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# A PROSPECTIVE STUDY OF INCIDENCE AND FACTORS DETERMINING THE OCCURRENCE OF SURGICAL SITE INFECTION IN ABDOMINAL SURGERIES AT A TERTIARY CARE HOSPITAL

General Surgery

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## ABSTRACT

**Background:** Surgical site infection (SSI) is one of the most common postoperative complications following abdominal surgeries and remains a significant cause of morbidity, prolonged hospital stay, and increased healthcare costs. **Objectives:** To determine the incidence of surgical site infection in abdominal surgeries and to evaluate patient-related and procedure-related factors influencing its occurrence. **Materials and Methods:** A prospective study was conducted over 18 months (March 2024–August 2025) at a tertiary care teaching hospital. One hundred patients undergoing elective and emergency abdominal surgeries were included. Patients were followed for 30 days postoperatively for SSI as per CDC criteria. Variables analysed included demographic factors, comorbidities, wound class, ASA grading, type and duration of surgery. Wound swabs from infected cases were subjected to culture and sensitivity testing. **Results:** The overall incidence of SSI was 9%. SSI was significantly associated with diabetes mellitus (20%), higher ASA grade (ASA III: 30.7%), contaminated and dirty wounds (Class IV: 71.4%), emergency surgeries (19.04%), open surgical procedures (10.14%), and prolonged operative duration (>4 hours: 33.33%). Minimally invasive surgeries showed a lower incidence of SSI. Gram-negative organisms predominated, with Escherichia coli being the most common isolate. **Conclusion:** SSI continues to be a significant postoperative complication in abdominal surgeries. Identification of high-risk patients, optimization of modifiable risk factors, and strict adherence to aseptic surgical practices are essential in reducing SSI incidence.

## KEYWORDS

Surgical Site Infection, Abdominal Surgery, Risk Factors, ASA Grading, Wound Classification

## INTRODUCTION

Surgical site infection (SSI) is the most common postoperative complication and accounts for approximately 20% of all hospital-acquired infections.

According to the Centres for Disease Control and Prevention (CDC), SSI is defined as an infection occurring at the surgical site within 30 days of surgery or within one year in cases involving implants. SSIs contribute to prolonged hospitalization, increased healthcare costs, and increased postoperative morbidity and mortality.

The incidence of SSI varies depending on patient-related factors such as age, comorbidities, nutritional status, and lifestyle habits, as well as procedure-related factors including wound class, type of surgery, duration of surgery, and emergency status. In developing countries, SSI rates are higher due to increased exposure to risk factors and limited healthcare resources.

This study was undertaken to determine the incidence of SSI in abdominal surgeries and to evaluate factors influencing its occurrence at a tertiary care hospital.

## MATERIALS AND METHODS

### Study Design and Setting

A prospective study was conducted in the Department of General Surgery, Akash Institute of Medical Sciences and Research Centre, Bengaluru, over a period of 18 months from March 2024 to August 2025.

### Study Population

One hundred patients undergoing elective and emergency open or minimally invasive abdominal surgeries were included after obtaining informed written consent.

### Inclusion Criteria

- Patients aged 18–80 years
- Patients undergoing abdominal surgeries
- Administration of at least one dose of preoperative intravenous antibiotic

### Exclusion Criteria

- Patients on chemotherapy or radiotherapy
- Immunocompromised patients (HIV, HBsAg positive)
- Patients on chronic steroid therapy

### Data Collection

Demographic details, comorbidities, addictive habits, wound class, ASA grading, type and duration of surgery were recorded. Patients were followed for 30 days postoperatively for development of SSI as per CDC criteria. Pus samples from infected wounds were sent for culture and sensitivity testing.

### Statistical Analysis

Data were analyzed using standard statistical methods. Categorical variables were expressed as frequencies and percentages. A p-value <0.05 was considered statistically significant.

## RESULTS

- Out of 100 patients studied, 9 Patients developed surgical site infection, giving an overall SSI incidence of 9%.

- **Table 1: Age Distribution of Subjects and SSI**

| Age group (in | With SSI | Without SSI | Total |
|---|---|---|---|
| 18-30 | 2 | 16 | 18 |
| 31-40 | 3 | 21 | 25 |
| 41-50 | 0 | 16 | 16 |
| 51-60 | 2 | 19 | 21 |
| 61-70 | 2 | 12 | 14 |
| 71-80 | 0 | 6 | 6 |


**Figure 1: Age Distribution and SSI**

Out of the 100 patients who were included in this study, 18 of them belonged to the age group of 18-30 years of which 12.5% of them developed SSI. 25 subjects belonged to the age group of 31-40 years and 12% of them eventually developed SSI. 10.5% of the study subjects who were in 51-60 years age group had SSI post-operatively. But majority of the subjects who developed SSI were in the age group of 61-70years with an incidence of 16.7%. This shows that the incidence of SSIs increase with advancing age.

- **Table 2: Gender Distribution and SSI**

| Sex | With SSI | Without SSI | Total |
|---|---|---|---|
| Male | 4 | 54 | 58 |
| Female | 5 | 37 | 42 |

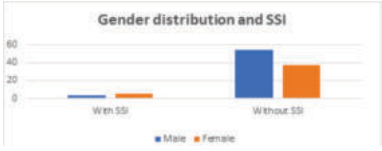


**Figure 2: Gender Distribution and SSI**

Out of the 100 patients, 4 out of 54 male patients developed SSI, which accounted for 7.4% of the total SSIs among male patients. 5 out of the 37 female patients developed SSI, which accounted for 13.5% of total SSIs among female patients.

- **Table 3: Diabetes and SSI**

| | With SSI | Without SSI | Total |
|---|---|---|---|
| With Diabetes | 6 | 24 | 30 |
| Without Diabetes | 3 | 67 | 70 |


**Figure 3: Diabetes and SSI**

30 out of the 100 patients who were included in this study were diabetic. 6 of them landed with SSIs accounting for 20% incidence of SSI among diabetics. 70 patients were non-diabetic and among them 4.3% (3 patients) developed SSI, which was statistically significant ($p<0.05$).

- **Table 4: Hypertension and SSI**

| | With SSI | Without SSI | Total |
|---|---|---|---|
| Hypertensive | 2 | 19 | 21 |
| Non-Hypertensive | 7 | 72 | 79 |


**Figure 4 : Hypertension and SSI**

2 out of 21 patients who had hypertension developed SSIs, accounting for 9.5% , whereas, 8.9 % of non-hypertensives developed SSI

- **Table 5: Smoking and SSI**

| | With SSI | Without SSI | Total |
|---|---|---|---|
| Smoker | 2 | 20 | 22 |
| Non-smoker | 7 | 71 | 78 |

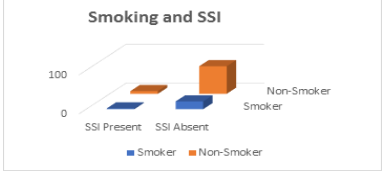


**Figure 5: Smoking and SSI,**

2 of the 22 patients had history of smoking developed SSIs, accounting for 9.09%,whereas 8.9% non- smokers developed SSI

- **Table 6: Alcohol Consumption and SSI**

| | With SSI | Without SSI | Total |
|---|---|---|---|
| Yes | 1 | 16 | 17 |
| No | 8 | 75 | 83 |


**Figure 6: Alcohol Consumption and SSI**

Among patients with alcohol consumption, 1 out of 17 patients developed SSI accounting to 5%, whereas, 6 of 83 patients who had no history of alcohol consumption developed SSI, which was statistically insignificant.

- **Table 7: Wound Class and SSI**

| Wound Class | With SSI | Without SSI | TOTAL |
|---|---|---|---|
| I | 0 | 6 | 6 |
| II | 1 | 63 | 64 |
| III | 3 | 20 | 23 |
| IV | 5 | 2 | 7 |

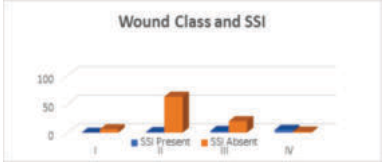


**Figure 7: Wound Class and SSI**

71.4%% of the patients with wound Class IV developed SSIs, compared to 15% with wound class III and 1.5 % of patients with wound class II who developed SSI during follow-ups, which is statistically significant ($p<0.05$).

- **Table 8: ASA Grading and SSI**

| ASA Grade | With SSI | Without SSI | TOTAL |
|---|---|---|---|
| I | 3 | 44 | 47 |
| II | 2 | 34 | 36 |
| III | 4 | 13 | 17 |


**Figure 8: ASA Grading and SSI**

30.7% of the patients with ASA grade III developed SSI when compared to 6.8% of patients with ASA grade I and 5.9% of patients with ASA grade II who developed SSI. This is statistically significant ($p<0.05$).

- **Table 9: Type of Surgery and SSI**

| | With SSI | Without SSI | Frequency |
|---|---|---|---|
| Elective surgery | 5 | 70 | 75 |
| Emergency surgery | 4 | 21 | 25 |


**Figure 9: Type of Surgery and SSI**

Of the 25 patients who underwent emergency abdominal surgeries, 19.04% developed SSIs during the follow-up period when compared

to 7.14% incidence among the elective surgeries which is statistically significant ($p<0.05$).

- **Table 10: Type of Operative Procedure and SSI**

| | With SSI | Without SSI | Frequency |
|---|---|---|---|
| Open surgery | 7 | 59 | 66 |
| Minimally invasive surgery | 2 | 32 | 34 |


**Figure 10: Type of Operative Procedure and SSI**

10.14% of the patients who underwent open surgery developed SSIs when compared to 6.25% of patients who developed SSI after MIS (minimally invasive surgeries (Laparoscopy)) which is statistically significant ($p<0.05$)

- **Table 11: Duration of Surgery and SSI**

| | With SSI | Without SSI | Frequency |
|---|---|---|---|
| < 1 hr | 2 | 38 | 40 |
| 1-2 hrs | 5 | 38 | 43 |
| 2-3 hrs | 1 | 9 | 10 |
| 3-4 hrs | 0 | 4 | 4 |
| >4 hrs | 1 | 2 | 3 |

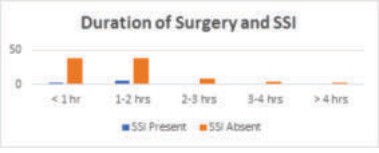


**Figure 11: Duration of Surgery and SSI**

33.33% of the patients in whom the surgical procedure duration exceeded beyond 4hrs developed SSI, when compared to 13.15%, 11.1% and 5.2% of patients who developed SSI even with procedural duration of 1-2hrs, 2-3hrs and within 1hr respectively.

- **Table 12: Organisms Isolated on Culture of SSI Wounds**

| Organism | No. of SSIs |
|---|---|
| E.coli | 4 |
| K.pneumonia | 2 |
| P.aeruginosa | 1 |
| MSSA | 1 |
| No Growth | 1 |

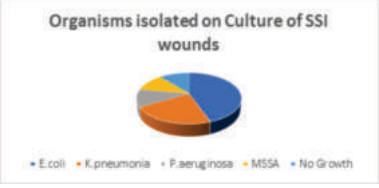


**Figure 12: Organisms Isolated on Culture of SSI Wounds**

Of the 9 patients who developed SSI in the present study, 4 patients had wound swab culture positive for E.coli, 2 for K.pneumonia and 1 each for P.aeruginosa, MSSA (Methicillin Sensitive Staphylococcus aureus).

## DISCUSSION

The overall SSI rate of 9% observed in this study is comparable with other Indian studies. Increased age, diabetes mellitus, higher ASA grading, contaminated and dirty wounds, emergency surgeries, open procedures, and prolonged operative duration were significant risk factors for SSI.

Emergency surgeries are associated with higher infection rates due to inadequate preoperative preparation and higher contamination levels. Minimally invasive surgeries demonstrated a lower incidence of SSI, highlighting their advantage in reducing postoperative morbidity.

Gram-negative organisms predominated, with E. coli being the most common isolate, consistent with findings from other Indian studies.

## CONCLUSION

- Surgical site infection remains a significant postoperative complication in abdominal surgeries.
- Higher ASA grades, contaminated and dirty wounds, emergency and open surgeries, prolonged operative duration, and comorbidities such as diabetes are major determinants of SSI.
- Early identification of high-risk patients and implementation of preventive strategies are crucial to reduce SSI incidence and improve surgical outcomes.

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