



Comparative Study on Single Dose Antibiotic Versus Multiple Dose Antibiotic Therapy in General Surgery

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Abstract:

Background & Objectives:

Surgical site infection (SSI) is a major complication after surgery. Surgical site infection leads to increased patient's length of stay, burden, mortality and morbidity. Hence antibiotics are used to prevent SSI complications after surgery. This study was conducted to compare the use of single dose and multiple dose antibiotic therapy in the department of general surgery.

The main objective of our study is to compare effectiveness of single dose antibiotic versus multiple dose antibiotic in General Surgery and to assess the adherence of prophylactic antibiotic regimen to Standard guideline (ASHPGuidelines).

Materials and methods:

This is a prospective study carried out in the department of general surgery in BGS GIMS Hospital, Kengeri, for a period of 6 months. A total of 140 patients were enrolled based on their inclusion and exclusion criteria and distributed into 2 groups (Single dose group and multiple dose group). Incidence rate of SSI is compared in both groups. Adherence to ASHP guideline is assessed based on the time frame at which the antibiotic is given, time difference between the incision and prophylactic antibiotic administration, and selection of antibiotic.

Results:

Out of 140 patients, 65.7% were males and 34.3% were females. Majority of patients in single dose group underwent excision (18.6%) and hernioplasty (12.9%), Majority of patients in multiple dose group underwent hernioplasty (15.7%), hernia repair (15.7%). The incidence of surgical site infection among the single dose group was 4.3% and 7.1% among the multiple-dose group. Length of the hospital stay was observed in both groups was between 1-5 days, 45.7% in single dose group and 44.3% were multiple dose group.

Interpretation & Conclusions:

SSI incidence rate was found to be more in multiple dose patient groups, but it was found to be there is no statistical difference in the incidence of SSI among the patients when both the groups were compared. ASHP guidelines was followed majorly in single dose group compared to multiple dose group. Length of stay and cost were assessed between both the groups. Average length of stay was 6 days in both the groups.

Key words: Surgical site infection, ASHP guidelines, Antibiotics, Single dose, Multiple doses.

Introduction:

A surgical site infection (SSI) is an infection that develops after a surgical procedure in the area of the body where the surgery was performed. SSIs can range from minor infections affecting only the skin to more severe cases involving deeper tissues, organs, or implanted medical devices.^[1] The CDC defines SSIs as infections that arise within 30 days of surgery, or within a year if implants are involved.^{[2], [3]}

The most common organisms implicated as causes of surgical site infections include^[4]:

- Staphylococcus aureus
- Staphylococcus epidermidis
- Aerobic streptococci
- Anaerobic cocci

Criteria to be classified as a surgical site infection

To be classified as a surgical site infection, the wound must:

1. occur within 30 days after the surgery (in the case of organ/space infections with an implant in-situ this is one year)
2. only include the skin, subcutaneous tissues, deep layers or distant organs, and
3. have either purulent drainage or organisms isolated from the wound site.^{[5][6]}

SINGLE DOSE ANTIBIOTIC THERAPY AND MULTIPLE DOSE ANTIBIOTIC THERAPY

A dose of medicine or a drug is a measured amount of it which is intended to be taken at one time is referred to as single dose. Antimicrobial prophylaxis, the antimicrobial drugs can be given either as a single-dose regimen or multiple-dose regimen in which the postoperative continuation of antimicrobials is warranted. However, each regimen has its strengths and limitations, which vary among different surgical procedures.^[8]

The World Health Organisation recommends a single dose of pre-operative antibiotic as optimal prophylaxis to reduce surgical site infection (SSI), whilst causing the least possible impact on patient microbiota and antimicrobial resistance.^[7]

ASHP GUIDELINES

Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery were developed jointly by the American Society of Health-System Pharmacists (ASHP), the Infectious Diseases Society of America (IDSA), the Surgical Infection Society (SIS), and the Society for Healthcare Epidemiology of America (SHEA). This guidelines offer

a standardized approach for the rational, safe, and effective use of antimicrobial agents to prevent surgical-site infections (SSIs) based on current clinical evidence and emerging issues.

Studies supporting the recommendations for the use of antimicrobial therapy were classified as follows:

- Level I (evidence from large, well-conducted, randomized, controlled clinical trials or a meta-analysis)
- Level II (evidence from small, well-conducted, randomized, controlled clinical trials)
- Level III (evidence from well-conducted cohort studies)
- Level IV (evidence from well-conducted case-control studies)
- Level V (evidence from uncontrolled studies that were not well conducted)
- Level VI (conflicting evidence that tends to favour the recommendation)
- Level VII (expert opinion or data extrapolated from evidence for general principles and other procedures)

This system has been used by the Agency for Healthcare Research and Quality, and ASHP, IDSA, SIS, and SHEA support it as an acceptable method for organizing strength of evidence for a variety of therapeutic or diagnostic recommendations. Each recommendation was categorized according to the strength of evidence that supports the use or non-use of antimicrobial prophylaxis as

Category A (levels I–III),

Category B (levels IV–VI)

Category C (level VII).

Preoperative-dose timing

The optimal time for administration of preoperative doses is within 60 minutes before surgical incision. This is a more-specific time frame than the previously recommended time, which was “at induction of anesthesia.” Some agents, such as fluoroquinolones and vancomycin, require administration over one to two hours; therefore, the administration of these agents should begin within 120 minutes before surgical incision.

Selection and dosing.

The guidelines suggest weight-based dosing in obese patients and the need for repeat doses during long procedures. Obesity increases the risk of SSI and may alter drug pharmacokinetics, requiring dosage adjustments. Intraoperative redosing is necessary if the procedure exceeds two drug half-lives or involves excessive blood loss. Recommendations also cover antimicrobial selection for specific surgeries and alternatives for patients allergic to beta-lactam antimicrobials.

Duration of therapy

New recommendations for a shortened postoperative course of antimicrobials involving a single dose or continuation for less than 24 hours are provided. Further clarity on the lack of need for postoperative antimicrobial prophylaxis based on the presence of indwelling drains and intravascular catheters is included.^[9]

Application of Guidelines to Clinical Practice.

Recommendations are provided for adults (19 years or older) and pediatric (1–18 years) but do not address newborns (premature or full-term). While patients with kidney or liver issues aren't specifically addressed, a single preoperative dose of antibiotics typically doesn't need adjustment for these conditions.

Decisions to follow these recommendations must be based on the judgment of the clinician and consideration of individual patient circumstances and available resources. These guidelines reflect current knowledge of antimicrobial prophylaxis in surgery. Given the dynamic nature of scientific information and technology, periodic review, updating, and revisions are to be expected.

Material & Methods

Ethical Committee approval was obtained on 26th June 2023 from the Institutional Ethical Committee of BGS Global institute of medical science, Kengeri, Bengaluru have approved the study prior to the commencement of the study. (Reference no: BGSGIMS/IEC/App/June/2023/007). This is a prospective study carried out in the department of general surgery in BGS GIMS Hospital located in Kengeri, Bangalore for a period of 6 months. A total of 140 patients were included in the study for a period of 6 months after obtaining informed consent to get outcome results.

Collection of Data:

Patients enrolled based on their inclusion and exclusion criteria were distributed into 2 groups i.e. group A and group B

Group A: Patients prescribed with single dose of pre-operative antibiotic prophylaxis that is different from post operative antibiotic is categorized as single dose group.

Group B: Patients prescribed with same pre-operative antibiotic prophylaxis and post operative antibiotic is categorized as multiple dose group.

Case records of patients will be collected in the Performa containing demographic details, chief complaints, diagnosis, laboratory parameters, details of operative procedures and antibiotic treatment details during hospital stay.

Study procedure:

Step 1: Patients enrolment based on inclusion criteria and exclusion criteria

Step 2: Demographic details of the patient (Name, Age, Sex, IP number etc) was collected including data regarding chief complaints, diagnosis, laboratory parameters, details of operative procedures and antibiotic treatment details during hospital stay

Step 3: Patients are categorized into 2 groups based on antibiotic treatment received as single dose group (group 1) or Multiple dose group (group 2).

Step 4: The obtained data was subjected for suitable statistical method using SPSS software.

Step 5: Comparing the data obtained from both groups and obtain the result

Inclusion criteria:

Inpatients patients above 18 years of age, undergoing general surgery prescribed with antibiotics.

Exclusion criteria:

Patients who are not willing to participate in the study, paediatric patients, pregnant and lactating women, Immunocompromised patients and patient allergic to preoperative antibiotics are excluded.

Source of data:

Patient case records and Case Record Form (CRF) were the sources of data for this study.

Statistical Analysis:

All the data collected were entered in a Microsoft Excel worksheet and analyzed using statistical software SPSS 20.0.0 The Qualitative characteristics like Gender, Diagnosis, Antibiotic given within the time frame (60 mins of incision) and surgical site infection was expressed in frequency with proportions and compared between the groups by *Chi-square test & fisher exact test*.

The Continuous study variable age, LOS, lab investigations is expressed by Mean±SD if data follows normality, else Median with IQR (Interquartile range) in case of non- normality, based on normality t-test and Mann-Whitney U-Test is applied for comparison between the groups.

RESULTS

Comparison of Age-distribution between groups

Age-Group	Single Dose		Multiple Dose		Total	
	n	%	n	%	n	%
18-20	2	2.8	0	0.0	2	1.4
21-30	9	12.9	16	22.9	25	17.9
31-40	16	22.9	16	22.9	32	22.9
41-50	17	24.3	14	20.0	31	22.1
51-60	13	18.5	13	18.6	26	18.6
61-70	10	14.3	6	8.5	16	11.4
71-80	3	4.3	4	5.7	7	5
81-90	0	0.0	1	1.4	1	0.7
Total	70	100.0	70	100.0	140	100.0
Comparison						
Median (Q1-Q3)	46 (34.8-58)		42.5 (31-57.3)		Mann-Whitney U-test = 2298	p-value =0.526

Table 1: Comparison of Age - distribution between groups

The study investigated the age distribution within both groups. In both groups, most subjects were in the age group 41-50 years, 24.3% in the single dose group, 20% in multiple dose group. The average age in single dose group is 46 years, multiple dose group is 42.5 years and there was statistically not significant difference.

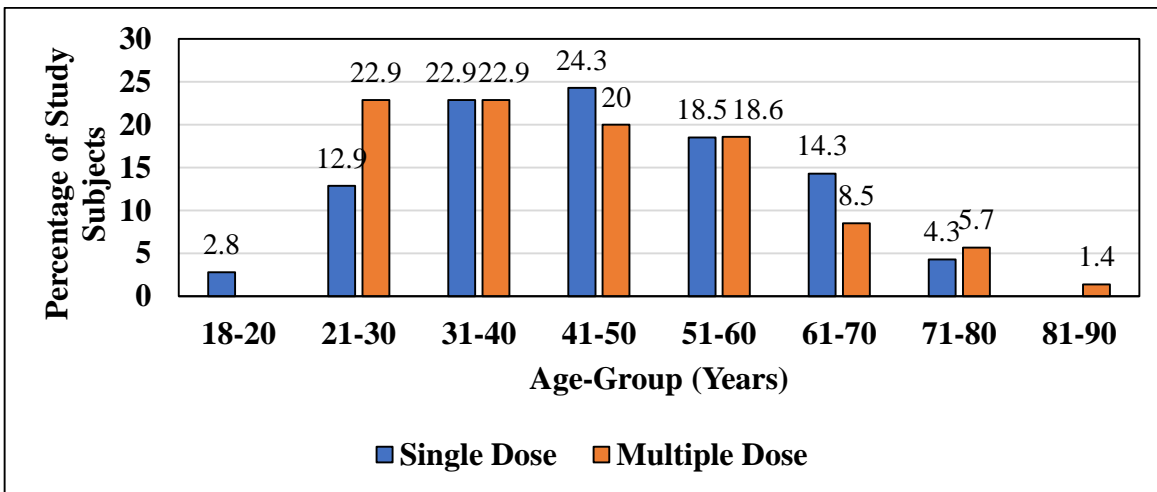


Fig. 1: Age-distribution among groups

Gender distribution and comparison between groups

Gender	Single Dose		Multiple Dose		Total		Chi-square test	p-value
	n	%	n	%	n	%		
Male	45	64.3	47	67.1	92	65.7	0.127	0.722
Female	25	35.7	23	32.9	48	34.3		
Total	70	100.0	70	100.0	140	100.0		

Table 2 Gender distribution and comparison between groups

In the study, 65.7% were males and 34.3% were females. Among single dose group, 64.3% were males and 35.7% were females. Among multiple dose group, 67.1% were males and 32.9% were females, and there was statistically not significant difference.

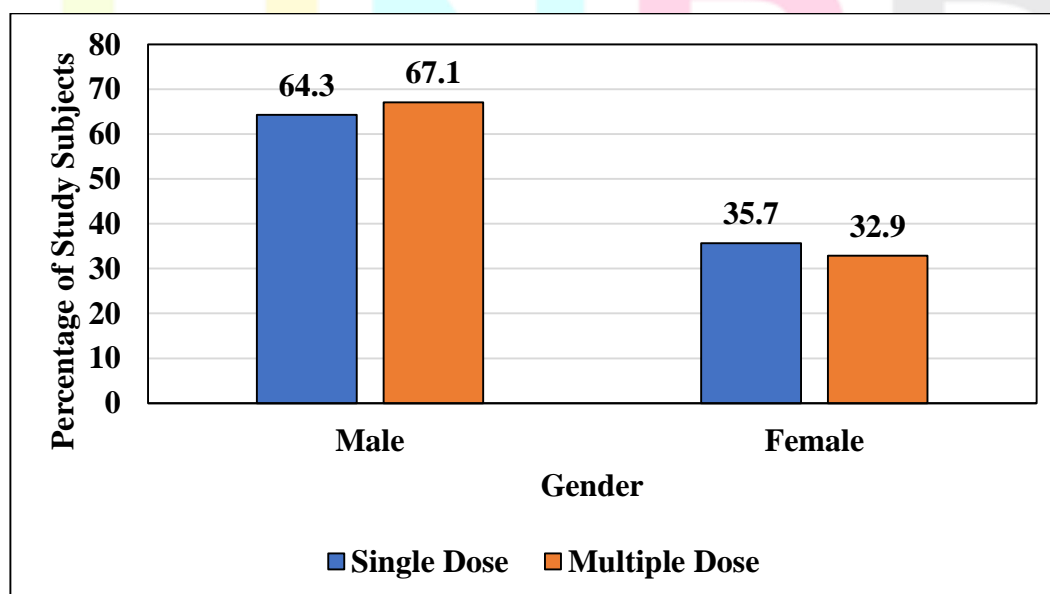


Fig. 2: Gender distribution among groups

Diagnosis of the patients

Diagnosis	Single Dose	Multiple Dose
Abscess	3 (4.2)	3 (4.3)
Appendicitis	3 (4.2)	6 (8.6)
Adenomyosis, Irritable bowel syndrome	0 (0)	1 (1.4)
Anterior thigh swelling	0 (0)	1 (1.4)
B/L Chronic hydrocele	0 (0)	2 (2.9)
Inguinal hernia	5 (7.1)	4 (5.7)
B/L ear lobule tear	1 (1.4)	0 (0)
Bilateral Gynecomastia	1 (1.4)	0 (0)
Bulbar stricture	1(1.4)	1 (1.4)
Bursitis	1 (1.4)	0 (0)
Calculus	2 (2.9)	5 (7.1)
Carcinoma	0 (0)	2 (2.9)
Category 3 dog bite over left leg	1 (1.4)	0 (0)
Cellulitis	4 (5.7)	5 (7.1)
Cholelithiasis	1 (1.4)	4 (5.7)
Cyst	3 (4.3)	0 (0)
Fistula	3 (4.3)	3 (4.3)
Fissure	2 (2.9)	0 (0)
Haemorrhoids	1 (1.4)	1 (1.4)
Hernia	11 (15.7)	18 (25.7)
Left Emphysematous Pyelonephritis	0 (0)	1 (1.4)
Lipoma	4 (5.7)	0 (0)
Lymphadenopathy	2 (2.9)	0 (0)
Necrotising fasciitis	1 (1.4)	1 (1.4)
Papilloma in the right lower groin	1 (1.4)	0 (0)
Paraphimosis	3 (4.3)	0 (0)
Pelvic mass under evaluation	0 (0)	2 (2.9)
Pilonidal sinus	1 (1.4)	1 (1.4)
Prostatomegaly with LUTS with high post-void urine	1 (1.4)	0 (0)
Right breast Fibroadenoma	1 (1.4)	1 (1.4)
Suppurative Enterocolitis with inflamed mesentery	0 (0)	1 (1.4)
Thrombosed piles	0 (0)	1 (1.4)
Tubercular Cervical Lymphadenitis with secondary infection	1 (1.4)	0 (0)
Ulcer	9 (12.8)	2 (2.9)
Varicose vein	3 (4.3)	4 (5.7)

Table 3 : Diagnosis of the patients

The diagnosis in the single & multiple groups given in the above table. In both the groups most of the subjects were diagnosed with hernia. Among SD group 11 (15.7%) patients were diagnosed with hernia , 9 patients (12.8%) diagnosed with ulcer and among the MD group 18 (25.7%) patients were diagnosed with hernia & 6 patients (8.6%) were diagnosed with appendicitis.

Operative Procedure among the groups:

Operative Procedure	Single Dose	Multiple Dose
Appendectomy	3 (4.3)	6 (8.6)
B/L ear lobule repair	1 (1.4)	0 (0)
Circumcision	3 (4.3)	0 (0)
Colostomy	1 (1.4)	0 (0)
Completion thyroidectomy	0 (0)	1 (1.4)
Cystoscopy + end-to-end anastomosis	1 (1.4)	0 (0)
Debridement	3 (4.3)	2 (2.9)
Dilation and curettage	0 (0)	1 (1.4)
Endovenous laser ablation	3 (4.3)	0 (0)
Excision	13 (18.6)	3 (4.3)
Fasciotomy	9 (12.9)	7 (10)
Haemorrhoidectomy (3,5 & 7 o'clock with lateral internal sphincterotomy)	1 (1.4)	2 (2.9)
Hernioplasty	9 (12.9)	11 (15.7)
Hernia Repair	7 (10)	11 (15.7)
Incision and Drainage	2 (2.9)	3 (4.3)
Jobulay's procedure	0 (0)	2 (2.9)
Laparoscopic Cholecystectomy	3 (4.3)	6 (8.6)
Lateral Internal Sphincterotomy	1 (1.4)	0 (0)
Left 4th finger nail bed repair with pulp repair	1 (1.4)	0 (0)
Left Open Simple Nephrectomy	0 (0)	1 (1.4)
Mastectomy	1 (1.4)	1 (1.4)
Rays Amputation	0 (0)	1 (1.4)
Resection and Anastomosis	0 (0)	1 (1.4)
Right URSL with DJ stunting	0 (0)	1 (1.4)
Secondary suturing	2 (2.9)	0 (0)
Skin Graft	4 (5.7)	1 (1.4)
Superficial parotidectomy	1 (1.4)	0 (0)
Transurethral resection of prostate	1 (1.4)	0 (0)
Trendelenburg procedure	0 (0)	4 (5.7)
Trucut biopsy of mass over the lateral wall of the rectum	0 (0)	2 (2.9)
Ureteroscope with DJ Stunt in situ	0 (0)	1 (1.4)
Visual internal Urethrotomy	0 (0)	1 (1.4)
VIU & Right URSL & Right PCNL	0 (0)	1 (1.4)
Total	70	70

Table 4: Operative Procedure among the groups

Operative Procedure among the groups is given in the table. Majority of patients in single dose group underwent excision (13 patients -18.6%), hernioplasty (9 patients – 12.9%), fasciotomy (9 patients -12.9%), and hernia repair (7 patients – 10%). Majority of patients in multiple dose group underwent hernioplasty (11 patients - 15.7%), hernia repair (11 patients – 15.7%), appendectomy (6 patients- 8.6%), laparoscopic cholecystectomy (6 patients- 8.6%).

Brand Name of the drugs

Brand Name	Single Dose	Multiple Dose
Inj Amikacin	1 (1.4)	0 (0)
Inj Augmentin	36 (51)	12 (17.1)
Inj Cefixime	1 (1.4)	0 (0)
Inj Ceftriaxone	0 (0)	1 (1.4)
Inj Ciplox	0 (0)	1 (1.4)
Inj Kephazone - TZ	0 (0)	1 (1.4)
Inj Kephazone S forte	2 (2.9)	6 (8.6)
Inj Meropenem	0 (0)	1 (1.4)
Inj Monocef	7 (10)	8 (11.4)
Inj Oflox	1 (1.4)	0 (0)
Inj Ofloxacin	1 (1.4)	0 (0)
Inj Opicure S	1 (1.4)	0 (0)
Inj Piptaz	3 (4.3)	3 (4.3)
Inj Piptaz, Inj Metronidazole	0 (0)	2 (2.9)
Inj Taxim	15 (21.4)	35 (50)
Inj Xone	2 (2.9)	0 (0)
Total	70 (100)	70 (100)

Table 5: Brand Name of the drugs

The brand names of the drugs in the single & multiple groups given in the above table. Majority of patients (n=35) in single dose group was prescribed with Inj Augmentin, whereas many multiple dose patients were prescribed with Inj Taxim (n=35).

Generic Name of the drugs

Generic Name	Single Dose	Multiple Dose
Amikacin	1 (1.4)	0
Amoxicillin/ Potassium Clavulanate	36 (51)	12 (17.1)
Cefixime	1 (1.4)	0
Cefoperazone + Tazobactam	0	1 (1.4)
Cefoperazone/ Sulbactam	2 (2.8)	6 (8.5)
Cefotaxime	15 (21.4)	35 (50)
Ceftriaxone	10 (14.2)	9 (12.8)

Ciprofloxacin	0	1 (1.4)
Meropenem	0	1 (1.4)
Ofloxacin	2 (2.8)	0
Piperacillin/ Tazobactam	3 (4.3)	3 (4.3)
Piperacillin/ Tazobactam Metronidazole	0	2 (2.9)

Table 6: Generic Name of the drugs

The generic names of the drugs in the single & multiple groups given in the above table.

Class / Spectrum of Antibiotics among the groups

Class / Spectrum of Antibiotic	Single Dose	Multiple Dose
Aminoglycoside /Broad	1(1.4)	0(0)
Carbapenem / Broad	0(0)	1(1.4)
Cephalosporins / Broad	28(40)	51(72.9)
Fluoroquinolone/ Broad	2(2.9)	1(1.4)
Penicillin/ Broad	39(55.7)	15(21.4)
Penicillins/ Broad Nitroimidazole / Narrow	0(0)	2(2.9)

Table 7: Class / Spectrum of Antibiotics among the groups

The Spectrum of Antibiotic in the single & multiple groups given in the above table. In both the groups broad spectrum Cephalosporins (In MD, n = 51; In SD, n = 28) and broad-spectrum penicillins (in SD n=39; in MD, n=15) class of antibiotic was given for surgical prophylaxis.

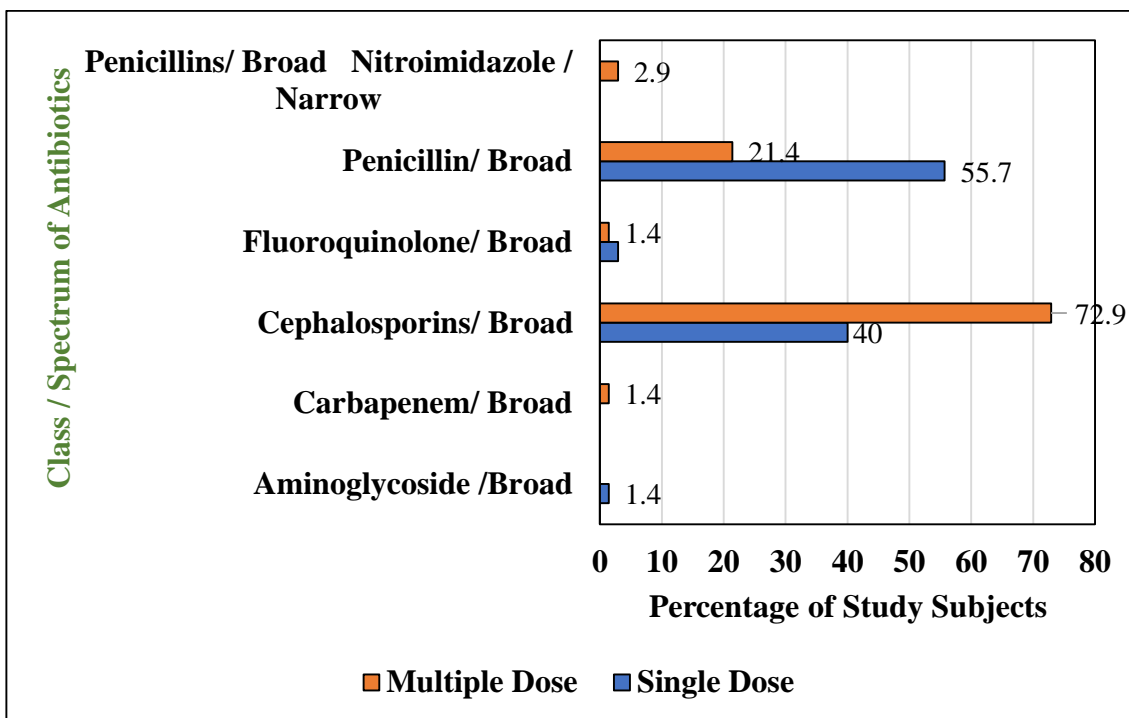


Fig 3: Class / Spectrum of Antibiotics among the groups

Comparison of study variables between the groups

Variables	Group	n	Mean±SD	t-test	p-value
Hb	Single Dose	70	13.2±2.1	-0.397	0.692
	Multiple Dose	70	13.3±2		
Lymphocytes	Single Dose	70	22.8±9.4	-3.153	0.002
	Multiple Dose	70	27.8±9.4		
Variables	Group	n	Median (Q1-Q3)	Mann-Whitney U-test	p-value
WBC	Single Dose	70	9.1 (6.9-10.9)	2230	0.359
	Multiple Dose	70	8.7 (7.7-11.3)		
PLT	Single Dose	70	215 (182-289.8)	2394.5	0.817
	Multiple Dose	70	212 (194-256.5)		
Neutrophils	Single Dose	70	64.9 (56.4-74.9)	1887	0.019
	Multiple Dose	70	59.9 (51.9-71.4)		
ESR	Single Dose	70	18 (14-21.3)	1937	0.032
	Multiple Dose	70	20 (15.8-26)		
Blood sugar	Single Dose	70	98.5 (88.8-121)	2294.5	0.517
	Multiple Dose	70	98 (83-118.8)		
Blood Urea	Single Dose	70	18 (16-22)	2079.5	0.122
	Multiple Dose	70	20 (15.8-25)		
Creatinine	Single Dose	70	0.7 (0.6-0.8)	2396	0.819
	Multiple Dose	70	0.7 (0.6-0.8)		

Table 8: Comparison of study variables between the groups

The lab investigations were evaluated between the groups, the average haemoglobin in single doses was 13.2, and 13.3 in multiple doses and there was no statistically significant difference, with a p-value>0.05.

The average lymphocytes were 22.8 in a single dose and 27.8 in multiple doses and there was a statistically significant difference, with p-value<0.05.

The average WBC was 9.1 in a single dose and 8.7 in multiple doses and there was no statistically significant difference, with p-value>0.05.

The average platelet count was 215 in single dose and 212 in multiple dose and there was no statistically significant difference, with p-value>0.05.

The average neutrophils were 64.9 in single dose and 59.9 in multiple dose and there was no statistically significant difference, with p-value>0.05.

The average ESR was 18 in single dose and 20 in multiple dose and there was no statistically significant difference, with p-value>0.05.

The average Blood sugar was 98.5 in a single dose and 98 in multiple doses and there was no statistically significant difference, with p-value>0.05.

The average Blood Urea was 18 in a single dose and 20 in multiple doses and there was no statistically significant difference, with p-value>0.05.

The average Creatinine was 0.7 in both the single dose and multiple dose and there was no statistically significant difference, with p-value>0.05.

Comparison of incidence of surgical site infection in both the groups

Group	Incidence of SSI	No incidence of SSI	Fisher exact test statistic value
Single dose (70)	3 (4.3%)	67 (95.7%)	0.7184
Multiple dose (70)	5 (7.1%)	65 (92.9%)	

Table 9: Comparison of incidence of SSI among the groups

3 patients in the single dose group and 5 patients in the multiple dose group developed surgical site infection. The incidence of surgical site infection among the single dose group was 4.3% and 7.1 among the multiple-dose group and there was no statistically significant difference observed with p-value>0.05. E coli was the most common organism causing SSI.

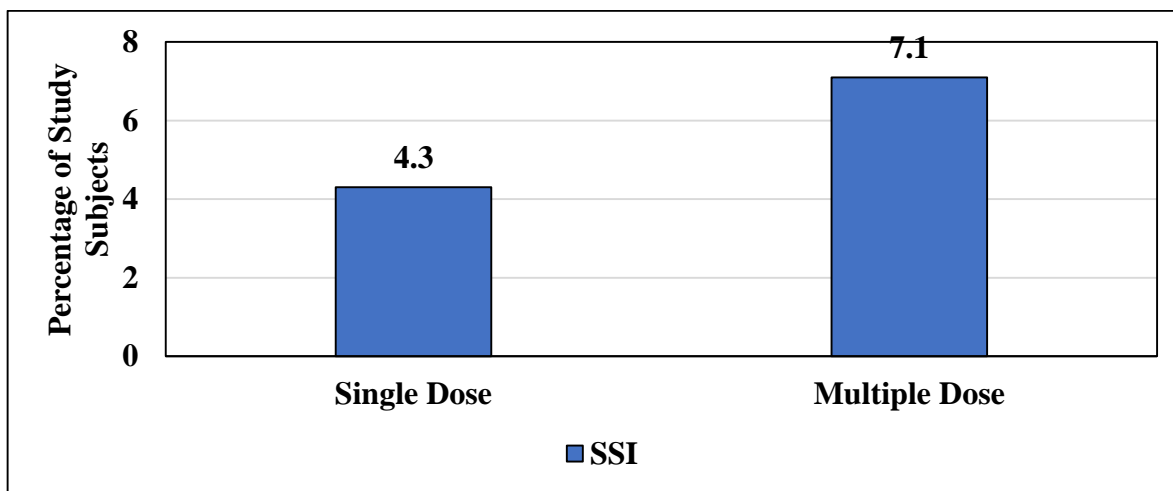


Fig 4: Comparison of incidence of SSI in both the groups

Adherence to ASHP Guideline

a) Comparison of Antibiotics given within the time frame, 60 mins of incision among the groups

Antibiotic given within the time frame (60 mins of incision)	Single Dose		Multiple Dose		Total		Chi-square test	p-value
	n	%	n	%	n	%		
Yes	54	77.1	50	71.4	104	74.3	0.598	0.439
No	16	22.9	20	28.6	36	25.7		
Total	70	100.0	70	100.0	140	100.0		

Table 10: Comparison of Antibiotics given within the time frame (60 mins of incision) among the groups

In the study, 74.3% were given antibiotics within the time frame of 60 mins of incision. Among single dose group, 77.1% were given antibiotics within the time frame and 71.4% in a multiple-dose group were given antibiotic within the time frame, and there was a statistically not significant difference with p-value<0.05.

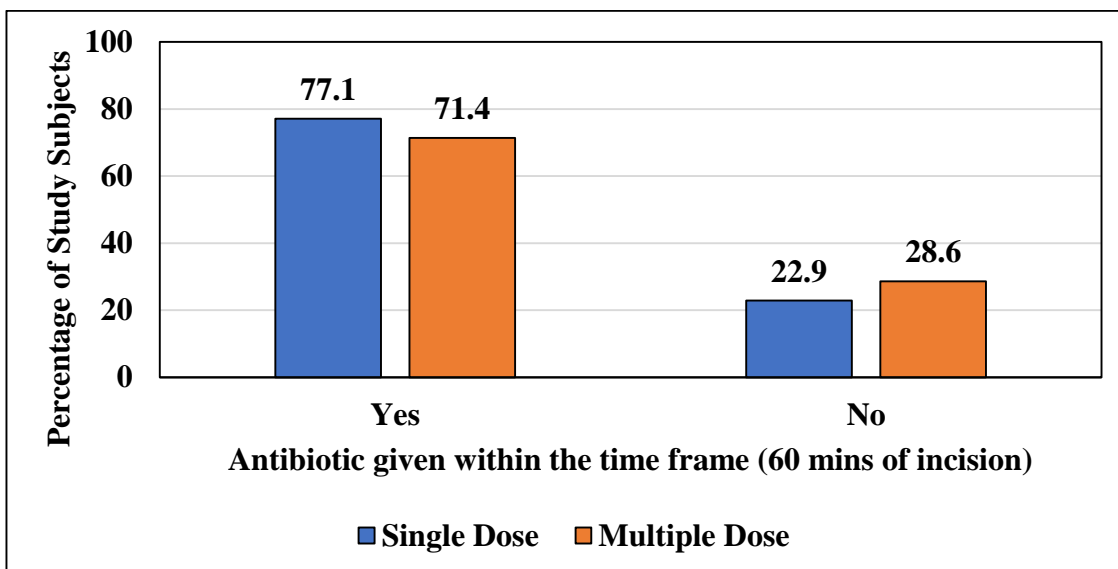


Fig 5: Antibiotics given within 60 mins of incision among the groups

b) Time Difference between incision & Prophylactic Antibiotic Administration among the groups

Time Difference between incision & Prophylactic Antibiotic Administration	Single Dose		Multiple Dose		Total	
	n	%	n	%	n	%
10-30	19	27.1	19	27.1	38	27.1
31-60	35	50.0	31	44.3	66	47.1
61-90	9	12.9	9	12.9	18	12.9
91-270	7	10.0	11	15.7	18	12.9
Median (Q1-Q3)	50 (30-60)		50 (30-80)		Mann-Whitney U-test = 2370	p-value= 0.736

Table 11: Time Difference between incision & Prophylactic Antibiotic Administration among the groups

In both groups, time difference between incision & Prophylactic Antibiotic administration was between 31-60 mins, 50% in the single dose group, 44.3% in multiple dose group. The average time is 50 mins in both single dose, and multiple dose group and there was not statistically significant difference observed with a p-value<0.05.

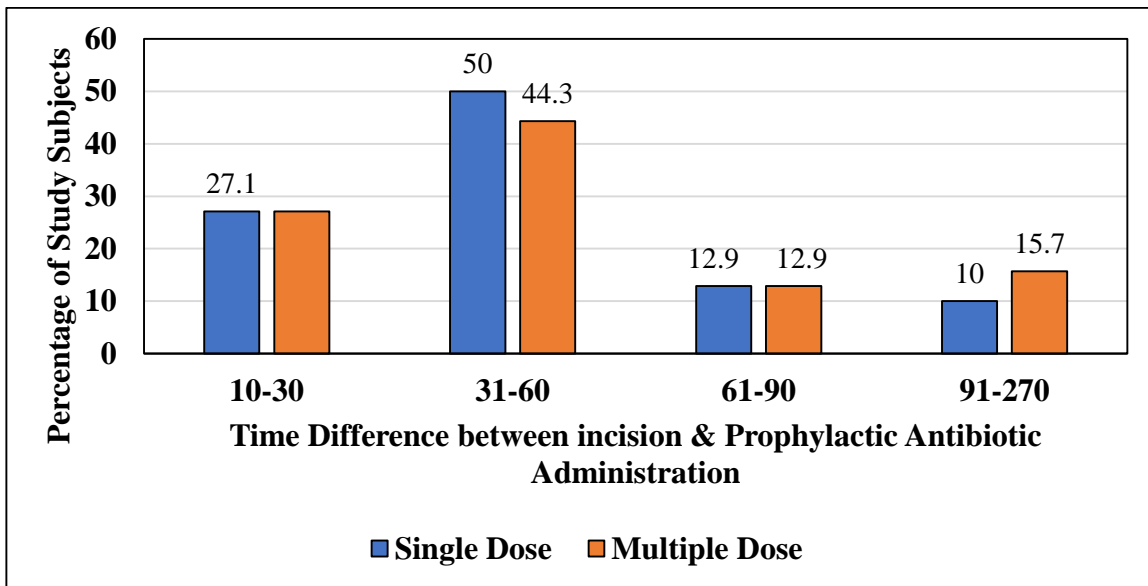


Fig. 6: Time Difference between incision & Prophylactic Antibiotic Administration

c) Duration of antibiotics among the groups

Duration	Single Dose		Multiple Dose		Total	
	n	%	n	%	n	%
< 24 hrs	70	100.0	0	0.0	70	50.0
> 24 hrs	0	0.0	70	100.0	70	50.0
Total	70	100.0	70	100.0	140	100.0

Table 12: Duration of antibiotics among the groups

All the single doses were <24 hrs, and multiple dose were >24 hrs. Single Dose group had followed the recommended duration as per ASHP guidelines.

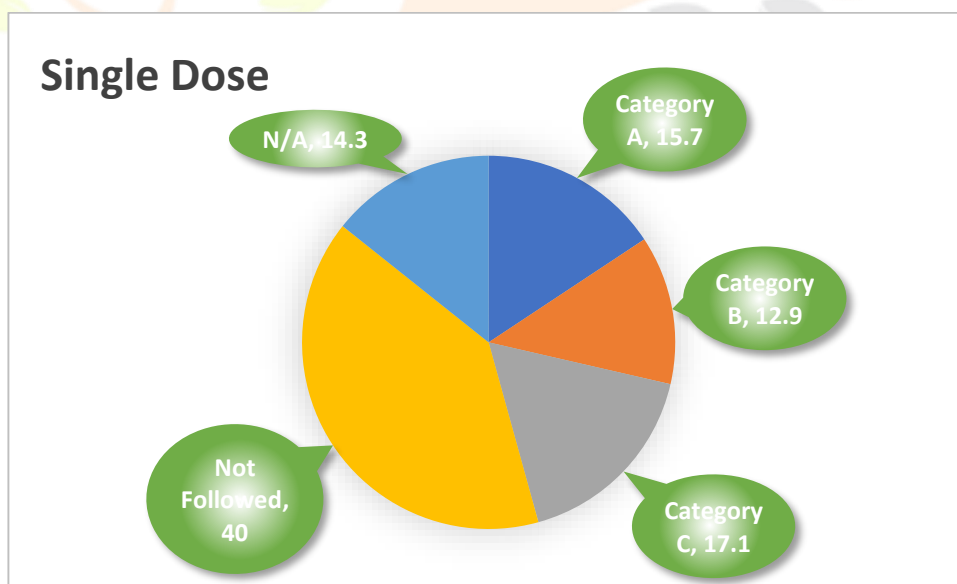
d) Antibiotics given as per the recommendation of the guideline

Antibiotic selection	Single Dose		Multiple Dose		Total	
	n	%	n	%	n	%

Category A	11	15.7	15	21.4	26	18.6
Category B	9	12.9	11	15.7	20	14.3
Category C	12	17.1	3	4.3	15	10.7
Not Followed	28	40.0	32	45.7	60	42.9
N/A	10	14.3	9	12.9	19	13.6

Table 13: Antibiotics given as per the recommendation of the guideline

In the study, antibiotic selection was made based on Category A in single doses 15.7%, and 21.4% in multiple doses. Category of selection of antibiotic as per ASHP Guideline was assessed and study found that 26 patients (18.6 %) received antibiotics based on category A, 20 patients (14.3%) based on category B and 15 patients (10.7 %) based on category C. 60 (42.9%) did not follow any selection criteria as per the guidelines. 32single dose group patients were antibiotics according to the ASHP recommendations.



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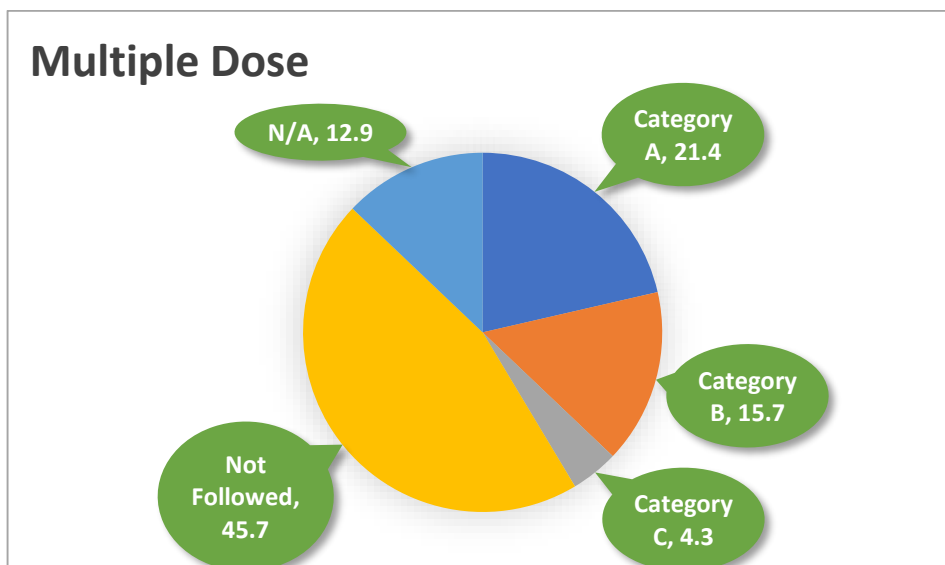


Fig 7: Antibiotics given as per the recommendation of the ASHP guideline

Comparison of length of stay in the hospital between groups

Duration	Single Dose		Multiple Dose		Total	
	n	%	n	%	N	%
1-5	32	45.7	31	44.3	63	45.0
6-10	29	41.4	29	41.4	58	41.4
11-15	9	12.9	9	12.9	18	12.9
16-20	0	0.0	1	1.4	1	0.7
Total	70	100.0	70	100.0	140	100.0
Comparison						
Median (Q1-Q3)	6 (4-8)		6 (4.8-8.3)		Mann-Whitney U-test = 2265	p-value= 0.437

Table 14: Comparison of length of stay in the hospital between groups

Length of the hospital stay was observed in both groups was between 1-5 days, 45.7% in single dose group and 44.3% were multiple dose group. The average duration was 6 days in both single dose group and multiple dose group, and there was no statistical significance difference with p-value<0.05.

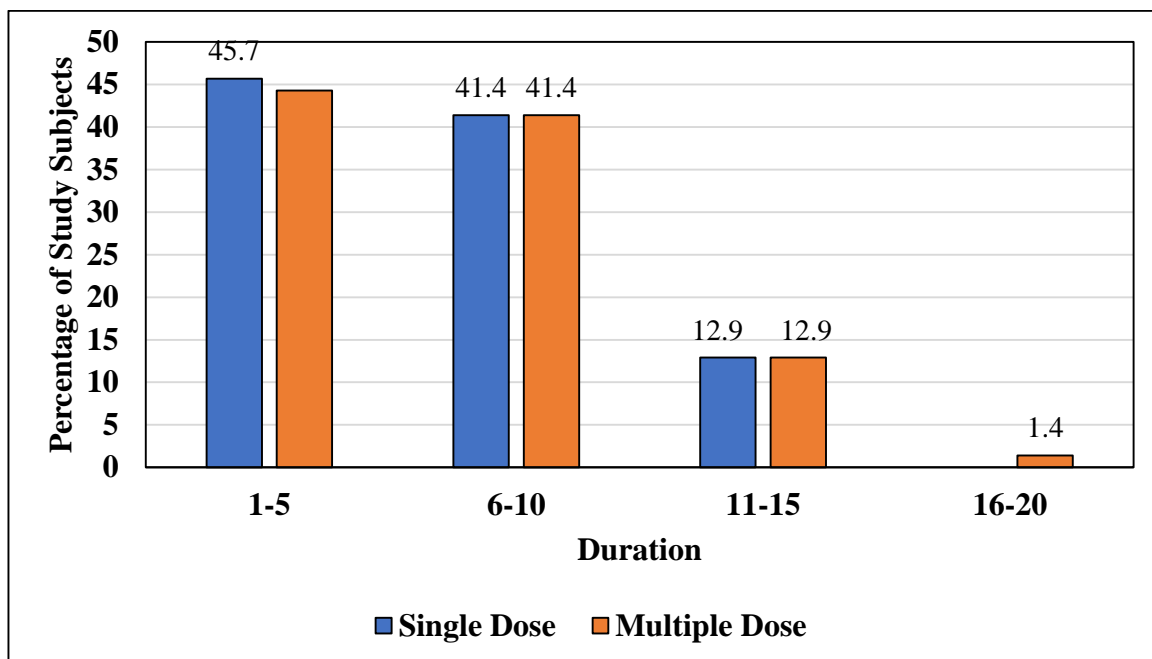


Fig. 8: Length of Stay in the hospital among groups

Comparison of Cost among the groups

Cost	Group	n	Mean \pm SD	*Median (Q1-Q3)	Mann-Whitney U-test	p-value
Surgical Prophylaxis	Single Dose	70	149.4 \pm 124.8	156 (69-156)	1667.5	0.001
	Multiple Dose	70	159.7 \pm 225.8	45 (45-156)		
Post operative antibiotics	Single Dose	61	2742.5 \pm 5134.8	720 (270-2896)	1949.5	0.391
	Multiple Dose	70	1541.8 \pm 2418.1	450.5 (277.5-1477.5)		

Table 15: Comparison of Cost among the groups

The cost of surgical prophylaxis was compared between the groups, and it was observed high in the single group with an average of 156 Rs, and an average of 45 Rs in the multiple-dose group, and it was a statistically significant difference with p-value<0.05.

The cost of postoperative antibiotics was compared between the groups, and it was observed high in the single group with an average of 720 Rs, and an average of 450 Rs in the multiple-dose group, and it was no statistically significant difference with p-value>0.05.

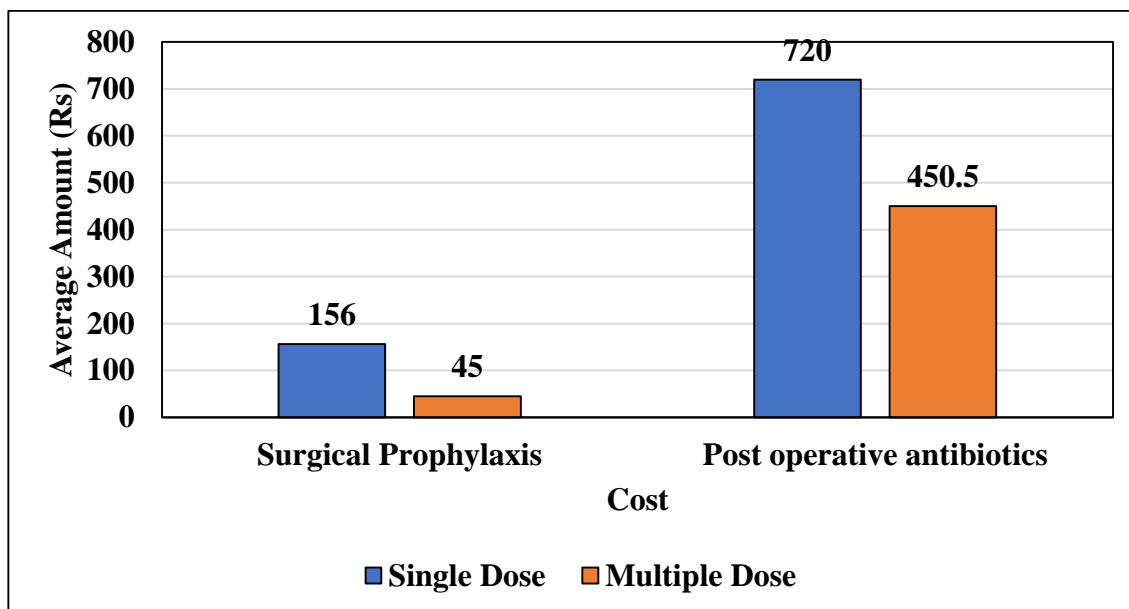


Fig.9: Comparison of cost among the groups

Discussion

This study compared single-dose versus multiple-dose antibiotic therapy in preventing surgical site infections (SSI) among 140 general surgery patients been divided into single dose and multiple dose patient groups of 70 each, examining hospital stay, antibiotic costs, and several lab markers (WBC, lymphocytes, neutrophils, ESR, haemoglobin, blood sugar) between the two groups. Findings of the study:

Most patients were aged 41–50, with a male predominance of 65.7% in total. Hernia was the most common diagnosis across both groups (SD- 11 patients, MD- 18 patients). Single-dose group mainly underwent excision (n= 13) and hernioplasty (n=9), while the multiple-dose group saw more hernioplasty (n=11), hernia repairs (n=11), and appendectomy (n=6) surgical procedures.

Single-dose patients primarily received amoxicillin and potassium clavulanate, while multiple-dose patients received cefotaxime, reflecting a pattern of penicillin use in single doses and cephalosporins in multiple doses. No statistically significant difference was found in most variables except lymphocytes, where a higher average was observed in the multiple-dose group (27.8 vs. 22.8, with $p < 0.05$).

Incidence of SSI rates were 4.3% in single-dose, 7.1% in multiple-dose with no statistical difference, with *E. coli** as the predominant organism, differing from prior studies where *Staphylococcus aureus** was more common.

With comparison to ASHP guidelines, from our study 104 patients received antibiotics within the time frame, Single-dose antibiotics in the SD group were administered within 24 hours post-surgery, whereas multiple-dose antibiotics for the MD group patients extended beyond 24 hours. Category of selection of antibiotic as per ASHP

Guideline was assessed and study found that 26 patients received antibiotics based on category A, 20 patients based on category B and 15 patients based on category C. 60 did not follow any selection criteria as per the guidelines.

The average stay was six days across both groups, aligning partially with other studies but indicating longer stays than prior findings. Surprisingly, the single-dose group incurred higher prophylaxis costs (Rs 156 vs. Rs 45) and postoperative costs (Rs 720 vs. Rs 450) in an average, due to use of high-cost surgical prophylactic antibiotic, which differs with previous studies that said single-dose regimens to be more cost-effective.

Limitations of the study

The data was collected from a single hospital and it may not be a representation of the pattern across the other hospitals in the city, the study was carried out for a short duration of time, some of the surgical procedures were not included in the ASHP guidelines for which adherence to the guideline was not been able to assessed and only cost of antibiotic treatment was analysed.

Acknowledgement

We wish to express our sincere gratitude to Dr. S.N. Sriharsha, M Pharm, PhD., professor & principal of The Hillside College of Pharmacy, Bengaluru for providing us the opportunity to perform our project work. We thank Prof. Dr. G Jesindha Beyatricks., M Pharm, PhD., HOD, department of pharmacy practice, The Hillside College of Pharmacy, and our guide Mohammed Vazir, HOD, Department of Pharmacology, The Hillside College of pharmacy and Research Centre, and our co-guide Dr. Osman Goni, Asst Professor, Hillside college of pharmacy and research center, for providing their insights. It is our pleasure to express our gratitude to all who support us in this study.

Financial support and sponsorship

None

Conflict of interest

None

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