



Original Article

An Observational Study of Incidence and Risk Factors of Incisional Hernia After Abdominal Surgery at a Tertiary Care Hospital

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ABSTRACT

Background: Incisional hernia remains a common long-term complication following abdominal surgery despite advances in surgical techniques and wound closure methods. Identification of modifiable risk factors is essential to reduce postoperative morbidity.

Aims & Objective: To study various risk factors, Incidence of incisional hernias at J.L.N. MEDICAL COLLEGE & HOSPITAL, AJMER (RAJASTHAN)

Methods: A prospective observational study was conducted from June 2024 to December 2025 in the Department of General Surgery at a tertiary care centre. Adult patients (>18 years) presenting with incisional hernia were included. Demographic variables, comorbidities, operative details, and postoperative complications were recorded. Statistical analysis was performed using SPSS version 31.0. Categorical variables were expressed as percentages, and continuous variables as mean \pm standard deviation.

Results: Among 832 abdominal wall hernia cases, 65 were incisional hernias, with an incidence of 7.81%. The mean age was 53.8 ± 12.95 years, with the highest incidence in the 51–60 years age group. Females were more commonly affected (58.46%). Most hernias developed within six months of the index surgery (72.31%). Exploratory laparotomy (58.46%) and midline incision (64.62%) were the most common surgical factors. A higher proportion occurred following emergency surgeries (81.54%). Major associated risk factors included postoperative wound infection (41.54%), anaemia (20%), diabetes mellitus (15.38%), hypertension (13.85%), and smoking (13.85%).

Conclusion: Incisional hernia continues to be a significant postoperative complication, particularly following emergency laparotomy. Surgical site infection and patient-related factors such as anaemia and diabetes significantly increase risk. Optimisation of perioperative care, strict infection control, and meticulous surgical technique are essential to reduce its incidence.

Keywords: Incisional Hernia; Laparotomy; Surgical Site Infection; Risk Factors; Abdominal Wall.

INTRODUCTION

Incisional hernia is defined as a protrusion of abdominal contents through a defect in the abdominal wall at the site of a previous surgical incision. It represents a failure of fascial healing following abdominal surgery and remains a common complication of laparotomy.¹

The reported incidence ranges from 10% to 20%, with higher rates observed in high-risk populations. Incisional hernias significantly impair quality of life and may lead to complications such as bowel obstruction, incarceration, and strangulation, often necessitating complex surgical repair.

The pathogenesis is multifactorial, involving patient-related, disease-related, and technical factors. Impaired collagen synthesis, increased intra-abdominal pressure, surgical site infection, and inadequate fascial closure contribute to fascial failure.^{1,2} Patient-related factors such as obesity, diabetes mellitus, smoking, anaemia, and advanced age adversely affect wound healing and reduce the tensile strength of the abdominal wall.³

Current international guidelines recommend continuous small-bite suturing using slowly absorbable sutures over rapidly absorbable materials, as this technique has been shown to reduce the risk of incisional hernia formation.⁴

Most incisional hernias develop within the first two years following surgery, highlighting the importance of adequate postoperative follow-up and early detection.¹

Despite advances in surgical techniques and perioperative care, incisional hernia continues to pose a significant clinical burden, particularly in tertiary care settings. There is limited region-specific data regarding the pattern and associated risk factors of incisional hernia in our population.

This study was undertaken to evaluate the burden and identify risk factors associated with incisional hernia following abdominal surgery in a tertiary care centre.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of General Surgery at J.L.N. Medical College and Associated Group of Hospitals, Ajmer, Rajasthan, India, over a period of 18 months from June 2024 to December 2025.

Ethical Approval

Approval was obtained from the Institutional Ethics Committee. Written informed consent was taken from all participants.

Study Population

The study population consisted of patients presenting with incisional hernia following previous abdominal surgery during the study period.

Inclusion Criteria

- Patients aged more than 18 years with a history of previous abdominal surgery.
- Patient giving written and informed consent.

Exclusion Criteria

- Patients below 18 years
- Patients unwilling to participate in the study.

Data Collection

Data were collected using a structured proforma. The following variables were recorded:

Patient-related factors

- Age, gender
- Body Mass Index (BMI)
- Diabetes mellitus
- Hypertension
- Chronic kidney disease
- Smoking

Disease-related factors

- Indication for surgery
- Elective vs emergency surgery
- Wound contamination
- Type of incision

Postoperative factors

- Surgical site infection (SSI)
- Wound dehiscence

Clinical Assessment

All patients were subjected to a comprehensive clinical assessment, including general physical examination and a detailed abdominal examination. Particular attention was given to the characteristics of the hernia, including its location, size, reducibility, and any associated complications such as obstruction or strangulation.

Laboratory Investigations

Baseline laboratory investigations were carried out in all patients, including complete blood count, blood glucose levels, liver and renal function tests, serum electrolytes, and screening for viral markers. Additional tests such as electrocardiography and coagulation profile were performed in patients planned for operative management.

Radiological Evaluation

Ultrasonography of the abdomen and pelvis was utilised to assess the contents of the hernial sac and detect any associated complications. Computed tomography of the abdomen was reserved for selected patients with complex or large hernias. Chest radiography was performed in patients undergoing surgical intervention.

Outcome Measures

The burden of incisional hernia and associated risk factors were evaluated. The proportion of incisional hernia cases was calculated among patients presenting with abdominal wall hernias during the study period.

Statistical Analysis

Data were analyzed using SPSS version [31.0].

- Continuous variables expressed as mean \pm SD
- Categorical variables as percentages

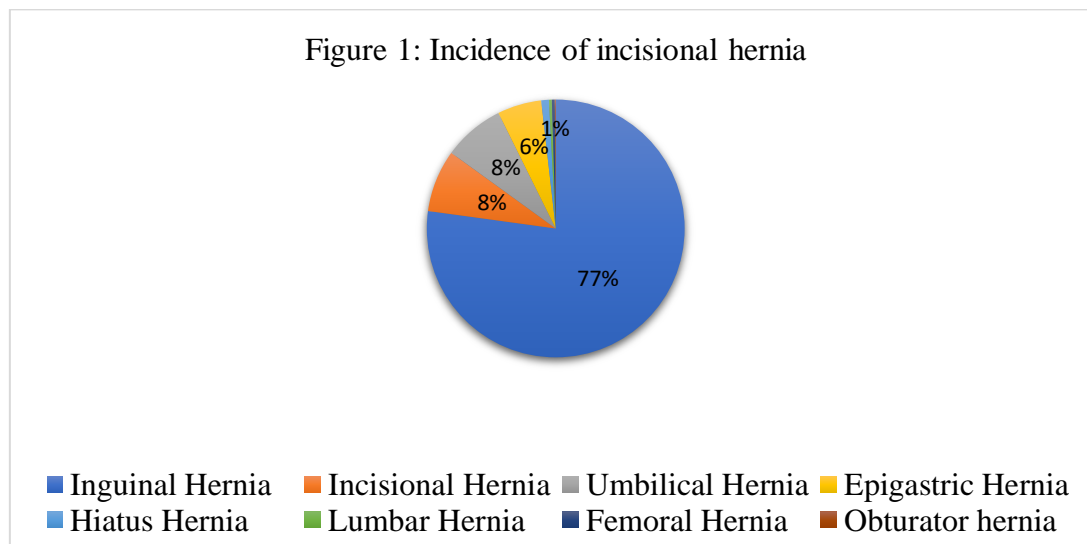
RESULTS

Overall Distribution

During the study period, a total of 832 cases of abdominal wall hernia were evaluated, of which 65 were incisional hernias, yielding a proportion of 7.81% (Table 1, Figure 1).

Type of Hernia	Number of Cases	Percentage
Inguinal Hernia	642	77.2%
Incisional Hernia	65	7.8%
Umbilical Hernia	64	7.7%
Epigastric Hernia	46	5.5%
Hiatus Hernia	8	1.0%
Lumbar Hernia	3	0.36%
Femoral Hernia	3	0.36%
Obturator hernia	1	0.12%
Total	832	100%

Figure 1: Incidence of incisional hernia

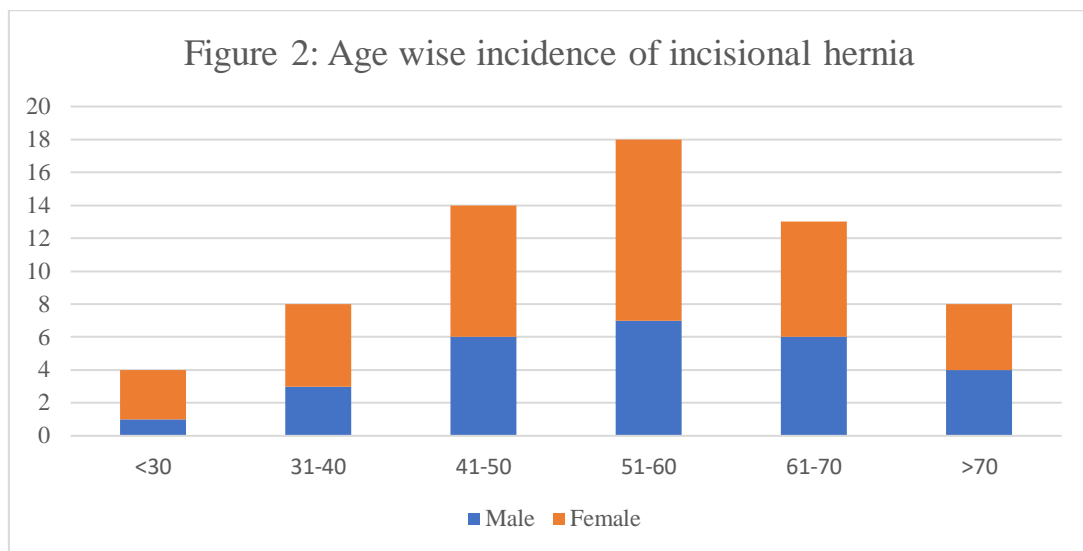


Demographic Profile

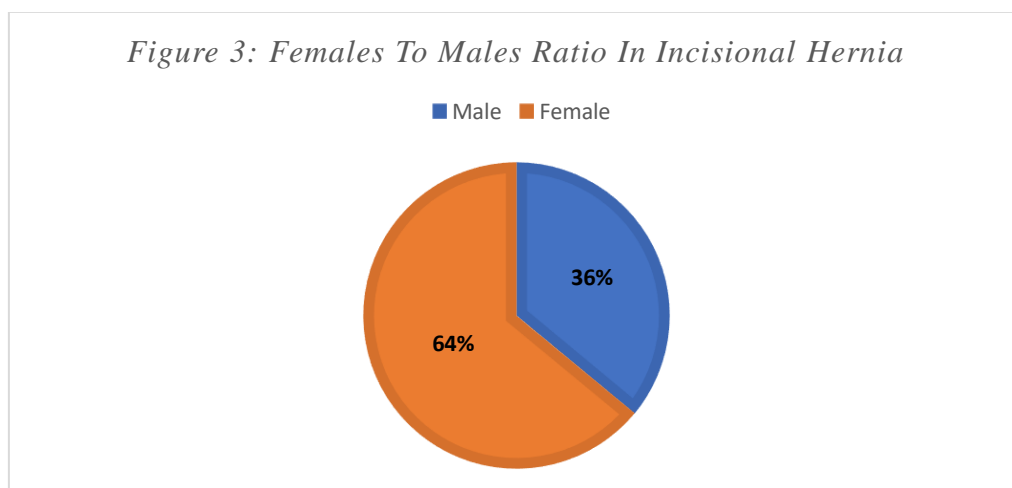
The mean age of patients was 53.8 ± 12.95 years (range 24–81 years). The highest frequency was observed in the 51–60 years age group (29.23%), followed by 61–70 years (27.69%).(Table 2, Figure 2).

The study population exhibited a female predominance, comprising 38 females (58.46%) and 27 males (41.54%). [table 3] [figure 3]

Age	Male	Female	Total
<30	1	3	4
31-40	3	5	8
41-50	6	8	14
51-60	7	11	18
61-70	6	7	13
>70	4	4	8
Total	27	38	65



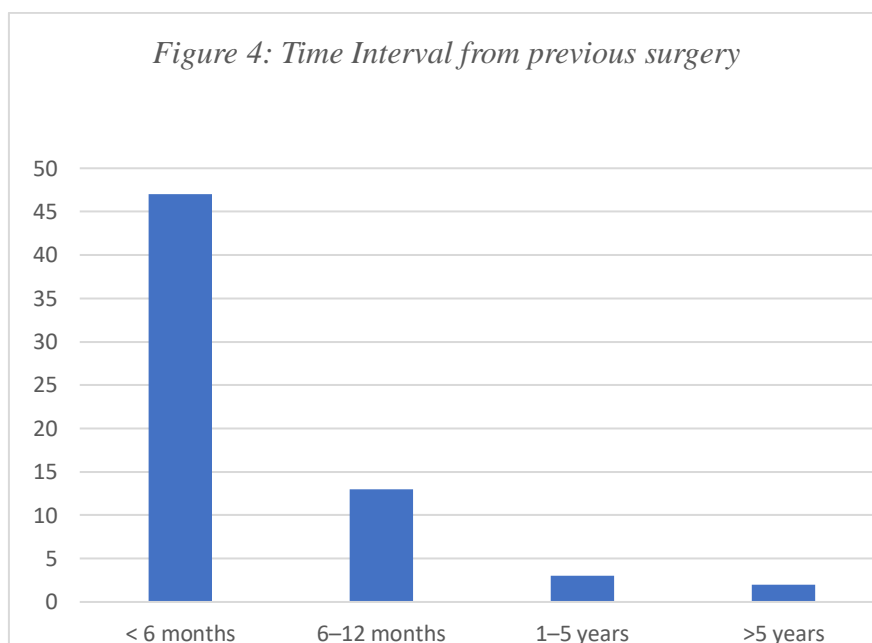
Sex	No. Of cases	Percentage
Male	27	41.54%
Female	48	58.46%
Total	65	



Time Interval from Previous Surgery

Most incisional hernias developed within six months of the index surgery (72.31%), followed by 6–12 months (20%), while a smaller proportion presented after more than one year (Table 4, Figure 4).

Time Interval	Number of Patients	Percentage
< 6 months	47	72.31%
6–12 months	13	20.00%
1–5 years	3	4.62%
>5 years	2	3.07%
Total	65	100%



Type of Previous Surgery

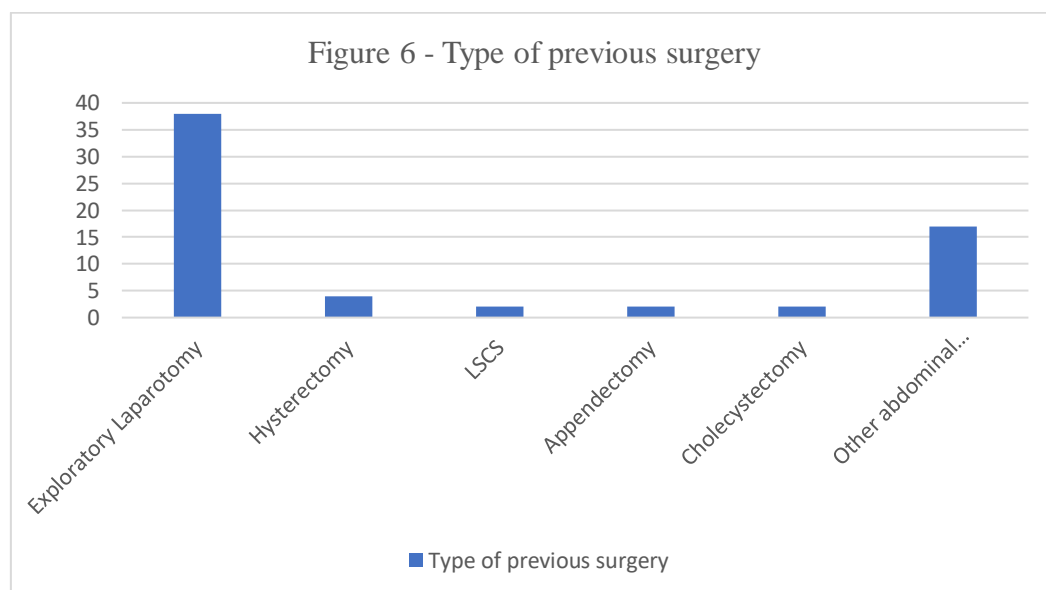
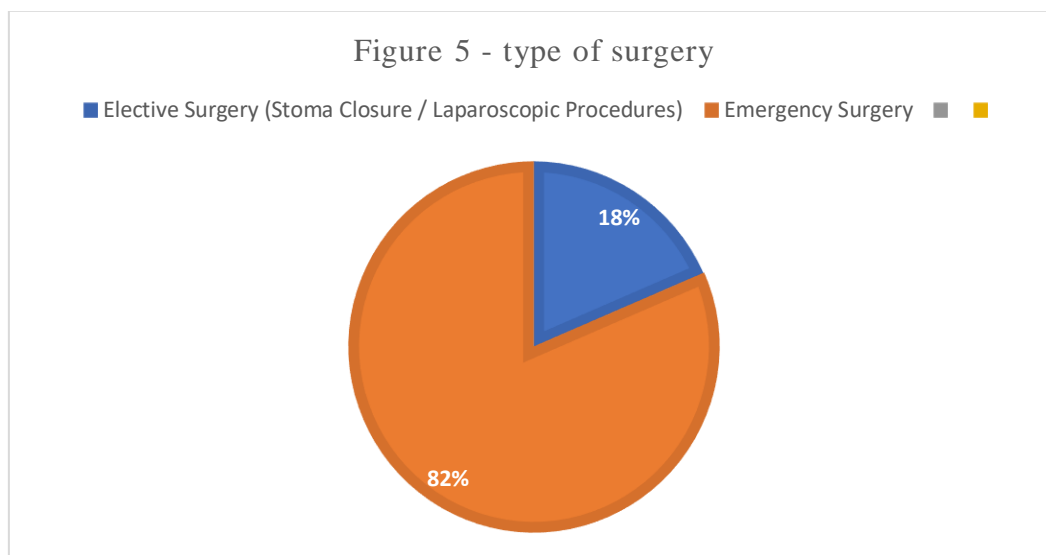
A majority of cases occurred following emergency abdominal surgeries (81.54%), whereas 18.46% developed after elective procedures, including stoma closure and laparoscopic surgeries (Table 5, Figure 5).

Exploratory laparotomy was the most common preceding procedure (58.46%). Midline incision was the most frequent incision type (64.62%), followed by Pfannenstiel and other incision types. A small proportion of patients (6.2%) had a history of laparoscopic surgery (Table 6, Figure 6).

Type of Surgery	Number of Patients	Percentage
Elective Surgery (Stoma Closure / Laparoscopic Procedures)	12	18.46%
Emergency Surgery	53	81.54%
Total	65	100%

Type of Previous Surgery	Number of Patients	Percentage
Exploratory Laparotomy	38	58.46%

Type of Previous Surgery	Number of Patients	Percentage
Hysterectomy	4	6.15%
LSCS	2	3.07%
Appendectomy	2	3.07%
Cholecystectomy	2	3.07%
Other abdominal surgeries	17	26.15%
Total	65	100%

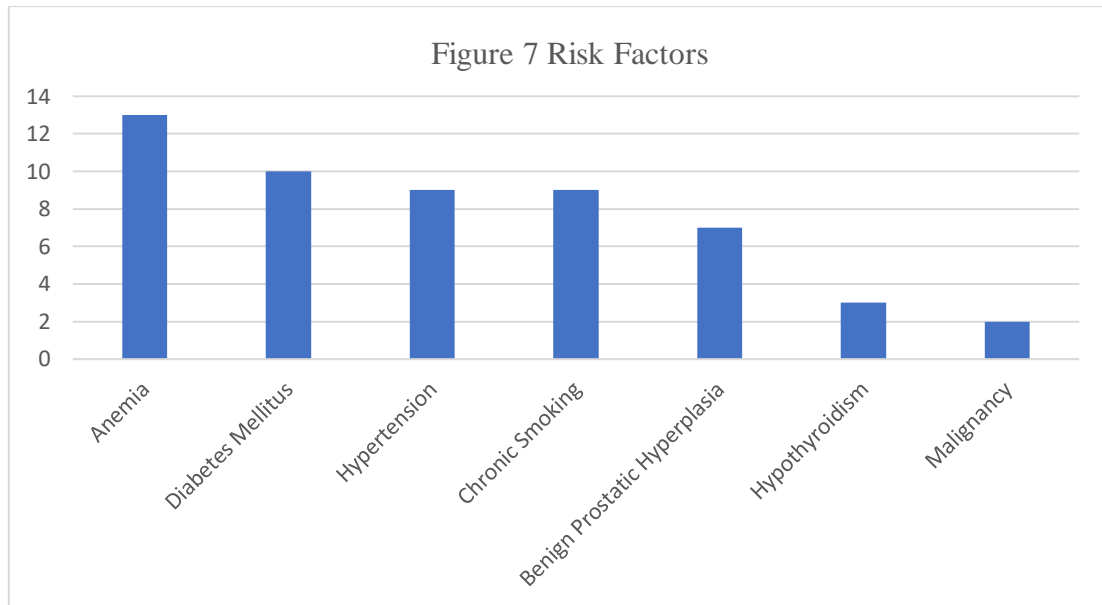


Risk Factors

Several patient-related risk factors were identified. The most common were anaemia (20%), diabetes mellitus (15.38%), hypertension (13.85%), and smoking (13.85%) (Table 7, Figure 7).

Risk Factor	Number of Patients	Percentage
Anemia	13	20.00%
Diabetes Mellitus	10	15.38%
Hypertension	9	13.85%

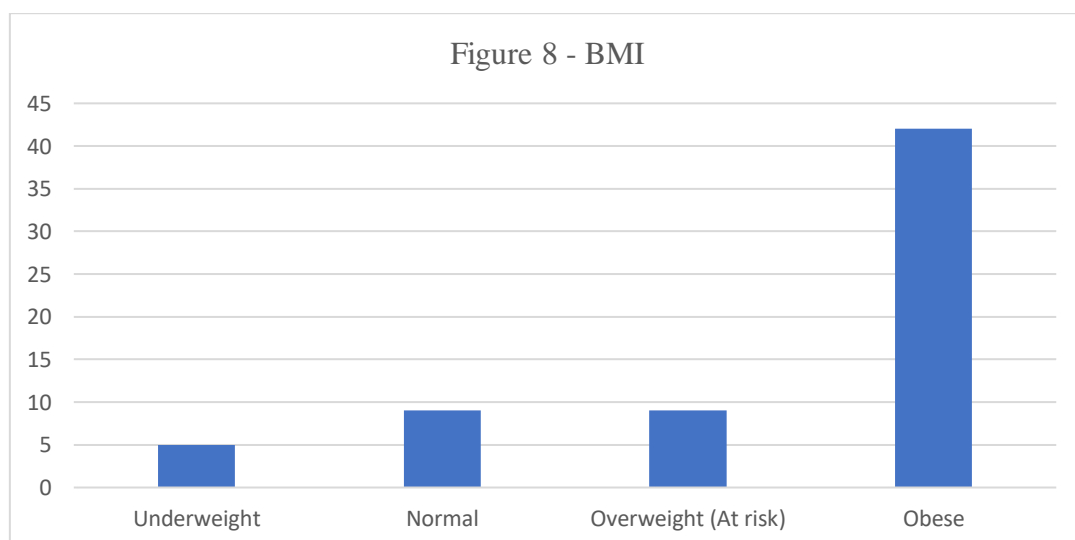
Risk Factor	Number of Patients	Percentage
Chronic Smoking	9	13.85%
Benign Prostatic Hyperplasia	7	10.77%
Hypothyroidism	3	4.62%
Malignancy	2	3.08%



Body Mass Index

A majority of patients (64.6%) were obese (BMI ≥ 25), while 13.8% had normal BMI. Overweight and underweight categories accounted for 13.8% and 7.7% of cases, respectively (Table 8, Figure 8).

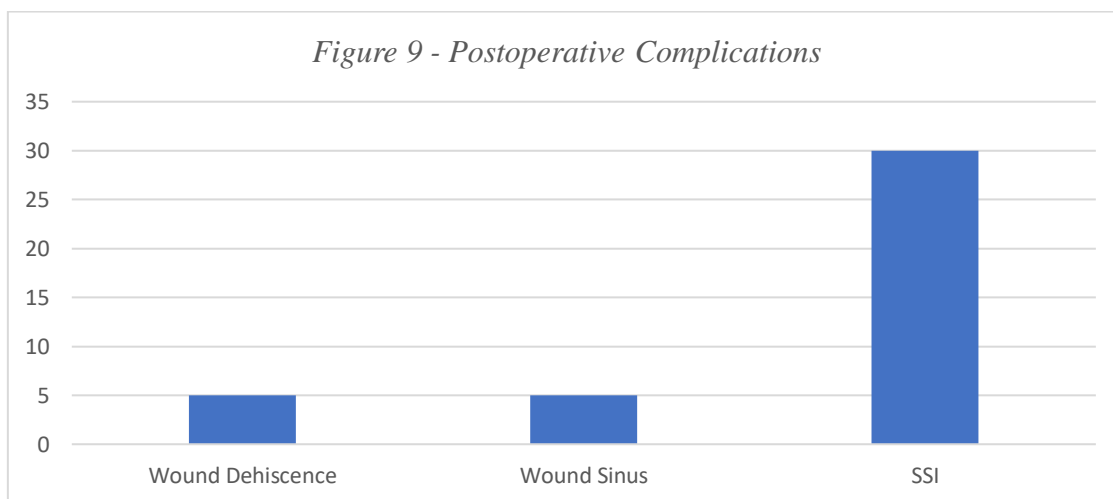
BMI Category	BMI Range	Frequency (n)	Percentage (%)
Underweight	< 18.5	5	7.7%
Normal	18.5 – 22.9	9	13.8%
Overweight (At risk)	23 – 24.9	9	13.8%
Obese	≥ 25	42	64.6%
Total	—	65	100%



Postoperative Complications

Postoperative wound-related complications were observed in a significant proportion of patients. Surgical site infection (SSI) was the most common complication (46.1%), followed by wound dehiscence (7.7%) and wound sinus (7.7%). Overall, 61.5% of patients had wound-related complications (Table 9, Figure 9).

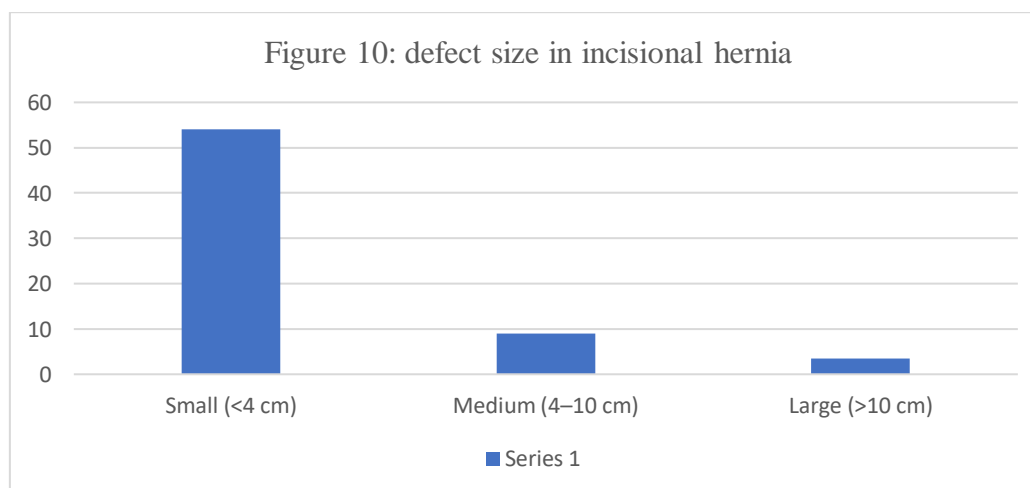
Postoperative Complication	Number of Patients	Percentage
Wound Dehiscence	5	7.7%
Wound Sinus	5	7.7%
SSI	30	46.1%
Total	40	61.5%



Defect Size

According to the European Hernia Society (EHS) classification, most patients (83.1%) had small defects (<4 cm), while 13.8% had medium-sized defects (4–10 cm) and 3.1% had large defects (>10 cm) (Table 10, Figure 10).

Size of Defect	Number	Percentage
Small (<4 cm)	54	83.1%
Medium (4–10 cm)	9	13.8%
Large (>10 cm)	2	3.1%
Total	65	100%



DISCUSSION

- Incisional hernia remains a significant complication following abdominal surgery, resulting from failure of fascial healing at the incision site. Despite advances in surgical techniques and perioperative care, it continues to pose a considerable clinical burden due to the complex interplay of patient-related factors, surgical technique, and postoperative events.
- In the present study, the proportion of incisional hernia was 7.81%, which is comparable with previously reported rates ranging from 5% to 20%. Studies by Itatsu et al. and Muysoms et al. have reported similar findings, indicating that incisional hernia remains a persistent challenge in surgical practice.^{5–9}
- Age was found to be an important determinant, with a mean age of 53.8 ± 12.95 years, and the majority of patients belonging to the fifth and sixth decades of life. Similar observations have been reported by Helgstrand et al., who demonstrated that increasing age is associated with impaired wound healing due to reduced collagen strength and tissue elasticity.^{10,11}
- A female predominance (58.46%) was observed in this study, which may be attributed to the higher frequency of abdominal procedures such as caesarean section and hysterectomy. Comparable findings have been reported by Köckerling et al.¹²
- Most hernias (72.31%) developed within six months of the index surgery, highlighting the importance of early postoperative wound healing. This period corresponds to active collagen remodelling, during which disruption may predispose to hernia formation. Similar temporal patterns have been described in previous studies.^{13,14}
- A majority of cases (81.54%) occurred following emergency surgeries, reflecting the impact of inadequate preoperative optimisation, contamination, and compromised operative conditions on wound healing.
- Exploratory laparotomy was the most common preceding procedure, and midline incisions accounted for the majority of cases (64.62%). Midline laparotomy, although widely used, has been associated with higher rates of incisional hernia due to relatively poor vascularity and increased tension across the wound, as supported by studies including Deerenberg et al. and the European Hernia Society guidelines.^{6,15}
- Patient-related factors such as anaemia, diabetes mellitus, hypertension, and smoking were commonly observed and are known to impair wound healing through mechanisms including reduced oxygen delivery and altered collagen synthesis.^{10,16,17}
- Obesity was a prominent risk factor in the present study (64.6%), contributing through increased intra-abdominal pressure and impaired tissue quality. This is consistent with findings reported in previous studies.^{18,19}
- Postoperative wound complications were identified as the most significant contributing factors, with 61.5% of patients affected, particularly surgical site infection (46.1%). Surgical site infection leads to collagen degradation and disruption of fascial integrity and has been consistently reported as a major risk factor for incisional hernia.^{6,16}
- Although minimally invasive surgery is associated with reduced wound complications, it is not entirely risk-free. Studies such as those by Hiraki et al. have demonstrated that hernias may still occur at trocar or specimen extraction sites. In the present study, 6.2% of patients had a history of laparoscopic procedures, supporting this observation.^{20,21}
- An important observation was that the majority of hernias were small defects (<4 cm) (83.1%), suggesting relatively early presentation and potential for timely intervention.
- Proper abdominal wall closure techniques play a crucial role in prevention. Recent evidence-based reviews emphasise the importance of optimal suture technique, tension-free closure, and strict infection control in reducing the risk of incisional hernia (Agrawal and Jaiswal, 2026).²²
- Overall, the present study supports the multifactorial nature of incisional hernia, resulting from a combination of biological impairment in wound healing and mechanical stress on the abdominal wall.^{11,23} Among these, postoperative wound infection and obesity emerged as the most important modifiable risk factors.
- From a clinical perspective, these findings highlight the need for patient optimisation, meticulous surgical technique, appropriate incision selection, and strict infection control measures to reduce the burden of incisional hernia.

Strengths

The present study has several strengths. It was conducted using a prospective design with systematic data collection. Standardised clinical evaluation was performed in all patients. Additionally, multivariate analysis was utilised to identify independent risk factors associated with incisional hernia.

Limitations

This study has certain limitations. It was a single-centre study, which may limit the generalisability of the findings. Furthermore, larger multicentric studies with longer follow-up are required to validate these results.

CONCLUSION

- The present study demonstrated that incisional hernia constituted 7.81% of abdominal wall hernias in patients presenting to a tertiary care centre. The condition was more commonly observed in middle-aged individuals, with a female predominance. Most incisional hernias developed within the first six months following abdominal surgery, underscoring the importance of early postoperative wound healing.
- Emergency abdominal surgeries, exploratory laparotomy, and midline incisions were the most common surgical factors associated with incisional hernia. Patient-related factors such as anaemia, diabetes mellitus, hypertension, and smoking were frequently observed. In addition, postoperative wound infection emerged as a major contributing factor, highlighting the importance of meticulous surgical technique and effective infection control.
- Early identification and optimisation of modifiable risk factors, along with careful abdominal wall closure and appropriate postoperative care, may help reduce the burden of incisional hernia following abdominal surgery. Evidence-based techniques such as small-bite fascial closure have been shown to reduce the risk of incisional hernia formation.²⁴
- For large or complex defects, advanced reconstructive techniques such as component separation with mesh reinforcement may provide improved outcomes.²⁵

Declarations

Funding: None

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: Obtained from the Institutional Ethics Committee.

Informed Consent: Written informed consent was obtained from all participants.

REFERENCES

1. Williams NS, O'Connell PR, McCaskie AW. Bailey & Love's Short Practice of Surgery. 28th ed. Boca Raton: CRC Press; 2022.
2. Townsend CM, Beauchamp RD, Evers BM, Mattox KL. Sabiston Textbook of Surgery. 22nd ed. Philadelphia: Elsevier; 2024.
3. Brunicaudi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB, et al. Schwartz's Principles of Surgery. 11th ed. New York: McGraw-Hill; 2019.
4. Sanders DL, Pawlak MM, Simons MP, Aufenacker T, Balla A, Berger C, et al. Midline incisional hernia guidelines: the European Hernia Society. *Br J Surg.* 2023;110(12):1732–1768.
5. Itatsu K, Yokoyama Y, Sugawara G, Kubota H, Tojima Y, Kurumiya Y, et al. Incidence of and risk factors for incisional hernia after abdominal surgery. *Br J Surg.* 2014;101(11):1439–1447.
6. Muysoms FE, Antoniou SA, Bury K, Campanelli G, Conze J, Cuccurullo D, et al. European Hernia Society guidelines on the closure of abdominal wall incisions. *Hernia.* 2015;19(1):1–24.
7. Le Huu Nho R, Mege D, Ouassini M, Sielezneck I, Sastre B. Incidence and prevention of ventral incisional hernia. *J Visc Surg.* 2012;149(5 Suppl):e3–e14.
8. Gignoux B, Bayon Y, Martin D, et al. Incidence and risk factors for incisional hernia and recurrence: retrospective analysis of the French national database. *Colorectal Dis.* 2021;23:1515–1523.
9. Ortega-Deballon P, Renard Y, de Launay J, Lafon T, Roset Q, Passot G. Incidence, risk factors, and burden of incisional hernia repair after abdominal surgery in France: a nationwide study. *Hernia.* 2023;27(4):861–871.
10. Guo S, DiPietro LA. Factors affecting wound healing. *J Dent Res.* 2010;89(3):219–229.
11. Franz MG. The biology of hernia formation. *Surg Clin North Am.* 2008;88(1):1–15.
12. Köckerling F. Onlay technique in incisional hernia repair: a systematic review. *Front Surg.* 2018;5:71.
13. Fink C, Baumann P, Wente MN, Knebel P, Bruckner T, Ulrich A, et al. Incisional hernia rate 3 years after midline laparotomy. *Br J Surg.* 2014;101(2):51–54.
14. Helgstrand F. National results after ventral hernia repair. *Dan Med J.* 2016;63(7):B5258.
15. Deerenberg EB, Harlaar JJ, Steyerberg EW, Lont HE, van Doorn HC, Heisterkamp J, et al. Small bites versus large bites for closure of abdominal midline incisions (STITCH): a randomised controlled trial. *Lancet.* 2015;386(10000):1254–1260.
16. Sanders DL, Kingsnorth AN. From ancient to contemporary times: a concise history of incisional hernia repair. *Hernia.* 2012;16(1):1–7.
17. Kanani F, Messer N, Zahalka A, et al. Abdominal incisions and hernia development: a systematic review and meta-analysis of risk factors. *Am Surg.* 2026;92(2):590–604.
18. Dietz UA, Menzel S, Lock J, Wiegering A. The treatment of incisional hernia. *Dtsch Arztebl Int.* 2018;115(3):31–37.

19. Turmine J, Florence AM, Tardivon C, Passot G, Gillion JF, Moszkowicz D, et al. Obesity increases the surgical complexity and risk of recurrence after midline primary ventral hernia repair. *Hernia*. 2024;28(3):779–788.
20. Hiraki M, Tanaka T, Azama S, Sadashima E, Sato H, Miyake S, et al. Risk factors of incisional hernia at the umbilical specimen extraction site in laparoscopic colorectal surgery. *Ann Coloproctol*. 2024;40(2):136–144.
21. Wu XW, Yang DQ, Wang MW, Jiao Y. Occurrence and prevention of incisional hernia following laparoscopic colorectal surgery. *World J Gastrointest Surg*. 2024;16(7):1973–1980.
22. Agrawal UK, Jaiswal S. Principles of abdominal wall closure: a narrative review of evidence-based techniques. *Cureus*. 2026;18(3):e104512.
23. Abbas AA, Gunning P, Chintapatla S, Kröger R. Incisional hernia development: wound healing gone wrong? *Wound Repair Regen*. 2026;34(2):e70131.
24. Van den Berg R, van Egmond S, Smits F, Baart SJ, Aufenacker TJ, Cense HA, et al. Small bites vs large bites for closure of abdominal midline incisions: a randomized clinical trial. *JAMA Surg*. 2026:e260618.
25. Orban YA, Baz Y, Hegab YH, Zakaria R, Heggy IA. Incisional hernia repair using component separation with perforator preservation and onlay mesh: a pilot study. *Hernia*. 2026;30(1):151.