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Original Research Article

Comparison of single dose versus multiple doses of antibiotic prophylaxis for prevention of surgical site infection

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ABSTRACT

Background: Surgical site infection is a common problem following general surgical procedures. Despite major improvement in antibiotics, improved antiseptic measures SSI continues to present a big challenge. In this study we will compare single dose versus multiple dose antibiotic prophylaxis for prevention of SSI in clean and clean contaminated surgical wound.
Methods: This is an institution based prospective, comparative study, with total 60 patients as study population. Clinical finding, wound swab culture and routine haematological reports were taken as study variables. Patients receiving single dose antibiotic and multiple dose antibiotic were included in 'Group A' and 'Group B' respectively. The surgical sites were examined from post-operative days 3 to 8 for signs of infection.
Results: In This study, 46.7% patients were female, and 53.3% patients were male. In Group-A, patients having post operative fever, tachycardia and leucocytosis were 16.7%, 13.3% and 20.0% respectively. 6.7% patients had purulent and 10.0% patients had seropurulent discharge from wound. In Group-B, patients having post operative fever, tachycardia, and leucocytosis were 13.3%, 16.7% and 13.3% respectively. 6.7% patients had purulent and seropurulent discharge from wound. There is no statistically significant difference between two groups regarding post operative fever, tachycardia, leucocytosis and wound discharge.
Conclusions: There is no significant difference between single dose and multiple dose antibiotic prophylaxis to prevent SSI in patients for elective clean and clean contaminated surgery however single dose is more cost effective.

Keywords: Antibiotic prophylaxis, Single dose versus multiple doses, Surgical site infection

INTRODUCTION

Surgical site infection (SSI) is a common problem following general surgical procedures.[1,2] It was estimated that SSIs develop in 1 in 24 patients who undergo inpatient surgery in the United States of America.[3,4] Despite major improvement in antibiotics, improved antiseptic measures, early diagnosis and treatment in recent years the rate of surgical site infections continue to present a challenge to the surgeon. Surgical site infections are defined as infections that occur within 30 days after surgery without implant or within 1 year of surgery with implant.[5] Centre for Disease Control and Prevention (CDC) has classified surgical site infections into three major types: superficial incisional, deep incisional and organ space infection.[6] Superficial incisional SSI occurs within 30 days of surgery involving the skin and subcutaneous tissue only. Deep incisional SSI occurs within 30 days of surgery without implant or within 1 year of surgery with placement of an implant and involves deep soft tissues (fascia and underlying muscle). Organ space infection occurs within 30 days of

surgery without implant or 1 year of surgery with implant and involves any part of the operation opened or manipulated.

Antibiotic prophylaxis for prevention of development of SSI is being practised for long time. Surgical antibiotic prophylaxis is an effective management strategy for reducing postoperative infections provided that appropriate antibiotics are given at the correct time for appropriate durations and appropriate surgical procedures.[7] Various types of antibiotics have been tried including amoxycillin with clavulanic acid, second generation cephalosporins, piperacillin with tazobactam etc. They can be given as a single preoperative dose or multiple doses depending on the type of surgery, duration of surgery, patient's co-morbidities, OT environment, sterility factors and surgeon's preference. In this study we will compare single dose versus multiple dose antibiotic prophylaxis for prevention of SSI in clean and clean contaminated surgeries.

METHODS

This is an institution based prospective, comparative study, has been carried out in department of General Surgery of BSMC&H from March 2019 to August 2020. Satisfying below mentioned inclusion and exclusion criteria, the study population comprised of total 60 patients. The primary data for this study were patient's details, clinical findings, investigation reports, collected in predesigned case record proforma.

Sample size

Sample size has been determined using following formula.

$$N = 2\{Za + Zb)2 * SD2\} \div D^2$$

Where, N= sample size; Za = alpha error; Zb = beta error; SD = standard deviation; D = difference

Inclusion criteria

Patients undergoing general surgical procedures with clean and clean contaminated type of wounds.

Exclusion criteria

Exclusion criteria for current study were patients having diabetes mellitus, HIV infection or any immunocompromised condition or receiving immunosuppressive therapy in last 6 months. Pregnant women and nursing mothers were also excluded from this study.

Study variables

Study variables include clinical finding i.e., temperature of the patient, pulse rate and discharge from the wound site. Wound swab culture and routine haematological reports were also taken as study variables.

Study technique

This study has been conducted after getting ethical approval from 'The institutional ethical committee' and proper written informed consent from each patient or legally acceptable representative of the patient after explaining the study procedure to them in their own vernacular language.

Patients who received single dose antibiotic prophylaxis before 4 hours of surgery were included in Group A and patients who received antibiotic prophylaxis on the day before surgery and 4 hours before surgery (multiple dose) were included in Group B.

The surgical sites were examined from post-operative days 3 to 8 for sign of infection. Swabs for culture were sent from wounds having discharge or sign of infection.

Statistical analysis

For statistical analysis data were entered into 'Microsoft excel 2016' spreadsheet and then analysed by utilizing Chi-square test and independent sample t-test. P≤0.05 was considered for statistically significant.

RESULTS

Distribution of age and gender

In our study, 46.7% patients were female, and 53.3% patients were male. the mean age of patients was 41.6 years and maximum patients belongs to age between 41-50 years of age. Association of Age in years with group was not statistically significant (p=0.7692) and association of gender with group was also not statistically significant (p=0.3006).

Table 1: Association between age with study groups.

Age in years	Group A	Group B	Total	P value
≤30	4	2	6	0.7692
>30-40	4	7	11	
>40-50	8	6	14	
>50-60	5	4	9	
>60-70	7	7	14	
>70	2	4	6	

Comparison of surgical site infection

In Group-A, 16.7% patients and in Group-B, 13.3% patients had post-operative fever. Association of post-operative fever with group A and group B was not statistically significant (p=0.7176).

In Group-A, 13.3% patients had post-operative tachycardia while in Group-B, 16.7% patients had same. Association of post-operative tachycardia with group A and group B was not also statistically significant (p=0.7176).

Table 2: Association between post operative fever with study groups.

Post operative fever	Group A	Group B	Total	P value
Absent	25	26	51	0.7176
Present	5	4	9	

Table 3: Association between post operative tachycardia with study groups.

Post operative tachycardia	Group A	Group B	Total	P value
Absent	26	25	51	0.7176
Present	4	5	9	

Table 4: Association between discharge from wound with study groups.

Wound discharge	Group A	Group B	Total	P value
Nil	25	26	51	0.8960
Purulent	2	2	4	
Seropurulent	3	2	5	

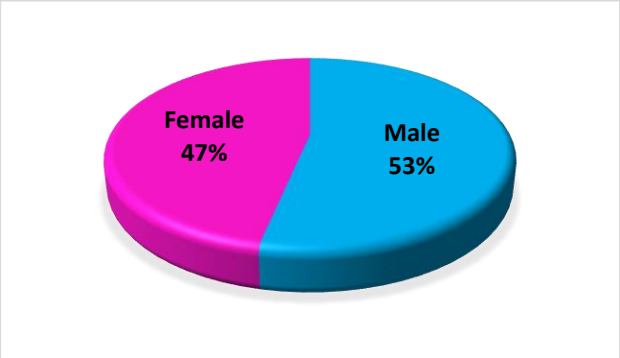

Figure 1: Distribution of gender.

In Group-A, 6.7% patients had purulent and 10.0% patients had seropurulent discharge from wound. In Group-B, 6.7% patients had purulent and seropurulent discharge. Association of discharge from wound with study groups were not statistically significant (p=0.8960).

In Group-A, 20.0% patients had total WBC count more than 11000/ml, and in Group-B, 13.3% patients had total WBC count more than 11000/m. Association of leucocytosis with study groups were not statistically significant (p=0.4884).

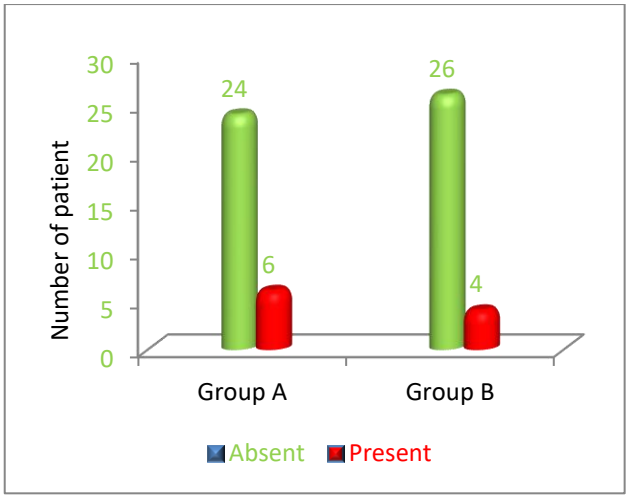

Figure 2: Association between leucocytosis with study groups.

DISCUSSION

Distribution of age and gender

In this study, 46.7% patients were female, and 53.3% patients were male with mean age of patients 41.6 years. Association of age and gender with study groups were not statistically significant. In 2012 Shaikh SA et al found that 88% patients were female and 12% patients were male with mean age was 40.69 years.[8] Next year Shah et al found that out of the 120 patients, 63 (52.5%) were male and 57 (47.5%) female with mean age 38.9 years.[9]

Comparison of surgical site infection

In Group-A, 16.7% patients and in Group-B, 13.3% patients had post-operative fever without any statically significant association. In Group-A, 13.3% patients had post-operative tachycardia while in Group-B, 16.7% patients had same. In Group-A, 6.7% patients had purulent and 10.0% patients had seropurulent discharge from wound. In Group-B, 6.7% patients had purulent and seropurulent discharge and.

In 2016 Rahman et al found that there is no statistically significant difference in the outcome between two groups and single dose preoperative inj. Ceftriaxone (1 gm) is sufficient as a prophylaxis of surgical site infection in clean-contaminated elective surgery.[10]

Pinto-Lopes et al were also unable to find any significant difference between single dose and multiple dose antibiotic prophylaxis in the incidence of postpartum infectious morbidity, endometritis and wound infection.[11] Similar result was also found in a study by Bhatnagar et al and Frank et al in 2019 found that the overall SSI rate was 5.1% in the single dose group versus 1.4% in multiple dose group without any statistical significance.[12,13]

Limitations

In our study we used a very small sample size. For proper results a larger sample size would be more helpful. Furthermore, incidence of surgical site infection also depends on type of operation, duration of operation, site of incision, surgical techniques etc. But these parameters have been excluded from this study.

CONCLUSION

There is no significant difference between single dose and multiple dose antibiotic prophylaxis to prevent SSI in patients for elective clean and clean contaminated surgery however single dose is more cost effective. So, we prefer to go for single dose antibiotic prophylaxis over multiple doses antibiotic prophylaxis for prevention of surgical site infections in clean and clean contaminated surgery in our institution.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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