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ANALYSIS OF FACTORS INFLUENCING SURGICAL SITE INFECTION IN ABDOMINAL SURGERY: PREVENTIVE MEASURES AND CLINICAL OUTCOMES

Running Title: Surgical Site Infection in Abdominal Surgery

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Abstract

Surgical site infections (SSIs) remain one of the most common postoperative complications following abdominal surgery and are associated with increased morbidity, mortality, prolonged hospital stays, and healthcare expenditure. The present descriptive observational study was conducted to evaluate the factors influencing SSIs in abdominal surgery and to identify effective preventive and therapeutic measures. The study was carried out over a one-year period at Tamralipto Government Medical College and Hospital and included 30 patients aged between 15 and 60 years who developed SSIs following abdominal surgical procedures.

Data were collected from patient records, clinical observations, and postoperative follow-up. Demographic variables, surgical procedures, wound characteristics, causative factors, symptoms, dressing intervals, antibiotic therapy, and wound healing duration were analyzed. Female patients constituted 66.6% of cases, while males represented 33.4%. Gastrointestinal surgeries and secondary suturing after caesarean section accounted for the majority of SSI cases. Major contributing factors included microbial contamination, low immunity, hypertension, diabetes mellitus, emergency surgery, poor tissue handling, prolonged hospital stay, and improper wound care.

The study observed that appropriate antibiotic therapy, proper sterilization, regular dressing, negative-pressure wound therapy, and suitable suturing techniques significantly improved wound healing outcomes. The findings emphasize the importance of perioperative sterility, rational antibiotic use, and evidence-based wound management in reducing SSI incidence. Implementation of effective preventive strategies and improved postoperative care may substantially reduce complications and improve patient outcomes following abdominal surgery.

1. INTRODUCTION

Surgical site infection (SSI) is defined as an infection occurring within 30 days after surgery and involving the incision site, deep soft tissues, or organ spaces manipulated during the procedure[12,2]. SSIs are among the most frequent postoperative complications in abdominal surgery and significantly contribute to increased morbidity, mortality, prolonged hospitalization, delayed wound healing, and elevated healthcare costs[11,1].

Abdominal surgeries are particularly vulnerable to infection because of the high microbial load associated with gastrointestinal procedures and the possibility of contamination during surgery [12,4]. The incidence of SSIs in abdominal surgery ranges from 15% to 25% depending on the type of procedure, contamination level, surgical duration, patient comorbidities, and perioperative management.

Several patient-related, surgical, and environmental factors contribute to the development of SSIs. Patient-related factors include diabetes mellitus, obesity, malnutrition, advanced age, hypertension, immunocompromised state, anemia, and chronic illnesses. Surgical factors such as prolonged operative duration, emergency surgeries, inadequate tissue handling, improper sterilization, and poor wound closure techniques also increase the risk of infection [13]. Environmental factors including poor air ventilation, improper fumigation, inadequate sterilization of instruments, and excessive traffic in operation theatres further contribute to SSI development.

Common microorganisms associated with SSIs include Staphylococcus aureus, Klebsiella species, Escherichia coli, Streptococcus species, and Pseudomonas species [14.] Appropriate antibiotic prophylaxis, strict aseptic techniques, wound care management, proper dressing procedures, and maintenance of perioperative sterility are therefore essential for SSI prevention [13,5.]

The present study was conducted to analyze the factors influencing surgical site infections in abdominal surgery and to evaluate preventive and therapeutic measures that can improve postoperative outcomes.

2.STUDY DESIGN AND METHODOLOGY

2.1 Study Design

A descriptive observational study was conducted during the internship period over a duration of one year.

2.2 Study Setting

The study was carried out at Tamralipto Government Medical College and Hospital, West Bengal, India.

2.3 Study Population

A total of 30 patients who developed surgical site infections following abdominal surgery were included in the study.

2.4 Inclusion Criteria

1. Patients aged between 15 and 60 years.
2. Patients undergoing elective or emergency abdominal surgery.
3. Patients diagnosed with postoperative surgical site infection.
4. Patients willing to participate in the study.

2.4 Exclusion Criteria

1. Patients with malignant gallbladder disease.
2. Patients with severe emergency complications unrelated to SSI.
3. Immunocompromised patients undergoing chemotherapy.
4. Patients with incomplete follow-up data.

2.5 Data Collection

Data were collected from patient medical records, direct observation, wound assessment, and postoperative follow-up. The following parameters were documented:

- Age and sex
- Type of surgical procedure
- Causes and risk factors associated with SSI
- Signs and symptoms
- Wound care duration
- Antibiotic therapy
- Dressing interval
- Suturing techniques and materials
- Preventive and therapeutic measures

2.6 Statistical Analysis

Descriptive statistical methods including mean, median, standard deviation, frequency, and percentage analysis were used to analyze the collected data.

3. RESULTS

Demographic Characteristics

A total of 30 patients were included in the study. Female patients constituted 66.6% (n=20), whereas male patients represented 33.4% (n=10).

Table 1: Age Distribution of Patients

Age Group (Years)	Number of Patients	Percentage
15–29	10	33.0%
30–39	9	30.0%
40–49	2	6.7%
50–60	8	26.7%

Mean age: 37.4 years
Median age: 34 years
Standard deviation: 12.67

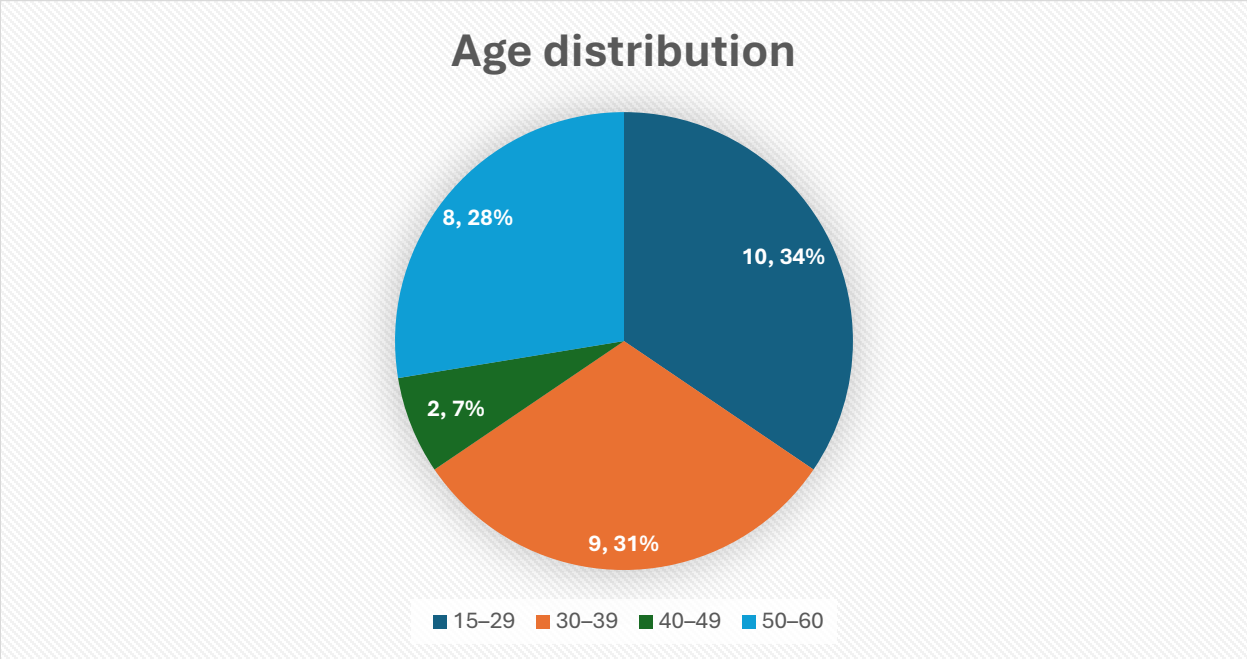

Fig 1. Age-wise distribution of patients with surgical site infection.

Table 2: Sex Distribution

Sex	Number of Patients	Percentage
Female	20	66.6%
Male	10	33.4%

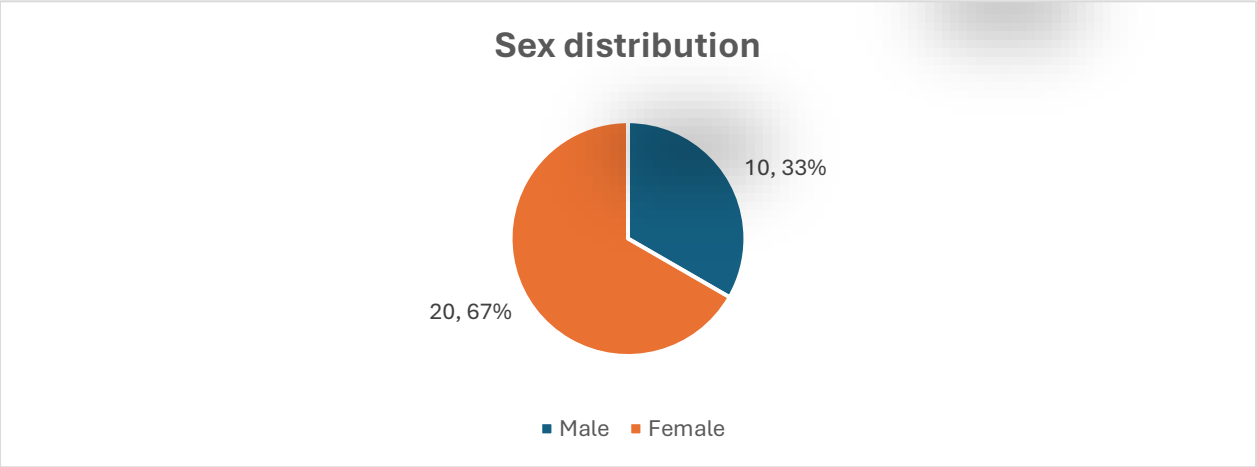

Fig 2. Sex distribution among patients included in the study.

Surgical Procedures Associated with SSI

Table 3: Frequency of Surgical Procedures

Surgical Procedure	Number of Cases

Gastrointestinal surgery	14
Secondary suturing after Caesarean section	10
Gynecological surgery	2
Enterocutaneous fistulectomy	2
Split skin grafting	1

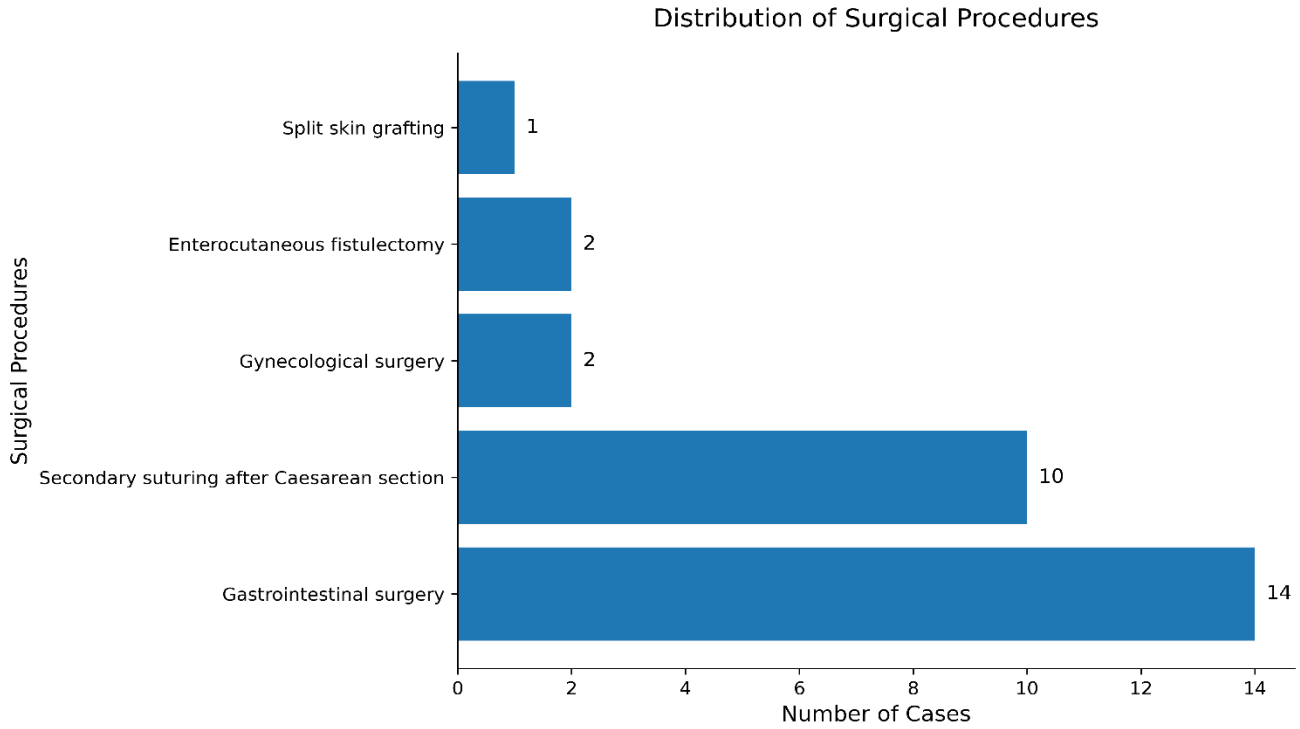

Fig 3. Distribution of surgical procedures associated with surgical site infection

Factors Associated with SSI

Table 4: Common Risk Factors Associated with SSI

Risk Factor	**Number of Cases**
Microorganisms	12
Low immunity/COPD/Allergic sensitivity	8
Hypertension	5
Cancer	3
Emergency surgery	3
Diabetes mellitus	2
Previous surgery	2
Serology positive status	2

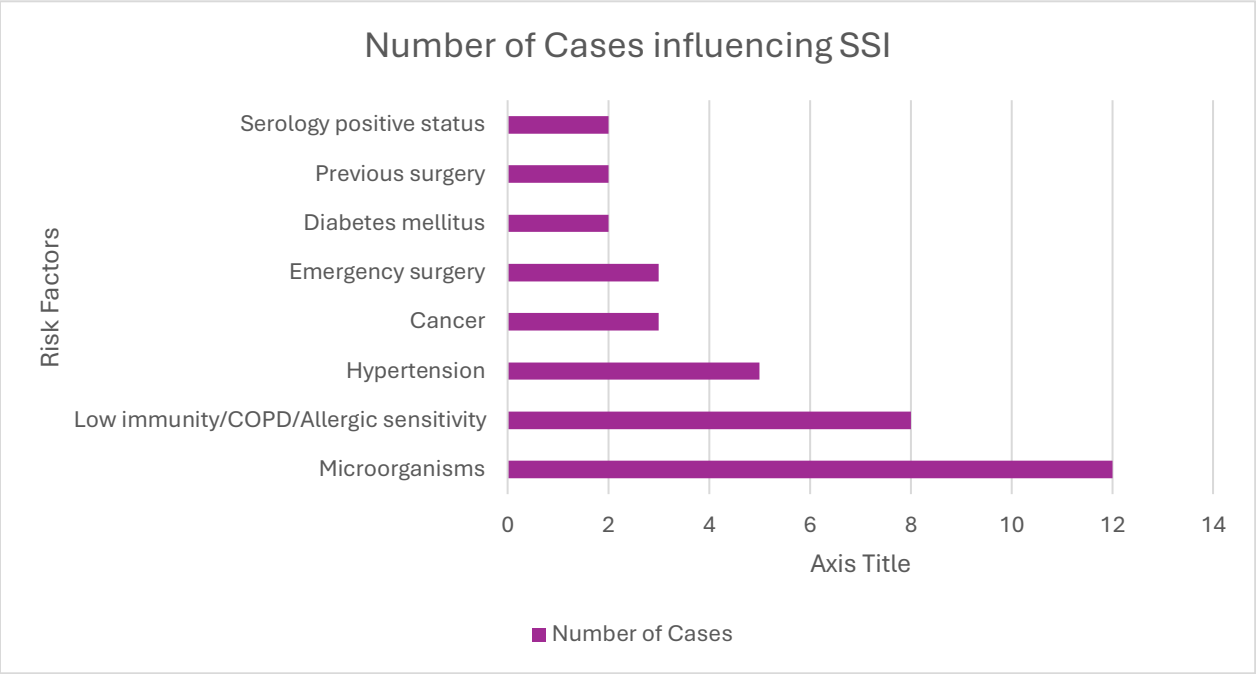

Fig 4. Major factors influencing surgical site infection.

Wound Care Duration

Table 5: Average Wound Care Duration

Surgical Event	**Duration (Days)**
Secondary suturing after C/S	8
Split skin grafting	7
Gynecological surgery	7
Enterocutaneous fistulectomy	2
Gastrointestinal surgery	1–5

Wound Healing and Age Correlation

Table 6: Correlation Between Age and Wound Healing Duration

Age Group	**Wound Healing Duration**
15–29	1–2 weeks
30–39	2–3 weeks
40–49	3–4 weeks
50–60	4–6 weeks

The findings indicated that wound healing duration increased with advancing age.

4. DISCUSSION

The present study analyzed various factors influencing surgical site infections in abdominal surgery and evaluated preventive measures used in clinical settings. The majority of SSI cases were observed among female patients, particularly after caesarean section and gastrointestinal procedures [15]. This finding may be associated with prolonged dressing intervals, emergency surgeries, and increased postoperative exposure.

Microbial contamination was identified as the most common causative factor, with organisms such as Klebsiella species, Escherichia coli, and Staphylococcus species frequently isolated from infected wounds [16]. Similar findings have been reported in previous studies investigating postoperative abdominal infections [17].

Patient-related factors such as diabetes mellitus, hypertension, anemia, low immunity, and cancer significantly contributed to delayed wound healing and increased infection risk [17]. Emergency surgeries and prolonged hospital stay also increased SSI incidence due to greater contamination exposure and tissue trauma [18].

The study observed that proper antibiotic prophylaxis and postoperative antibiotic therapy played an essential role in SSI prevention and management. Commonly administered antibiotics included Piperacillin-Tazobactam, Meropenem, Ceftriaxone, Linezolid, Vancomycin, and Metronidazole [19].

Regular wound dressing, maintenance of aseptic precautions, appropriate drain management, and negative-pressure wound therapy were effective in improving wound healing outcomes [20]. The application of monofilament absorbable sutures and advanced wound closure techniques also reduced complications and improved tissue healing.

The study further demonstrated that older patients required longer wound healing duration because of reduced immunity, impaired tissue regeneration, and multiple comorbidities [21].

Overall, the findings highlight the importance of perioperative sterility maintenance, rational antibiotic use, appropriate wound care, and adherence to infection control protocols in reducing the incidence of surgical site infections.

5. CONCLUSION

Surgical site infections remain a major postoperative complication in abdominal surgery and continue to pose significant challenges to healthcare systems. The present study identified multiple factors associated with SSI development, including microbial contamination, emergency surgeries, prolonged hospital stay, poor tissue handling, inadequate wound care, hypertension, diabetes mellitus, and low immunity.

The study emphasizes that strict maintenance of perioperative sterility, proper antibiotic prophylaxis, regular wound dressing, effective drainage systems, and advanced wound care techniques are essential for preventing SSIs and improving surgical outcomes.

Implementation of evidence-based preventive measures, continuous monitoring of infection control practices, and proper postoperative management can significantly reduce SSI incidence, improve patient recovery, and decrease healthcare costs.

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All authors declared that they have no conflict of interest in this study.

Declaration for using Artificial Intelligence-

The authors declare that artificial intelligence (AI) tools were used solely to assist in language refinement, grammar correction, and improvement of the manuscript. The AI tools did not contribute to the study design, data collection, data analysis, interpretation of results, or generation of original scientific content.

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