

## Original Research Article

# A study of surgical site infections with and without the use of pre-operative antibiotics

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**Received:** 08 August 2019

**Revised:** 31 August 2019

**Accepted:** 03 September 2019

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### ABSTRACT

**Background:** In spite of advances in infection control, infection still remains the major limiter of surgical horizons. After urinary tract infection, surgical site infection is a main factor contributing to morbidity and mortality.

**Methods:** The present study was carried out in the department of General Surgery and Microbiology at Shri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Sri Amritsar. In this study 100 patients were selected undergoing clean or clean contaminated surgeries out of which 50 patients were not given pre-operative antibiotics (first group) and remaining 50 patients (second group) were given preoperative antibiotics.

**Results:** Sample consisted of 100 patients with mean age of patients was 36.97 years. Total number of males was 57 and females were 43. 25 (50%) of patients who had not received prophylaxis developed SSI (group A) and 28 (56%) patients who received prophylaxis developed SSI (group B). Most common bacteria isolated from SSI was *Staphylococcus aureus* for both the groups. 10 (52.63%) Gram positive bacteria were isolated from microscopic examination of infected sample (A) and 25 (73.52%) were gram negative bacteria. 25 (73.52%) were Gram positive bacteria in group (b) and 9 (26.47%) were Gram negative isolates.

**Conclusions:** It can be concluded from the present study that there is no need to give antibiotic prophylaxis prior to surgery in order to reduce the incidence of surgical site infection.

**Keywords:** Surgical site infection, Preoperative antibiotics, Bacterial infections

### INTRODUCTION

All postoperative surgical infections occurring in an operative site is termed as surgical site infection (SSI). According to Centre for Disease Control and Prevention (CDC), Atlanta Georgia, USA, set criteria for defining the type and site of surgical wound infections and it is the most widely used definition of SSI. The previous CDC definitions published in 1988 considered surgical wound infections (SWI) related to the skin incision only whereas the current definition now classifies SSI into incisional or organ/space and has also introduced the change in terminology from SWI to SSI to prevent confusion

between the infection of a surgical incision and the infection of a traumatic wound. In spite of advances in infection control, infection still remains the major limiter of surgical horizons. Infection of surgical wounds occurs whenever the combination of microbial numbers and virulence in the wound is sufficiently large to overcome the local host defense mechanisms and establish progressive growth.<sup>1</sup> They are the third most frequently reported nosocomial infection, accounting for 14-16% of all nosocomial infections among hospital inpatients.<sup>2</sup> It is the major cause of postoperative illness resulting in increased morbidity, mortality and have a major impact on the cost of health care. A surgical wound may get

infected by the exogenous bacterial flora which may be present in the environmental air of operation theatre or by the endogenous flora.<sup>3</sup> A plethora of microorganisms with different antimicrobial susceptibility pattern has been identified as the causative agents of SSIs which vary from time to time, hospital to hospital and with the type of surgical procedure. A plethora of SSI with still varied number of microorganisms isolated as causative agents, posed a problem of classification. In order to work out an amicable solution, the Centre for Disease Control and Prevention (CDC),<sup>4</sup> Atlanta Georgia, USA, set criteria for defining the type and site of surgical wound infections and it is the most widely used definition of SSI. The previous CDC definitions published in 1988 considered surgical wound infections (SWI) related to the skin incision only whereas the current definition now classifies SSI into incisional or organ/space and has also introduced the change in terminology from SWI to SSI to prevent confusion between the infection of a surgical incision and the infection of a traumatic wound.<sup>4,5</sup>

The main aim of the present research was to study incidence of surgical site infection in group A (no pre-antibiotic treatment) and incidence of surgical site infection in group B (pre-operative antibiotic treatment given) along with the comparative analysis of infections in both groups.

## METHODS

The present study was conducted from Jan 2017 to Nov 2018 in the department of General Surgery and Microbiology at Shri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Sri Amritsar. In this study 100 patients were selected undergoing clean or clean contaminated type of surgery out of which 50 patients were not given pre-operative antibiotics (first group) and remaining 50 patients (second group) were given preoperative antibiotics. Samples were taken 2 days after the surgery from the operated surgical sites with two sterile swabs. One swab was used for making gram stained smear and presence of pus cells and bacteria were noted. Second swab was used for culture on to 5% sheep blood agar and MacConkey's agar and then put in brain heart infusion broth. Media was incubated under aerobic conditions at 37<sup>0</sup> for 24 hours, and was read the following day. Identification of the isolates was done by standard methods. The data was analyzed using SPSS version 19.

## Inclusion criteria

All the patients admitted to the general surgery wards of the hospital for elective clean or clean contaminated procedures. A wound infection was suspected if there were signs of inflammation (edema, redness, raised local temperature, tenderness, and induration) at the wound sites, oozing or discharge from the incision site, wound dehiscence or if the patient developed fever.

## Exclusion criteria

Patients who had SSI following any other invasive procedure prior to the start of surgery were not included in the study.

## RESULTS

The results of the study are presented below. The study groups comprised of 100 patients whose age range from 1-79 years. The maximum number of patients were 11 (22%) in the age group of 40-49 years in group A and 11 (22%) patients had 10-19 years in group B followed by age group 30-39 years (20%), 50-59 years (20%) in group A and 20-29 years, 50-59 years in group B. Only 2 patients were of age 70 or above in both groups. Mean age group of 100 patients was 36.97 years.

**Table 1: Age wise distribution of the patients in both study groups (n=100).**

Age (years)	Group A		Group B	
	No. of cases	%	No. of cases	%
1-9	3	6	1	2
10-19	5	10	11	22
20-29	7	14	10	20
30-39	10	20	4	8
40-49	11	22	9	18
50-59	10	20	10	20
60-69	2	4	3	6
70-79	2	4	2	4
<b>Total</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>100</b>

**Table 2: Gender wise distribution in both study groups (n=100).**

Gender	Group A		Group B	
	No. of cases	%	No. of cases	%
Male	23	46	34	68
Female	27	54	16	32
<b>Total</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>100</b>

Table 2 shows, gender wise distribution of the patients in both study groups, Out of 50 cases in group (A) number of male were 23 (44%) patients and female were 27 (56%) patients. In group B numbers of male were 34 (68%) patients and female were 16 (32%) patients. Mean age of the males in group A was 31.84 years and female was 43.00 years. Mean age of the males in group B was 32.85 years and female was 43.68. Male to female ratio in group A was 1:1.1 and in group B 2.1:1.

In group A out of 50 patients maximum number of patients underwent surgeries for cholelithiasis followed by paraumbilical hernia SSI rates is 20% in case of surgeries for cholelithiasis. No infection was found in case of for paraumbilical hernia surgeries. Overall surgical site infection rate is 50%. Out of 50% cases in group B maximum number of cases underwent surgeries for

cholelithiasis. Infection rate in surgery for cholelithiasis is 33%. Overall surgical site infection rate is 56%. Therefore it can be concluded that preoperative antibiotic prophylaxis does not play any role in preventing surgical site infection.

**Table 3: Microscopic examination in total number of infected cases (n=40).**

Gram staining of specimens	Group A		Group B	
	No. of bacteria	%	No. of bacteria	%
Gram positive	10	52.63	25	73.52
Gram negative	9	47.36	9	26.47

Table 3 shows, results of the gram staining done on the specimen of surgical site infection cases received in the laboratory. Microscopic examination showed 10 (52.63%) gram positive bacteria in group A and 25 (73.52%) gram positive bacteria in group B and similarly microscopic examination showed 9 (47.36%) gram negative bacteria in group A and 9 (26.47%) gram negative bacteria in group B.

**Table 4: Bacterial isolates obtained from the samples of surgical site infection (n=40).**

Bacterial isolates	Group A		Group B	
	No. of bacteria	%	No. of bacteria	%
<i>Staphylococcus aureus</i>	10	52.63	25	73.53
<i>Enterobacter species</i>	2	10.52	5	14.70
<i>Citrobacter species</i>	1	5.26	1	2.94
<i>Acinetobacter</i>	0	0.00	2	5.88
<i>E. coli</i>	6	31.57	1	2.94

Table 4 shows, the spectrum of organism isolated from the total 40 infected cases out of which maximum number of infected cases shows the growth of *S. aureus* in both the groups, followed by *E. coli* in group A and *Enterobacter* in group B. Least number of cases shows the growth of *Citrobacter species* and *Acinetobacter species*. Maximum number of *S. aureus* in group A was 10 (52.63%) and 25 (73.53%) in group B, followed by *E. coli* in group B (31.57%). Number of case infected by *Enterobacter species* was only 2 (10.52%) and similarly by *Acinetobacter species*, number of infected cases were 2 (5.88%). Number of infected cases by *Citrobacter species* is 1 (5.26%) in group A and 1 (2.94%) in group B. However, no infection was seen with *Acinetobacter species* in group A.

## DISCUSSION

The patients selected in group A for various surgical procedures like hernioplasty cholecystectomy, ureterolithotomy, excision of lipoma, fibroadenoma excision, etc. of which cholecystectomies (n=14) were commonest. The patients selected in group B for various surgical procedures like cholecystectomy, nephrectomy, split skin grafting, open reduction internal fixation with plating, hernioplasty etc. of which cholecystectomies were commonest (n=6). Infection rate in group (A) (no pre-antibiotic given) was 24% and infection rate documented in group (B) (pre-antibiotic given) was 56% which was statistically significant as indicated by Chi-square. This result is consistent with findings of Karlattis et al.<sup>6</sup>

The samples were taken from surgical sites in both groups gram staining in culture was performed in both groups out of 100 cases, 40 cases show surgical site infection 60% cases were culture negative. Number of bacteria isolated in 40 cases was 53, out of which 10 were gram positive in group A and 25 in group B and 9 were gram negative in group A and B. In our study 53 isolates were obtained from 40 specimen. Most common bacteria were *Staphylococci* in group A and group B which was 52.63% and 73.53% respectively followed by *E. coli* 31.57% in group A and *Enterobacter species* 14.70% in group B. The organisms most frequently involved in surgical infections change from time to time. In the present study, *S. aureus* was isolated as the most common pathogen at the surgical sites. This finding is in accordance with Sharan et al.<sup>7</sup> National Nosocomial Infections Surveillance system data had revealed that Gram positive pathogens were frequently associated with surgical site infections.<sup>8</sup>

## CONCLUSION

It can be concluded from the present study that there is no need to give antibiotic prophylaxis prior to surgery in order to reduce the incidence of surgical site infection.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Gupta AK, Mittal S, Dall TS, Bansal D. A study of surgical site infections with and without the use of pre-operative antibiotics. *Int Surg J* 2019;6:3806-9.