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Observational Study on Incisional Hernia Prevalence and Associated Risk Factors After Midline Laparotomy

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Abstract: ***Background: Incisional hernia is a frequent postoperative complication after abdominal surgeries, particularly midline laparotomies. It contributes to morbidity, affects quality of life, and often requires reoperation. Assessing its prevalence and related risk factors is crucial for prevention. Objectives: To determine the prevalence of incisional hernia and identify demographic, clinical, and surgical risk factors among patients undergoing midline laparotomy. Materials and Methods: This observational cross-sectional study was conducted in the Department of General Surgery, Hitech Medical College and Hospital, Bhubaneswar, from September 2024 to April 2025. A total of 100 patients who had undergone midline laparotomy at least six months earlier were included. Demographic, clinical, and intraoperative data were collected using a structured proforma. Diagnosis of incisional hernia was confirmed by physical examination and imaging when required. Data analysis was performed using SPSS version 25, with p-values <0.05 considered statistically significant. Results: The prevalence of incisional hernia was 18%. Important risk factors included advanced age (p = 0.003), BMI > 25 kg/m² (p = 0.009), diabetes mellitus (p = 0.01), wound infection (p = 0.002), emergency surgery (p = 0.02), and prolonged operative time (p = 0.01). Most hernias developed within one year post-surgery, predominantly in the infraumbilical region. Conclusion: Incisional hernia remains a common complication after midline laparotomy. Addressing modifiable factors such as glycaemic control, nutrition, and infection prevention can reduce its incidence.***

Keywords: Incisional hernia, midline laparotomy, prevalence, risk factors, abdominal surgery, wound complications

1. Introduction

Incisional hernia is a common long-term complication after abdominal surgery, with an incidence of 10%–20% depending on patient factors and the duration of postoperative follow-up [1,2]. It results from failed fascial healing at a prior surgical incision, leading to protrusion of intra-abdominal contents through the weakened abdominal wall [1].

Among abdominal surgical approaches, midline laparotomy remains widely used for its ease of execution and superior access to abdominal organs. However, it carries a higher risk of incisional hernia, particularly in the presence of patient-related risk factors such as advanced age, obesity, diabetes mellitus, and smoking, as well as surgery-related factors including emergency procedures, wound infections, and prolonged operative time [1,3,5].

The development of an incisional hernia is not merely a cosmetic or physical inconvenience. It can lead to significant morbidity, including bowel obstruction, incarceration, or strangulation, and often necessitates secondary surgical intervention, thereby increasing the healthcare burden and adversely affecting patients' quality of life [2,4].

Despite advances in surgical techniques and improved suture materials, the incidence of incisional hernia remains high. Emerging evidence also supports the role of prophylactic mesh placement in reducing its occurrence, particularly in high-risk patients [6]. Therefore, understanding the prevalence and identifying modifiable risk factors are crucial for implementing preventive strategies and enhancing surgical outcomes [3].

The present study aims to determine the prevalence of incisional hernia following midline laparotomy and to identify associated risk factors in a tertiary care setting.

2. Methodology

Study Design and Setting

This hospital-based observational cross-sectional study was conducted at the Department of General Surgery, Hitech Medical College and Hospital, Bhubaneswar.

Study Period

The study was carried out over eight months, from September 2024 to April 2025.

Study Population

The study included patients who had previously undergone midline laparotomy and presented for follow-up at the surgical outpatient department during the study period.

Inclusion Criteria

Patients aged ≥18 years.
Patients who underwent midline laparotomy for any indication at least 6 months before enrolment.
Willingness to provide informed consent.

Exclusion Criteria

Patients with laparoscopic incisions or non-midline abdominal incisions. Patients with known recurrent or previous incisional hernias.
Patients with terminal illness or unable to attend follow-up.

Sample Size

A total of 100 patients who met the inclusion criteria were enrolled consecutively during the study period.

Data Collection

A structured data collection form was used to obtain information on:

- Demographic variables: Age, gender, BMI.
- Clinical factors: Comorbidities such as diabetes, history of smoking.
- Surgical factors: Nature of surgery (elective/emergency), duration of surgery, and postoperative wound infection.
- Physical examination was performed to detect an incisional hernia.
- Radiological confirmation (if needed) was done using ultrasonography or a CT scan.

Ethical Considerations

Necessary permissions were obtained before starting the study. Informed written consent was obtained from all participants before inclusion in the study.

Statistical Analysis

Data were analysed using SPSS version 25. Descriptive statistics (mean, standard deviation, frequencies, percentages) were used to summarise the data. Associations between incisional hernia and risk factors were analysed using the Chi-square test or Fisher's exact test for categorical variables and Student's t-test for continuous variables. A p-value of <0.05 was considered statistically significant.

3. Results

Out of the 100 patients who underwent midline laparotomy, 18 patients developed incisional hernia, yielding a prevalence of 18% (Table 1).

Table 1: Prevalence of Incisional Hernia

Variable	Value
Total Patients	100
Patients with Incisional Hernia	18
Prevalence (%)	18.0%

Demographic characteristics revealed that the mean age of patients with hernia was significantly higher (58.3 ± 10.2 years) compared to those without hernia (48.7 ± 11.6 years; p = 0.003). A higher proportion of patients with hernia had a BMI >25 kg/m² (77.8%) as compared to those without hernia (43.9%), which was statistically significant (p = 0.009). Gender distribution showed no significant association with hernia development (Table 2).

Surgical and clinical factors were also analysed. Emergency surgery, diabetes mellitus, wound infection, and prolonged operative duration (>2 hours) were significantly associated with a higher incidence of incisional hernia (p < 0.05 for each). Although smoking history appeared more common among hernia patients, the difference was not statistically significant (p = 0.07) (Table 3).

Table 2: Demographic Characteristics

Variable	With Hernia (n=18)	Without Hernia (n=82)	p-value
Mean Age (years)	58.3 ± 10.2	48.7 ± 11.6	0.003
Male Gender	12 (66.7%)	45 (54.9%)	0.39
BMI >25 kg/m²	14 (77.8%)	36 (43.9%)	0.009

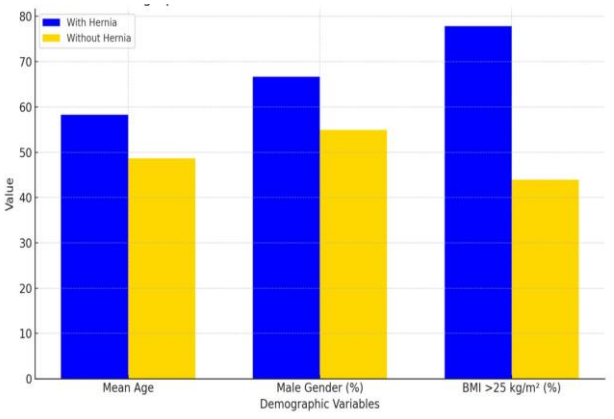

Figure 1: Demographic Characteristics: With vs Without Incisional Hernia

Table 3: Surgical and Clinical Risk Factors

Risk Factor	With Hernia (n=18)	Without Hernia (n=82)	p-value
Emergency Surgery	10 (55.6%)	22 (26.8%)	0.02
Diabetes Mellitus	9 (50%)	18 (21.9%)	0.01
Wound Infection	8 (44.4%)	10 (12.2%)	0.002
Smoking History	6 (33.3%)	12 (14.6%)	0.07
Duration >2 hrs Surgery	13 (72.2%)	31 (37.8%)	0.01

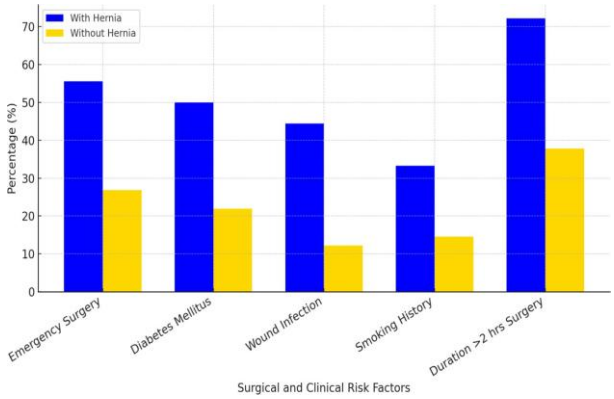

Figure 2: Risk Factors for Incisional Hernia

Among the 18 patients with incisional hernia, the most common time of presentation was between 6 and 12 months postoperatively (44.4%), followed by within the first 6 months (33.3%). All hernias occurred at the infraumbilical site, with 72.2% of cases having a defect size less than 5 cm, while 27.8% had larger defects (Table 4).

Table 4: Characteristics of Incisional Hernias (n = 18)

Parameter	Number of Patients	Percentage (%)
Time of Onset within 6 months	6	33.3%
Time of Onset between 6–12 months	8	44.4%
Time of Onset after 1 year	4	22.2%
Infraumbilical Location	18	100%
Defect Size <5 cm	13	72.2%
Defect Size >5 cm	5	27.8%

4. Discussion

The present study identified an 18% prevalence of incisional hernia among patients who had undergone midline laparotomy, which is consistent with rates reported in previous literature, typically ranging between 10% and 20% [9,12]. This notable prevalence highlights the clinical burden of incisional hernias as a common and impactful postoperative complication.

Age emerged as a significant risk factor, with older patients demonstrating a higher likelihood of hernia development. Age-related impairments in collagen remodelling and tissue regeneration may compromise fascial integrity, increasing hernia susceptibility, a trend similarly reported in large multicentre reviews [9].

Obesity (BMI >25 kg/m²) was also strongly associated with incisional hernia in our study. Elevated intra-abdominal pressure, poor vascularity, and delayed wound healing are key mechanisms underlying this risk. Our findings are in agreement with recent evidence showing significantly higher hernia rates among obese individuals post-laparotomy [11].

Likewise, diabetes mellitus was identified as a significant predictor, supporting prior studies indicating its detrimental effect on wound healing due to impaired collagen synthesis and microvascular circulation [10]. Among modifiable factors, postoperative wound infection demonstrated a particularly strong association with hernia formation. Wound sepsis contributes to fascial breakdown, as emphasised in risk analyses involving both elective and emergency surgeries [7,10].

Emergency procedures were significantly correlated with incisional hernia in our cohort, likely due to inadequate preoperative preparation and increased intraoperative contamination patterns mirrored in large-scale observational data [12]. The predominance of hernias in the infraumbilical region within the first-year post-surgery is consistent with anatomical and biomechanical observations documented in hernia prevention guidelines [9].

Although smoking history did not show statistical significance in this study, the trend toward increased risk suggests a possible association, as smoking has been linked to impaired oxygenation and collagen turnover [8]. Larger sample sizes or prospective follow-up may clarify this relationship. This study is not without limitations. The cross-sectional design restricts causal inference, and being single-centred, findings may not be universally generalizable. However, the results reinforce established risk factors and stress the importance of preventive strategies in high-risk patients, such as early identification, patient optimisation, and consideration of prophylactic mesh placement where appropriate.

5. Conclusion

Incisional hernia remains a common and significant complication following midline laparotomy, with a prevalence of 18% observed in the present study. Several factors were found to be significantly associated with its occurrence, including advanced age, obesity, diabetes mellitus, emergency surgery, prolonged operative duration, and postoperative wound infection. Early identification and targeted management of these modifiable risk factors, such as optimising glycaemic control, preventing surgical site infections, and minimising operative time, can play a vital role in reducing the incidence of incisional hernias. Routine postoperative follow-up and patient education are also essential for timely detection and intervention.

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