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Pattern of Aerobic Bacterial Species Causing SSIs and Their Antibiogram

Dr. Goutom Kumar Ghosh[1*], Dr. Md. Sherajul Islam[2], Dr. Shyamal Kumar Bashak[3], Dr. KH. Mehedi Ibnay Mostfa[4], Dr. A S M Kutub Uddin Awal[5], Dr. Md Majedul Islam[6], Dr. Raju Ahmed[6], Dr. ASM Abdur Rahman[7]

[1]Senior Consultant, Department of Surgery, 250 Bedded General Hospital, Pabna, Bngladesh
[2]Junior Consultant, Department of Surgery, 250 Bedded General Hospital, Pabna, Bangladesh
[3]Ex- Senior Consultant, Department of Anaesthesiology, 250 Bedded General Hospital, Pabna, Bangladesh
[4]Lecturer, Department of Community Medicine, Pabna Medical College, Pabna, Bangladesh
[5]Junior Cosultant, Department of Surgery, 250 Bedded General Hospital, Pabna, Bangladesh
[6]Assistant Registrar, Department of Surgery, 250 Bedded General Hospital, Pabna, Bangladesh
[7]Senior Consultant, Department of Anaesthesiology, Sadar Hospital, Jhenaidh, Bangladesh

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***Corresponding author:** Dr. Goutom Kumar Ghosh

Abstract **Original Research Article**

We carried out a comparative study in the department of surgery, 250 Bedded General Hospital, Pabna, Bangladesh during the period from January, 2015 to June 2018. A total of 160 patients who were admitted for elective general surgical operations were selected by purposive sampling. Out of these 65 patients were given 3 dose of prophylactic antibiotic and another 95 patients were given 7 days of traditional prophylactic antibiotic. Evidence of surgical site infection was observed in both groups up-to 30 days postoperatively in inpatient and outpatient. Our aim was to compare the result of short-term three prophylactic antibiotic versus traditional long-term seven days prophylactic antibiotic for prevention of surgical site infection. The age distribution of the patients. 17(10.7%) were below 20 years of age. Nearly 20% of patients were between 20-30 years of age, followed by 18.2% between 30-40 years, 25.2% between 40-50 years and the rest 27% were 50 years above. The comparison of sex distribution between 2 antibiotic regimens. About 50% of the short-term antibiotic group and 64.6% of the long-term antibiotic group were male and the male female ratio was roughly 3:2. In short-term group (9.23%) and in long-term group (7.36%) got surgical site infection. The difference in infection rates between two groups was not statistically significant. (P-value =0.771). The short-term regimen is less costly for the patients, has the same prophylactic benefits. There is no advantage in prolonging a patient's hospital stay following elective surgery to administer postoperative antibiotics for long duration. This study conclude that short-term prophylactic antibiotic is as effective as traditional long-term prophylactic antibiotic for prevention of surgical site infection and it is cost effective.

Keywords: Antibiotic, prophylactic, Infection, Elective, Surgery.

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INTRODUCTION

Surgical site infection (SSI) is a difficult term to define accurately because it has a wide spectrum of possible clinical features. The centers for disease control and prevention (CDC) have defined SSI to standardized data collection for the National Nosocomial Infections Surveillance (NNIS) program (CDC, 1996). Surgical site infection (SSI) is infection at the site an operation either at the site of infection or in the organ or body cavity that are manipulated during operation. Definitions of surgical site infection are based on those published by CDC in 1992, and are classified as incisional and organ/space infection. The concept of prophylactic antibiotic was established in the 1960s when experimental data established that antibiotic had to be in the circulatory system at a high enough dose at the time of incision to be effective [1]. General agreement exists that prophylactic antibiotics are indicated for clean-contaminated and contaminated wound. Antibiotic for dirty wound are part of the treatment because infection is established already. Clean procedures might be an issue of debate. No doubt exists regarding the use of prophylactic antibiotics in clean procedure in which prosthetic devices are inserted because infection in these cases would be disastrous for the patients. However, other clean procedures may be a matter of contention [2, 3]. Surgical site infection (SSI), antecedently known as operative wound infection,

results from microorganism contamination throughout or when a surgical procedure [4]. SSIs square measure classified into incisional SSIs which might be superficial or deep, and organ/space SSI, that have an effect on the remainder of the body aside from the bloody wall layers that square measure manipulated throughout the procedure. Superficial incisional SSI is additional common than deep incisional SSI and organ/space SSI and accounts for over half all SSIs for tall classes of surgery [5]. Surgical site infections, accounts 14-16% of the calculable two million medical building infections touching hospitalized patients in united states [6]. A survey sponsored by the planet health organization monstered a prevalence of medical building infections accounting for 5-34% of the total [7]. The 2002 survey reportable by the medical building Infection National police work service (NINSS), indicates the incidence of hospital no heritable infection (HAI) associated with surgical wounds within the United Kingdom is as high as 100 percent price the state health service within the United Kingdom more or less one billion pounds (1.8 billion dollars) annually [6]. Among the 27 million people undergoing survey annually, approximately 500,000 will acquire a nosocomial SSI. SSIs are the third most commonly reported nosocomial infection [8]. Most SSIs are contaminated by the patient's own endogenous flora, which are present on the skin, mucous membranes, or hollow viscera. The traditional microbial concentration quoted as being highly associated with SSIs is that of bacterial counts higher than 10,000 organisms per gram of tissue [9]. Internationally, the frequency of SSI is difficult to monitor because criteria for diagnosis might not be standardized. A survey sponsored by the world health organization demonstrated a prevalence of nosocomial infections varying from 3-21%, with wound infections accounting for 5-34% of the total [7]. SSIs Are associated with increased morbidity and mortality. Seventy-seven percent of the death of surgical patients were related to surgical wound infection [10]. Kirkland KB *et al*., [11] calculated a relative risk date of 2.2 attributable to SSIs, compared to matched surgical patients without infection. In another study it was found that patients who develop a surgical site infection are two to three times more likely to die compared to patients who do not develop a surgical infection [12]. A review of the incidence and economic burden of SSIs in Europe estimated that the mean length of extended hospital stay attributable to SSIs was 9.8 days. Furthermore, long-term use of antibiotics could turn out super infection. During this study the frequency yet as spectra and long-term antibiotic prophylactic teams. Short-term prophylactic antibiotic medical care is equally effective as that ancient long-term medical care for interference of surgical site infection.

OBJECTIVES

a) General Objective

- To compare the outcome of two regimens of antibiotic therapy.

b) Specific Objectives

- To find out the frequency of surgical site infections (SSIs) among recipients of short-term prophylactic antibiotic.
- To see the pattern of aerobic bacterial species causing SSIs and their antibiogram.

METHODOLOGY AND MATERIALS

It is a hospital bases prospective. Nonrandomized and cross-sectional type of descriptive study in the department of surgery, 250 Bedded General Hospital, Pabna, Bangladesh during the period from January, 2015 to June 2018. A total of 160 patients were selected by purposive sampling method. Patients were categorized into 2 groups. 65 cases were under of short-term prophylactic group irrespective of age sex and 95 cases were long-term prophylactic group. Clearance from the ethical committee of RMCH was taken prior to the study. The purpose was explained to the patients. Informed consent was taken from the conscious adult patients from the guardians of the immature. All clinical information including history, physical findings and investigation reports were collected and recorded in a pre-designed data collection sheet. Data were processed and analyzed using SPSS. The test statistical used to analyzed were descriptive statistical. The summarized data were presented in from of the table and graphs and were duty interpreted.

Inclusion Criteria

- Patients admitted for elective general surgical operations in different surgical units of RMCH.

Exclusion Criteria

- Patients suffering from severe malnutrition, malignancy, tuberculosis, obstructive jaundice and patients having medical problems like metabolic, cardiovascular, respiratory disease.

RESULTS

In this study a total of 160 patients were selected who underwent elective general surgery and received prophylactic antibiotics of different duration to prevent surgical site infections. Table-1 shows the age distribution of the patients. 17(10.7%) were below 20 years of age. Nearly 20% of patients were between 20-30 years of age, followed by 18.2% between 30-40 years, 25.2% between 40-50 years and the rest 27% were 50 years above. The mean age was 38.66±15.11 years and the minimum and maximum ages were 13 and 80 years respectively. Figure-1 compare the sex distribution between 2 antibiotic regimens. About 50% of the short-term antibiotic group and 64.6% of the long-term antibiotic group were male and the male female ratio was roughly 3:2. Table-2 shows that 92 (57.50%) surgery was clean surgery. Among the clean

surgery prophylactic long-term antibiotic was used in 61.96% of patients and in clean-contaminated surgery it was used in 55.88% of patients. Table-3 shows that surgical site infection in clean-contaminated surgery was more than that clean surgery [7(10.30%) Vs 6(6.52%)]. Figure-2 shows that 13 patients who shows clinically SSI when the wound swab cultured in the appropriate media reveals 7 (53.85%) growth of staphylococcus aureus. There was 4 (30.76%) pseudomonas infection. Table-4 shows that the average cost of antibiotics in non-infected cases for short-term group was less than of the long-term group (375.00 Taka Vs 1043.00 taka). Table-5 shows that total 13 patients developed SSI. The average additional post-operative hospital stays of them were 5.30 days. Among them 6 patients who were given short-term prophylactic antibiotic had less post-operative hospital stay in comparison to 7 patients who were given long-term prophylactic antibiotic. The mean duration of additional post-operative hospital stay in short-term and long-term antibiotic group was 4.33 days Vs 6.14 days.

Table-1: Age wise distribution of patients. (n=160)

Age (years)	Frequency	Percentage (%)
<20	17	10.7
20-30	30	18.9
30-40	29	18.2
40-50	40	25.2
≥50	43	27.0

Mean age =38.66 ±15.11 years. Range =13-80 years.

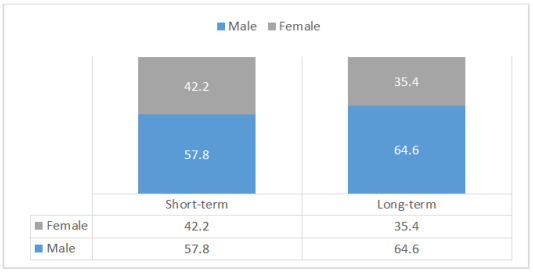

Fig-1: Shows the sex wise distribution of the patients. (n=160)

Table-2: Types of prophylactic antibiotic used in clean and clean-contaminated surgery. (n=160)

Prophylactic Antibiotic Regimen	Clean Surgery		Clean-Contaminated Surgery		Total	
	No.	%	No.	%	No.	%
Short-term	36	(53.84) [38.04]	30	(46.16) [44.12]	66	(40.62)
Long-term	57	(60.00) [61.96]	33	(40.00) [55.88]	90	(59.38)
Total	92	(57.50) [100.00]	68	(42.50) [100.00]	160	(100.00)

Data were analyzed using Chi-square (x^2) test.

Table-3: Surgical site infection (SSI) in clean and clean-contaminated surgery. (n=160)

Surgical Site Infection	Clean Surgery		Clean-Contaminated Surgery		Total	
	No.	%	No.	%	No.	%
Infection present	6	(6.52)	7	(10.30)	13	(8.12)
Infection absent	86	(94.48)	61	(89.70)	147	(91.88)
Total	92	(100.00)	68	(100.00)	160	(100.00)

Though the difference was not significant (P-values was 0.05).

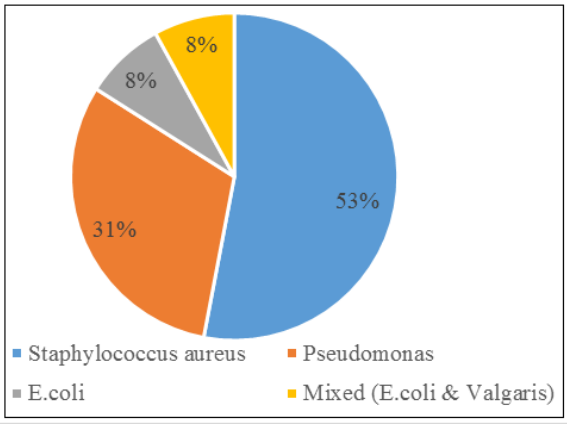

Fig-2: Growth of organism in the culture of the wound swab (n=160)

Table-4: Average cost of antibiotics in two groups of patients. (n=160)

Antibiotic Prophylactic group	Average cost for non-infected cases (taka)	Average cost for infected cases (taka)	Total
Short-term	375	691	1066
Long-term	1043	1263	2311
Total	1418	1959	3377

Though the difference was not significant (P-values was 0.05).

Table-5: Additional days of post-portative hospital stay for patients with surgical site infection (SSI). (n=160)

Antibiotic Prophylactic group	Number of patients with surgical site infection (SSI)	Total number of additional post-operative hospital stays (days)	Average of additional post-operative hospital stay (days)
Short-term	6	26	4.33
Long-term	7	43	6.14
Total	13	69	5.30

DISCUSSION

This study was carried out in 250 Bedded General Hospital, Pabna, Bangladesh during the period from January, 2015 to June 2018. In this study 160 patients were selected purposely. They were admitted in different surgical units of Rajshahi Medical College Hospital for elective general surgical operations during the period from July 2007 to June 2008. All the patients were received prophylactic antibiotics of different duration to prevent surgical site infections. The patients who received 7 days antibiotics were termed as traditional long-term antibiotic group. Out of the 160 patients 65 patients were given short-term prophylactic antibiotic and 95 patients were given long-term prophylactic antibiotic. In this study, the rate of surgical site infection in different elective surgical operations, in different surgical wounds, duration of hospital stay with short-term and long-term prophylactic antibiotic were carried out along with categorization of surgical site infection and aerobic bacteriological study. My findings can be compared with the result of study made by [11-16]. In this series, of the total 160 patients, 17(10.7%) were below 20 years of age. Nearly 20% of patients were between 20-30 years of age, followed by 18.2% between 30-40 years, 25.2% between 40-50 years and the rest 27% were 50 years above. The rate of od SSI occurred in 13(8.13%) patients in spite of conflictive antibiotic used. This indicates that there are still other factors for development of SSI. Again, in short term antibiotic used group the proportion of surgical site infection was 9.23% and in long-term group it was 7.36%. This may be due to unusual sample size of two groups of patients, inhomogeneous samples, different grades/ categories of surgeon performing operations which may reflect the differences. The rate of SSI in clean surgery was less because in this type of surgery no inflammation was observed and no unusual contamination occurred as because the respiratory, gastrointestinal, biliary, genital and urinary tract is not entered. Moreover, of the clean surgery thyroidectomy and enucleation of fibroadenoma of breast oppressions were done by more experienced surgeon this finding can be compared with the study made by [14]. Regarding the types of surgery 92 (57.50%) surgery was clean surgery. Among the clean surgery prophylactic long-term antibiotic was used in 61.96% of patients and in clean-contaminated surgery it was used in 55.88% of patients. SSI in clean contaminated, found 7(10.30%) was more than that of clean wound 6(6.52%). The study reveals that 13 patients developed SSI of which superficial incisional and deep incisional SSIs were 11 (84.61%) and 2 (15.39%) respectively. In short-term group superficial incisional SSI was double (66.66%) than deep incisional SSI (33.33%). These findings consistent with the result of study published by National Nosocomial Infection Surveillance system (NNIS system) in different journals [17]. Average cost of antibiotics for non-infected long-term group was much more than that of short-term group (1043.30 TK Vs 375.00 TK). Again, patients with SSI the average cost of antibiotic in long-term group was much more than that of short-term group (1268.57 TK Vs 691.66 TK). The average additional post-operative hospital stays of patients who developed SSI was 5.30 days. Out of 13 patients with SSI, 6 patients who were given short-term prophylactic antibiotic had less post-operative hospital stay (4.33 days) in comparison to 7 patients who were given long-term prophylactic antibiotic (6.14 days). The difference was not statistically significant. These findings show that surgical site infection prolongs post-operative hospital stay of the patients, which again increases the cost of treatment as well as health care system and increase the workload of hospital staffs for the management of infected wounds. These findings can be compared with the study made by [15]. From this study that SSI increases the cost of treatment, prolongs postoperative hospital stays and suffering which means increase the morbidity of patients and also increase the workload of hospital stuffs.

LIMITATIONS OF THE STUDY

The sample size was smaller than the required sample size determined which must be considered in generalization the findings of the study in reference population.

CONCLUSION AND RECOMMENDATIONS

Short-term prophylactic antibiotic can be recommended in elective surgery as it is less costly and has the same prophylactic benefit as that of traditional long-term prophylactic antibiotic. This study shows short term three dose of prophylactic antibiotic is as effective as long-term use of antibiotics traditional practiced in many centers of our country in elective surgery. The short-term regimen is less costly for the patients, has the same prophylactic benefits. There is no advantage in prolonging a patient's hospital stay following elective surgery to administer postoperative antibiotics for long duration. This study conclude that short-term prophylactic antibiotic is as effective as traditional long-term prophylactic antibiotic for

prevention of surgical site infection and it is cost effective.

REFERENCES

1. Burke JF. The effective period of preventive antibiotic action in experimental incisions and dermal lesions. Surgery. 1961 Jul 1;50(1):161-168.
2. Gupta R, Sinnett D, Carpenter R, Preece PE, Royle GT. Antibiotic prophylaxis for post-operative wound infection in clean elective breast surgery. European Journal of Surgical Oncology (EJSO). 2000 Jun 1;26(4):363-6.
3. Platt R, Zucker JR, Zaleznik DF, Hopkins CC, Dellinger EP, Karchmer AW, Bryan CS, Burke JF, Wikler MA, Marino SK, Holbrook KF. Perioperative antibiotic prophylaxis and wound infection following breast surgery. Journal of Antimicrobial Chemotherapy. 1993 Jan 1;31(suppl_B):43-8.
4. Cobb-Parren J, Schmieg-Robert, Hurt-Thomas K, Mundy-Linda M. (ed)., Inflammation, infection and Antimicrobial Therapy. In: Current Surgical Diagnosis and Treatment, USA, McGraw Hill; 12th ed; 2006; 106-107.
5. National Nosocomial Infections Surveillance (NNIS) System: NNIS report, data summery from October 1986 - April 1996, issued May 1996. A report from the NNIS system. Am J Infect Control, 1996 Oct; 24(5): 380-388.
6. Emori TG, Gaynes RP. An overview of nosocomial infections, including the role of the microbiology laboratory. Clinical microbiology reviews. 1993 Oct 1;6(4):428-42.
7. Mayon-White RT, Ducel G, Kereselidze T, Tikomirov E. An international survey of the prevalence of hospital-acquired infection. Journal of Hospital Infection. 1988 Feb 1;11:43-48.
8. Bonnie M, Barnard MPH. Limiting the duration of antimicrobial prophylaxis. In. fighting Surgical Site Infection. 2008. Available from: http//www.infectioncontrotoday.com. Virgo Publishing Copyright 2008.
9. Krizek TJ, Robson MC. Evolution of quantitative bacteriology in wound management. The American Journal of Surgery. 1975 Nov 1;130(5):579-584.
10. Mangram AJ, Horon TC, Pearson ML. Guideline for prevention of surgical site infection 1999. Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol. 1999; 20(4), 250-278.
11. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. Infection Control & Hospital Epidemiology. 1999 Nov;20(11):725-730.
12. Beilman G, Haues K, Kosmatha P. Health care protocol Prevention of Surgical site infection. ICSI. 2006; 20, 3-5.
13. Zahid MA, Bakhsh R, Dar FS, Akhter N, Malik ZI. Comparison of single dose and three dose antibiotic prophylaxis with cefotaxime sodium in cholecystectomy. Journal of Ayub Medical College Abbottabad. 2003;15(1), 38-40.
14. McDonald M, Grabsch E, Marshall C, Forbes A. Single-Versus Multiple–Dose Antimicrobial Prophylaxis For Major Surgery: A Systematic Review. Australian and New Zealand Journal of Surgery. 1998 Jun;68(6):388-395.
15. Haley RW, Schaberg DR, Crossley KB, Von Allmen SD, McGowan Jr JE. Extra charges and prolongation of stay attributable to nosocomial infections: a prospective interhospital comparison. The American journal of medicine. 1981 Jan 1;70(1):51-58.
16. Nelson CL, Green TG, Porter RA, Warren RD. One day versus seven days of preventive antibiotic therapy in orthopedic surgery. Clinical orthopaedics and related research. 1983 Jun(176):258-63.
17. Nosocomial Infections Surveillance System. Am J Med. Sep 16, 1991; 91(3B), 152S-157S.