

## ORIGINAL RESEARCH

### Reduction of surgical site infection in emergency laparotomy by subcutaneous suction drain

<sup>1</sup>Dr. Abhishak Kotwal, <sup>2</sup>Dr. Satish Parihar, <sup>3</sup>Dr. Tabassum Saleem, <sup>4</sup>Dr. Uzma Padwal, <sup>5</sup>Dr. Prerna Sharma

<sup>1,3,4,5</sup>Post Graduate Scholar, Govt. Medical College, Jammu, Jammu and Kashmir, India

<sup>2</sup>Associate Professor, Govt. Medical College, Jammu, Jammu and Kashmir, India

#### Corresponding author

Dr. Abhishak Kotwal

Post Graduate Scholar, Govt. Medical College, Jammu, Jammu and Kashmir, India

Email: [kotwalabhishhek1994@gmail.com](mailto:kotwalabhishhek1994@gmail.com)

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#### ABSTRACT

**Introduction:** The surgical site infection is defined as the occurrence of infection to the surgical site within 30 days of surgery if no prosthesis is placed and up to 12 months if a prosthetic is implanted in the patients. The commonest risk factors of surgical site infection are, degree of contamination, patient's own normal flora, organisms present in the hospital environment, preoperative preparation of surgical site, comorbidities etc. The present study was undertaken to evaluate the role of subcutaneous suction drain in reducing surgical site infections in emergency laparotomies.

**Material and Methods:** This prospective comparative study was conducted in Department of Surgery, GMC, Jammu over the period of 6 months and categorized a total of 100 patients in two groups, i.e. Group -A and Group- B. Group – A consist of 50 patients who had subcutaneous suction drain and Group-B consist of 50 patients, who didn't receive subcutaneous suction drain. A detailed history was collected, physical examination and routine investigations were done and all the patients were followed up in post-operative phase. Data was tabulated, organized, analysed and interpreted in both descriptive and inferential statistics i.e., frequency and percentage distribution, by using statistical package for social science software (SPSS), version 22.0.

**Results:** In the present study, 16% patients in the drain group and 42% in the non-drain group developed infections. The hospital stay in the drain group was also relatively lower ( $5.23 \pm 3.2$  days) as compared to non-drain group i.e.  $8.98 \pm 4.56$  days. Further, the most common organism found was E. coli (78%) in Group-A and (80%) in Group-B respectively.

**Conclusion:** The findings of the present study revealed that the rate of surgical site infection (SSIs) was more in Group-B as compared to Group-A and the presence of SSIs increases the duration of hospital stay. It was concluded that the subcutaneous suction drains in emergency setting play significant role in reducing the incidence of surgical site infection.

**Keywords:** Emergency, Surgery, Surgical site infection, Laparotomy, Suction, Drain and Infection.

## INTRODUCTION

Emergency laparotomy is a major surgery performed to open the abdomen and to visualise the abdominal organs. The emergency laparotomy surgery is to be performed commonly in following conditions; acute intestinal obstruction, rupture of appendix, perforation, peritonitis, trauma, stab injuries, etc.<sup>1,2</sup>

The outcome of the surgery depends on various factors like, type of anaesthesia used, co-morbidities of patients, risk and rate of infection, etc.

Surgical site infection (SSI) is defined by the Centers for Disease Control and Prevention as a wound infection that occurs within 30 days of an operative procedure or within a year if an implant is left in place and the infection is thought to be secondary to surgery.<sup>3</sup> According to the National Nosocomial Infections Surveillance (NNIS) system, SSI are the most frequently reported nosocomial infections, accounting for 12%-16% of all nosocomial infections among hospitalized patients.<sup>4</sup>

Globally, surgical site infection rates have been reported to range from 2.5% to 41.9% and the incidence of surgical site infection in India is 3% to 12%.<sup>5-8</sup>

The surgical site infections put detrimental effect on patient's health and increases the morbidity and mortality and also increases the health care costs and patient's hospital stay.<sup>9</sup>

It was observed that the commonest risk factors of surgical site infection development are, degree of contamination, type of wound, age of the patient, duration and type of surgery, patient's own normal flora, organisms present in the hospital environment, preoperative preparation of surgical site, co-morbidities (obesity or diabetes), etc.<sup>10</sup>

Surgical site infection is categorized into three types, i.e., superficial incisional surgical site infection, deep surgical site infection and organ / space surgical site infection. The initial manifestations of surgical site infections are; pain, tenderness, warmth, delayed healing at surgical wound and fever. The risk of surgical site infection can be reduced by following strict aseptic techniques during surgery, by controlling the co-morbidities of patients, with the use of appropriate antibiotics and appropriate assessment of wound.<sup>11</sup>

The treatment modalities of surgical site infection vary according to the type of infection / wound and other associated factors, like presence of serous fluids / haematoma, etc. as these factors can lead to significant wound complications. Literature suggests that negative suction of the site decreases the risk of infection.<sup>12</sup>

## AIM

To evaluate the role of subcutaneous suction drain in reducing surgical site infections in emergency laparotomies

## OBJECTIVE

1. To study the rate of surgical site infections using Southampton wound scoring.

## MATERIAL AND METHODS

This prospective comparative interventional study was conducted in Department of Surgery, GMC, Jammu over the period of 6 months.

A total of 100 patients were included in the study after taking informed consent from them.

## INCLUSION CRITERIA

1. Above 18 years of age.
2. Patients underwent laparotomy.

## EXCLUSION CRITERIA

1. Patients with co-morbidity.

## 2. Accidental removal of drain.

A total of 100 patients were involved and categorized in two groups, i.e. Group -A and Group- B. Group – A consist of 50 patients who had subcutaneous suction drain and Group-B consist of 50 patients, who didn't receive subcutaneous suction drain.

A detailed history was collected, physical examination and routine investigations were done. Antibiotic prophylaxis was given to all the patients. During surgery abdomen was irrigated for both the groups and drain was placed for Group- A. All the patients were followed up and the content of drain was examined. The wound was assessed and surgical site infection was classified according to the Southampton wound grading system. In the presence of manifestations of surgical site infection swab culture was done and growth and type of microorganisms were identified.

**SOUTHAMPTON WOUND - GRADING SYSTEM**  
(Bailey and love 25<sup>th</sup> edition)

Grade	Appearance	
0	Normal healing	
I	Normal healing with mild bruising or erythema	
	Ia	Some bruising
	Ib	Considerable bruising
	Ic	Mild erythema
II	Erythema plus other signs of inflammation	
	IIa	At one point
	IIb	Around sutures
	IIc	Along wound
	IId	Around wound
III	Clear or haemoserous discharge	
	IIIa	At one point only ( $\leq$ 2cm)
	IIIb	Along wound (>2 cm)
	IIIc	Large volume
	IIId	Prolonged (> 3 days)
IV	Pus	
	Iva	At one point only ( $\leq$ 2cm)
	IVb	Along wound (>2 cm)
V	Deep or severe wound infection with or without tissue breakdown; hematoma requiring aspiration	

Data was collected with the help of a record sheet which contains all the details of patients. The findings of both the groups were compared. Data was tabulated, organized, analysed and interpreted in both descriptive and inferential statistics i.e., frequency and percentage distribution, by using statistical package for social science software (SPSS), version 22.0.

## OBSERVATIONS AND RESULTS

**Table 1: Age**

Age	Group-A		Group -B	
	No.	%	No.	%
<b>18-27</b>	10	20	12	24
<b>28-37</b>	15	30	10	20
<b>38-47</b>	11	22	12	24
<b>48-57</b>	7	14	9	18
<b>58-67</b>	4	8	5	10
<b>&gt;67</b>	3	6	2	4

Table 1, showed that in Group-A majority (30%) of the patients were in the age group of 28-37 years, followed by 38-47 (22%), 18-27 years (20%), 48-57 years (14%), 58-67 years (8%) and > 67 years (6%). In Group-B majority (24%) of the patients were in the age group 38-47 years and 18-27 years followed by 28-37 years (20%), 48-57 years (18%), 58-67 years (10%) and >67 years (4%).

**Table 2: Gender**

Gender	Group-A		Group -B	
	No.	%	No.	%
Male	41	82	36	72
Female	9	18	14	28

Table 2, showed that the majority of the patients in both the groups were males 82% and 72% respectively

**Table 3: Residence**

Area	Group-A		Group -B	
	No.	%	No.	%
Urban	23	46	26	52
Rural	27	54	24	48

Table 3 showed that majority of the study participants in Group-A were from rural area (54%) and in Group-B study participants were from urban area (52%).

Figure 1, showed the educational status of patients, it was observed that depicts that majority of the participants studied till Secondary class (34.89%) followed by middle (28.72%), primary (18.27%), illiterate (7.74%), graduate (6.09 %) and post-graduate (4.26%).

**Figure 1: Educational status**

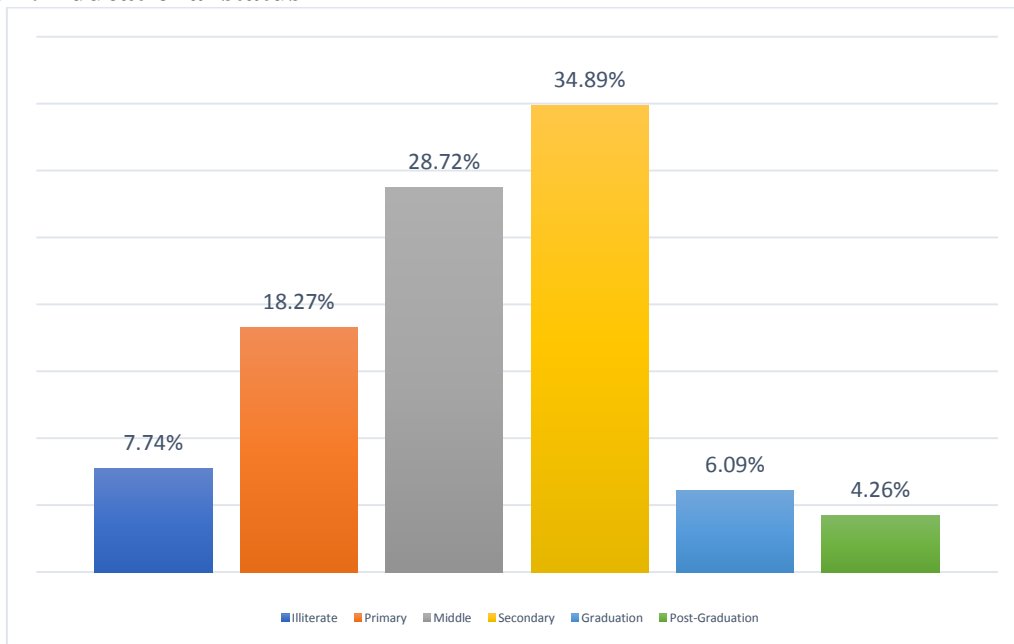
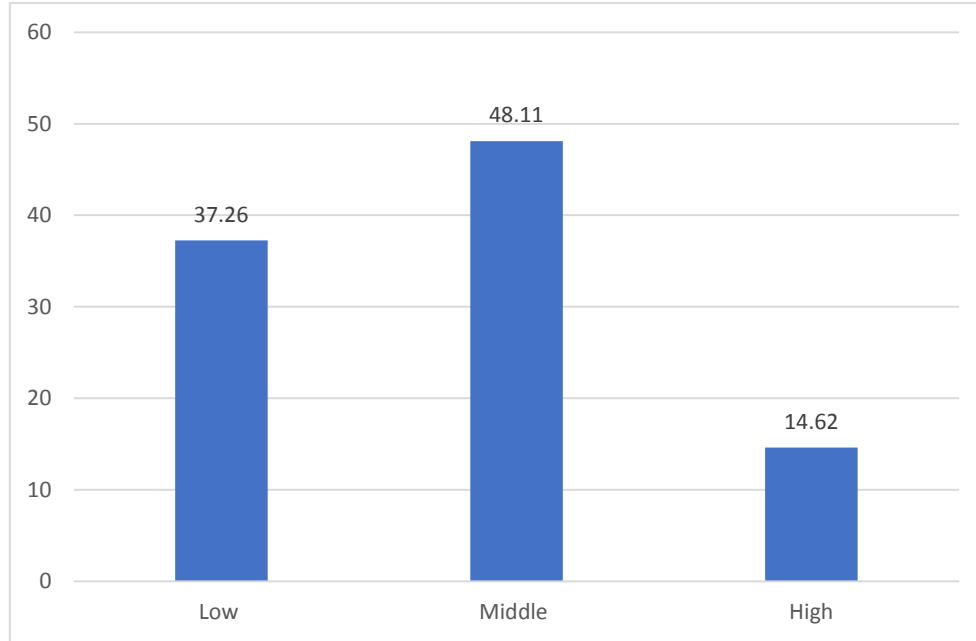


Figure 2, depicted the socio-economic status. Majority of the study participants were from middle class (48.11%), followed by low class (37.26%) and high class (14.62%).

**Figure 2: Socio-economic status****Table 4: Co Morbidities**

Co Morbidities	Group-A		Group -B	
	No.	%	No.	%
DM	9	18	11	22
Hypertension	13	26	15	30
No co morbidity	25	50	24	48
Others	3	6	0	0

It was observed that in both group most of the patients no comorbidity was found, followed by hypertension (26% in Group-A and 30% in Group-B), DM (26% in Group -A and 22% in Group-B) and others (6% in group-A) as shown in table 4.

**Table 5: Surgical site infection rate and grades of wound**

Surgical site infection Grade	Group-A		Group -B	
	No.	%	No.	%
Grade-0	42	84	08	16
Grade-I	3	6	18	36
Grade-II	2	4	12	24
Grade-III	2	4	7	14
Grade-IV	1	2	4	8
Grade-V	0	0	1	2

It was found that the Group -B had more Surgical site infection (42%) as compared to Group-A (16%) as presented in table 5. In Group-A, 45 (90%) patients had normal healing process (grade-0 or 1), 4 (8%) patients of grade-II or III and patients had minor wound complications requiring no further treatment, 1 (2%) patient had reported major complication at the surgical site and treated with antibiotics according to culture and sensitivity reports. In Group-B, 26 (52%) patients had normal healing (grade-0 or I), 19 (38%) patients of grade-II or grade-III had minor wound complications, 4 (8%) patients reported major complications and treated

with antibiotics whereas 1 (2%) patient had reported hematoma at the surgical site requiring evacuation.

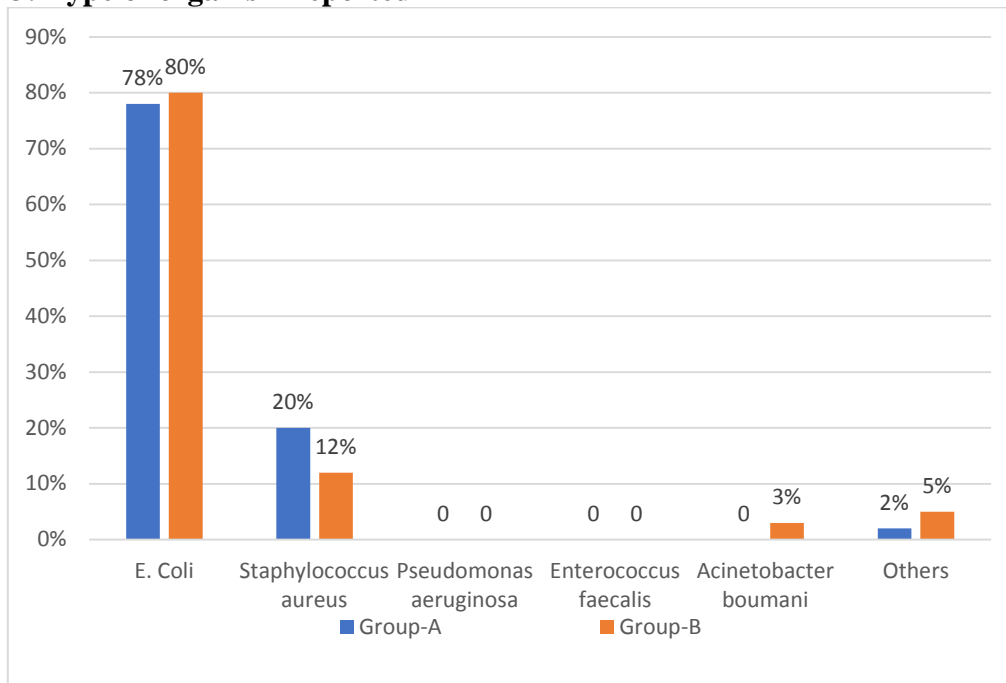
**Table 6: Mean duration of hospital stay**

Group	Duration in days (Mean±SD)
Group-A	5.23±3.2
Group-B	8.98±4.56

It was reported that the Group -B had more longer stay in hospital (8.98±4.56 days) as compared to group-A (5.23±3.2 days) as shown in table 6.

Figure 3. showed that the most common organism found were *E. coli* (78% & 80% in Group-A and Group-B respectively), followed by *Staphylococcus aureus*, *Acinetobacter boumani* (3% in Group-B)(20% & 12% in group-A and Group-B respectively) and others (5% in Group-B).

**Figure 3: Type of organism reported**



## DISCUSSION

In the present study the most of the patients were in the age group of 28-37 years and 38-47 years, majority of the patients were males (77%), in Group -A most of the patients were from rural area (54%), in Group-B most of the patients reside in urban area (52%), majority (34.89%) of the patients had secondary education and most of the patients (48.11%) were from middle class. The findings are consistent with the study conducted by Harish R *et al.*, (2021), observed that the majority of the patients were in the age  $\leq 30$  years.<sup>13</sup> In another study conducted by Dr. P. Vigneshwaran *et al.*, (2020) reported the majority of the patients were males (78%).<sup>14</sup>

It was observed that in both group most of the patients no comorbidity was found, Followed by hypertension (26% in Group-A and 30% in Group-B), DM (26% in Group -A and 22% in Group-B) and others (6% in group-A). In a similar study conducted by Harish R *et al.*, (2021), found that in case and control group 16% patients had hypertension respectively and 26% & 24% in case and control respectively had diabetes mellitus.<sup>13</sup>

The rate of surgical site infection in patients received subcutaneous suction drain was low (16%) as compared to the patients not received subcutaneous suction drain (42%). In Group-A, 45 (90%) patients had normal healing process (grade-0 or 1), 4 (8%) patients of grade-II or III and patients had minor wound complications requiring no further treatment, 1 (2%) patient had reported major complication at the surgical site and treated with antibiotics according to culture and sensitivity reports. In Group-B, 26 (52%) patients had normal healing (grade-0 or I), 19 (38%) patients of grade-II or grade-III had minor wound complications, 4 (8%) patients reported major complications and treated with antibiotics whereas 1 (2%) patient had reported hematoma at the surgical site requiring evacuation. Findings are correlated with the studies conducted by Naik AK *et al.*, (2022) and Dr. P. Vigneshwaran *et al.*, (2020), reported that the rate of surgical site infection in patients received subcutaneous suction drain was low as compared to the patients not received subcutaneous suction drain.<sup>15,14</sup>

It was reported that the mean duration of hospital stay was more in patients not received subcutaneous suction drain (8.98±4.56 days) than patients received subcutaneous suction drain (5.23±3.2 days). The findings are consistent with the studies conducted by Naik AK *et al.*, (2022) and Harish R *et al.*, (2021) observed the significant increase in hospital stay among patients without subcutaneous suction drain.<sup>15,13</sup>

The most common organisms found were *E. coli* (78% & 80% in Group-A and Group-B respectively), followed by *Staphylococcus aureus*, *Acinetobacter baumannii* (3% in Group-B) (20% & 12% in Group-A and Group-B respectively) and others (5% in Group-B). Similarly, Kumar S *et al.*, (2017), reported the most common organism involved in surgical site infection were *E. Coli* and *Klebsiella*.<sup>16</sup>

## CONCLUSION

In the present study, 16% patients in the drain group and 42% in the non-drain group developed infections. The hospital stay in the drain group was also relatively lower (5.23 ± 3.2 days) as compared to non-drain group i.e. 8.98±4.56 days. The present study concluded that the subcutaneous suction drains in emergency setting play significant role in reducing the incidence of surgical site infection.

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