries.[5] SSIs are associated with significant morbidity, mortality, and increased costs in health care.[6] SSIs significantly increase the postoperative length of the hospital stay, hospital charges, and risk of death.[7,8] One of the most common microorganisms that are involved in SSIs after clean procedures is *Staphylococcus aureus*, a skin flora, causing 37% of cases of SSIs in community hospitals with Methicillin-Resistant *Staphylococcus aureus* (MRSA) of particular concern and coagulase-negative staphylococci (e.g., *Staphylococcus epidermidis*).[9] The aim of surgical prophylaxis is to reduce rates of surgical site and healthcare-associated infections and so reduce surgical morbidity and mortality[10].

The principles of surgical prophylaxis have been established by various countries over the years. The guidelines are introduced to provide practitioners with a standardized approach to the rational, safe and effective use of antimicrobial agents for the prevention of Surgical-Site Infections (SSIs).[11] Irrational use of antimicrobials are associated with increase in the prevalence of antimicrobial resistance, adverse drug reaction and increased risk of surgical site infections and contribute to the rising cost of medical care and increase the economic burden to patients' family and society also.[12-15] In Bangladesh, there are few studies conducted on surgical antibiotic prophylaxis.[16,17] Therefore, this study was attempted to make sure that the current guidelines for surgical prophylaxis are followed, which will help to lower antibiotic resistance.

Materials and Methods

This was a retrospective observational study, conducted in East West medical college hospital, Dhaka, Bangladesh from July 2023 to December 2023 to find out the pattern of surgical antibiotic prophylaxis. By analyzing data of 600 patients who underwent different surgeries in East West medical College Hospital, Dhaka between July 2023 to December 2023. Demographic data, such as age, gender, admitted department were obtained from the treatment sheet. Information on antibiotics used as prophylaxis was recorded by using standard data collection form. Data was compiled, presented and analyzed using Microsoft Excel 2007 and was expressed as percentage.

Ethical clearance was obtained before analyzing the data.

Results

Table I showed that out of 600 patients, 245 (41%) were male and 355 (59%) were female. Highest bulk of patients were from Department of General Surgery (47.5%), followed by Department of Obstetrics & Gynecology (24.16%) and Department of Otolaryngology (16.7%). Majority of patients were age group 20-29 years (30.8%), followed by 30-39 years (20.8%) and 50-59 years (17.5%).

Table-I
Demographic data (n= 600)

Age (year)	Frequency	Percentage
<10	20	3.3%
10-19	65	10.8%
20-29	185	30.8%
30-39	125	20.8%
40-49	70	11.7%
50-59	105	17.5%
>60	30	3%
Gender		
Male	245	41%
Female	355	59%
Department wise distribution		
General surgery	285	47.5%
Orthopedics	40	6.7%
Otolaryngology	100	16.7%
Urology	15	2.5%
Obstetrics & Gynecology	145	24.16%
Neuro surgery	15	2.5%

Figure 1 showed that 505 patients (84.2%) had received monotherapy of antibiotic, whether 75 patients (12.5%) and 20 patients (3.3%) received two drugs combination and three drugs combination respectively.

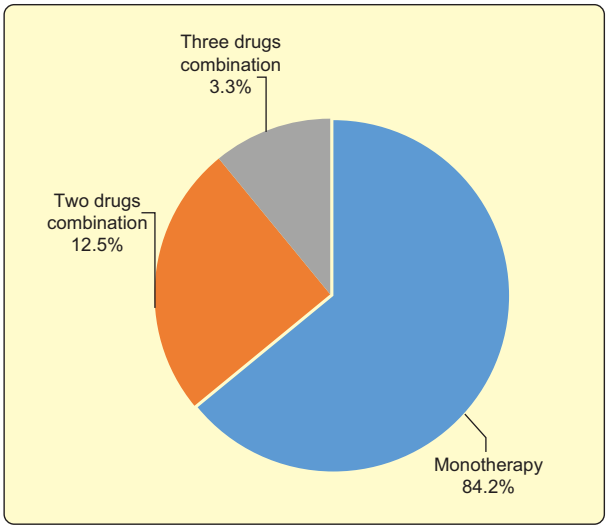

Figure 1 *Pattern of surgical antibiotic prophylaxis (n= 600)*

Figure 2 showed that ceftriaxone was the most commonly utilized antibiotic as monotherapy (94.3%), followed by cefuroxime (4%), Gentamycin (1%), Metronidazole (0.7%).

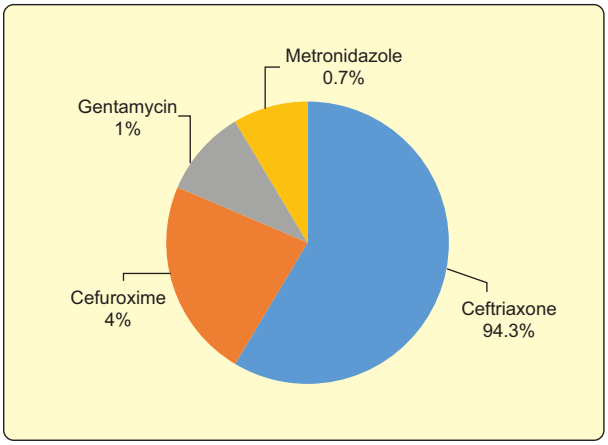

Figure 2: *Distribution of monotherapy (n=505)*

Combination of ceftriaxone and Metronidazole (42.7%) was the most common as two drug combination. As three drug combination, ceftriaxone, amikacin and metronidazole was solely used (Table II & Table III).

Table-II

Distribution of two drugs combination therapy

Two drug combination	Frequency (n=75)	Percentage
Ceftriaxone + Metronidazole	32	42.7%
Ceftriaxone + Gentamicin	26	34.7%
Cefuroxime + Metronidazole	10	13.3%
Cefuroxime + Amikacin	7	9.3%

Table-III

Distribution of three drugs combination therapy

Three drugs combination	Frequency (n= 20)	Percentage
Cefuroxime + Amikacin + Metronidazole	20	100%

Discussion

SSI remains the most common surgical complications. The rates of SSI are increasing globally even in hospitals with the most modern facilities.[13] In this current study, out of 600, 245 patients (41%) were male and 355 (59%) were female. Highest bulk of patients were from Department of General surgery (47.5%), followed by Department of Obstetrics & Gynecology (24.6%). Majority of patients were in an age group range of 20-29 years (30.8%), followed by 30-39 years (20.8%) and 50-59 years (17.5%). The age range of surgical patient's concordance with some studies conducted in India.[18,19]

The choice of antibiotic should take into account local resistance patterns. Narrow spectrum, less expensive antibiotics should be the first choice for prophylaxis during surgery.[20] In this current study it was found that most of the patients (84.2%) had received monotherapy of antimicrobial agent. Combination therapy with two drugs and three drugs were given to (12.5%) and patients (3.3%) respectively. But in a similar study conducted in Bangladesh, it was found that two drug combination was used as surgical prophylaxis in most of the patients followed by monotherapy and three drug combination.[16] The antibiotic usage pattern of the current study Showed that most commonly prescribed antibiotics was ceftriaxone (94.3%) which is similar with the findings of previous studies.[16,19] Use of cefuroxime stood next to ceftriaxone. But in another study conducted in Bangladesh, it was reflected that most commonly used antibiotic were Cefotaxime, followed by cefoperazone, ceftriaxone, and amoxicillin with clavulanate (20%) in surgical patients.[12] Combination antibiotic therapy was administered for synergistic action and to cover the broad spectrum of microorganisms in post-operative cases. In the current study, the antibiotic combination of ceftriaxone with metronidazole (42.7%) was common followed by ceftriaxone with gentamicin (34.7%), cefuroxime plus metronidazole (13.3%) and cefuroxime plus Amikacin (9.3%). But in other study with similar concept, it was revealed that most

commonly used antibiotic combination was Cefotaxime with metronidazole followed by ceftriaxone and ampicillin.[23] In case of three drug combination therapy, cefuroxime, amikacin and metronidazole were used in this current study. But the use of Ceftriaxone, metronidazole, gentamicin were more frequent in a similar study.[21] The difference in selection of antibiotic as prophylaxis may be due to the difference in sensitivity pattern of the targeted pathogens which are common causative agents for the surgical site infection.

Limitation

In this study sample size was small due to time constrains and conducted in single center.

Conclusion

Antimicrobials are key component of infection prevention and management. This study found that all patients underwent surgery received antibiotic prophylaxis through intravenous route, and the most frequently administered antibiotic was ceftriaxone followed by cefuroxime.

Recommendation

Implementation of an antimicrobial guideline along with antibiotic stewardship program in every hospital could be helpful for prescribers to play role in containment of antimicrobial resistance.

Disclosure

All the authors declared no competing interest.

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