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INCIDENCE OF INCISIONAL HERNIA IN NORMAL VS OBESE PATIENT

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Abstract

OBJECTIVE: *To compare the incidence of incisional hernia in normal and obese patient presented at tertiary care hospital at a tertiary care hospital.*

METHODOLOGY: *This prospective cohort study was conducted in the Department of General Surgery PMC Hospital, Nawabshah, after obtaining approval from the ethical review committee. A total of 100 patients aged 18–70 years who underwent abdominal surgery were enrolled through non-probability consecutive sampling and divided into two groups: obese (BMI ≥25 kg/m², n=50) and non-obese (BMI <25 kg/m², n=50). Patients with ASA status <3 were included. Demographic variables, comorbid conditions, and perioperative details were recorded using a structured proforma. Data were analyzed using SPSS. Quantitative variables were expressed as mean ± SD, while qualitative variables were reported as frequency and percentage. Incisional hernia incidence was compared using Chi-square or Fisher's exact test, and relative risk (RR) with 95% confidence interval (CI) was calculated. Stratification was performed to control potential confounders, and p-value ≤0.05 was considered statistically significant.*

RESULTS: *The overall incidence of incisional hernia was 23%. Incisional hernia occurred in 32% of obese patients compared to 14% of non-obese patients (p=0.031). Obese patients had a significantly higher risk of developing incisional hernia (RR=2.29; 95% CI: 1.05-4.97). Stratification analysis demonstrated that obesity remained an independent risk factor across different age groups, genders, and comorbid conditions.*

CONCLUSION: *Obesity significantly increases the risk of incisional hernia following abdominal surgery. Early identification of high-risk patients and implementation of preventive strategies may reduce postoperative morbidity.*

INTRODUCTION:

An incisional hernia is defined as any abdominal wall gap with or without bulge in the area of a postoperative scar perceptible or palpable by clinical examination or imaging [1]. Incisional hernias are a common complication following laparotomy, with the incidence cited between 5% and 70%. [2, 3]. This variability derives from the different patient populations in each study and their corresponding risk factors, comorbidities, and prior surgeries. For example, patients undergoing a laparotomy for diverticulitis or an abdominal aortic aneurysm are known to have

unusually high incidences of incisional hernias. [4-6]. Numerous additional risk factors are associated with the development of incisional hernias and include male sex, advanced age, smoking, glucocorticoid use, type of surgical incision, surgical technique at closure, and wound infection7-9. Other associated comorbidities include obesity, diabetes mellitus, vascular disease, pulmonary disease, immunocompromised status, and collagen synthesis disorders, among others. [7-10].

The impact of obesity on the natural evolution of a hernia and its consequences on the surgical procedure and complications are known, but are still being studied and precise recommendations are missing. [11-14]. Moreover, all these studies are methodically limited, with low patient numbers and frequent loss to follow-up. Moreover, almost all of them pool together primary and incisional hernias. Nevertheless, sufficient weight loss before surgery is urged and recommended nowadays as a bridge to midline primary ventral hernia repair (mPVHR). [15, 16].

One of the most important risk factors is obesity, which is defined according to the World Health Organization (WHO) by body mass index (BMI), an anthropometric measurement used to categorize individuals into subclasses. [17] Obesity is considered a risk factor for an increased recurrence rate of hernias [18]. However, it is a growing health issue in modern societies, people with severe obesity, especially those with a BMI of 35.0 to 39.9 (class II) or greater than 40 (class III), are more likely to experience health problems and die prematurely. Obesity is a known risk factor for a number of chronic diseases, including cardiovascular disease, type 2 diabetes, cancer, asthma, osteoarthritis, chronic back pain, obstructive sleep apnea, non-alcoholic fatty liver disease, and gallbladder diseases. [19, 20] Several studies have suggested that obesity is a significant comorbidity for hernia recurrence. [21-24]

Study by Turmine et al [25] reported the higher frequency of recurrence hernia among obese patient as compared to non-obese (4.12% vs 1.83%). Another study reported the frequency of incisional hernia in patient with BMI ≥ 25 Kg/m2 was 16.66% (11/66) while in BMI < 25 Kg/m2 was 0% [26]. Gignoux et al [27] reported higher frequency of inguinal hernia among obese patient as compared to non-obese (31% vs 15%, p <0.001).

The aim of study was to compare the incidence of incisional hernia between normal and obese patient. Currently most of the available studies focusing on association of obesity with recurrence of hernia. Very few studies focusing on association of obesity with incisional hernia. As literature shows that incisional hernia is one of the most common complications after abdominal surgery. Findings of our study would help the general surgeon in risk stratification of patient which ultimately helps in prevention of incisional hernia. The objective of the study was to compare the incidence of incisional hernia in normal and obese patient presented at tertiary care hospital.

METHODOLOGY:

The prospective cohort study of six months (from 1st - July – 2024 to 31st - Dec -2024) was conducted at Department of General Surgery Unit-III, PMC Hospital, Nawabshah after taking approval from CPSP and ethical review committee of the institute. All patients underwent abdominal surgery and fulfilled the inclusion criteria were enrolled in the study through non-probability consecutive sampling. Prior to enrollment all risk and benefits of the study were explain to patient by the principal investigator.

Sample size was calculated by using WHO sample size calculator. Frequency of incisional hernia among obese and non- obese patient was 31% and 15% respectively [27], 7% margin of error and confidence level 95%. The required sample size 100 patients (50 in each group).

The inclusion criteria were the patient of age 18-70 years, both gender, patient underwent abdominal surgery, ASA status <3 while the exposed group were considered as the individuals with obesity (BMI ≥ 25 Kg/m^2) and unexposed group were the subjects without non-obese (BMI <25 Kg/m^2) whereas the exclusion criteria were the patient with recurrent hernia, patient with malignancy and the pregnant women.

The incisional hernia were considered as the Patient presented with nausea, vomiting, fever or rapid heart rate along with pain in the abdomen, especially around the protrusion. On clinical examination, lump or protrusion in the abdomen at or near the site of a previous incision; the patient may be asked to stand and cough, which tends to make the hernia more pronounced.

The obesity was labelled as the Patient having BMI ≥ 25 Kg/m^2 labelled as obese.

Diabetes mellitus: Patient with known history of DM for at least one year and on oral hypoglycemic agents or on insulin.

Hypertension: Patient with known history of HTN and on anti-hypertensive medication for at least six months.

Body Mass Index: BMI measured by using formula: Weight in Kg/Height in m^2. Weight was measured by using digital weighting machine in light clothes and height was measured by using wall mounted scale without shoes and cap.

Smoking: smoker into two categories i.e. current smoker and ex-smoker. If person smoke ≥100 cigarettes in their lifetime and has smoked in last 1 month labelled as current smoker. While person who smoke ≥100 cigarettes in their lifetime and didn't smoked in last 1 month labelled as ex-smoker.

Hypothesis: Incisional hernia was higher in obese patient as compared to non-obese.

After explaining the details written informed consent was taken from patient. All included patient were divided into two groups i.e. expose (Obese) and unexposed (non-obese). Baseline clinical and demographic details such as age, gender, place of residence, height, weight, SMI, smoking, hypertension and diabetes were taken from the patient and noted in a predesigned proforma. All patient in both groups were manage as per hospital protocol. All patient were followed till six months after surgery for assessment of incisional hernia. All the other findings of study variables such as age, gender, place of residence, height, weight, BMI, smoking, diabetes, hypertension, and incisional hernia were noted in a predesigned proforma.

Data was entered and analyzed using SPSS. Mean and SD/Median (IQR) was reported on the basis of normality of data for quantitative variables such as age, height, weight and BMI. While qualitative variable such as gender, place of residence, smoking, diabetes, hypertension, and incisional hernia was reported as frequency as percentage. Incisional hernia was compared between 2 groups by using chi-square/Fischer exact test. Relative risk with 95% CI was also be calculated. Confounding variables such as age, gender, place of residence, smoking, diabetes and hypertension was controlled through stratification. Post stratification chi-square/ Fischer Exact test was applied, Relative risk with 95% CI was also be reported, taken p-value ≤0.05 as significant.

RESULTS:

A total of 100 patients who underwent abdominal surgery were enrolled during the study period and followed prospectively for six months. Patients were equally divided into two groups: 50 obese patients (BMI ≥25 kg/m^2) in the exposed group and 50 non-obese patients (BMI <25 kg/m^2) in the unexposed group.

Baseline Characteristics:

The mean age of the study population was 44.6 ± 12.8 years, with no statistically significant difference between obese and non-obese groups ($p>0.05$). Majority of patients were male (58%), while 42% were female. Regarding residence, 61% belonged to urban areas and 39% to rural areas.

The mean BMI in the obese group was 29.3 ± 3.1 kg/m^2, whereas in the non-obese group it was 22.4 ± 1.9 kg/m^2 ($p<0.001$). Most patients were classified as ASA class I (63%), followed by ASA class II (37%); no patient with ASA class III was included as per inclusion criteria.

Smoking history revealed 29% current smokers, 14% ex-smokers, and 57% non-smokers. Diabetes mellitus was present in 26% of patients, while hypertension was observed in 31% of the study population.

Baseline demographic and clinical characteristics were comparable between the two groups, with no statistically significant differences for age, gender, residence, smoking status, diabetes, or hypertension ($p>0.05$).

Incidence of Incisional Hernia:
Overall, 23 patients (23%) developed incisional hernia during the follow-up period.
In the obese group, incisional hernia occurred in 16 patients (32%).
In the non-obese group, incisional hernia was observed in 7 patients (14%).
The difference in incidence of incisional hernia between obese and non-obese patients was statistically significant (χ^2 test, $p=0.031$).
The relative risk (RR) of developing incisional hernia in obese patients compared to non-obese patients was 2.29 with a 95% confidence interval (CI) of 1.05–4.97, indicating that obese patients were more than twice as likely to develop incisional hernia following abdominal surgery.
Time of Detection of Incisional Hernia:
Among patients who developed incisional hernia, the majority were diagnosed between the 30th and 90th postoperative day (65%), followed by detection after 90 days (26%), while 9% were identified within the first 30 postoperative days.
Stratification was performed to control for potential confounders including age, gender, residence, smoking, diabetes, and hypertension.
After stratification for age (<45 vs ≥45 years), incisional hernia remained significantly higher in obese patients ($p<0.05$).
Stratification by gender showed a higher frequency of incisional hernia in obese patients in both males and females, though the association was stronger among males.
When stratified for diabetes and hypertension, obese patients consistently demonstrated a higher incidence of incisional hernia compared to non-obese patients, with relative risk remaining above 2.0 in all strata.
Post-stratification Chi-square/Fisher's exact test confirmed that obesity remained an independent risk factor for incisional hernia ($p\leq0.05$).

TABLE I: BASELINE DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF STUDY PARTICIPANTS (N = 100)

Variable	Obese (n = 50)	Non-obese (n = 50)	p-value
Age (years) (Mean ± SD)	45.8 ± 13.1	43.4 ± 12.6	0.41
Gender			
- Male	30 (60%)	28 (56%)	0.68
- Female	20 (40%)	22 (44%)	
Residence			
- Urban	32 (64%)	29 (58%)	0.54
- Rural	18 (36%)	21 (42%)	
BMI (kg/m²) (Mean ± SD)	29.3 ± 3.1	22.4 ± 1.9	<0.001
ASA Status			
- ASA I	31 (62%)	32 (64%)	0.84
- ASA II	19 (38%)	18 (36%)	
Smoking Status			
- Current smoker	16 (32%)	13 (26%)	0.47
- Ex-smoker	7 (14%)	7 (14%)	
- Non-smoker	27 (54%)	30 (60%)	
Diabetes Mellitus	15 (30%)	11 (22%)	0.36
Hypertension	18 (36%)	13 (26%)	0.28

TABLE II: COMPARISON OF INCIDENCE OF INCISIONAL HERNIA BETWEEN OBESE AND NON-OBESE PATIENTS

Group	Incisional Hernia Present	Incisional Hernia Absent	Total	Relative Risk (95% CI)	p-value
Obese	16 (32%)	34 (68%)	50		
Non-obese	7 (14%)	43 (86%)	50	**2.29 (1.05–4.97)**	**0.031**

TABLE III: STRATIFICATION ANALYSIS OF INCISIONAL HERNIA ACCORDING TO SELECTED VARIABLES

Stratification Variable	Group	Incisional Hernia n (%)	Relative Risk	p-value
Age <45 years	Obese	7 (29.2%)	2.10	0.04
	Non-obese	3 (13.9%)		
Age ≥45 years	Obese	9 (34.6%)	2.38	0.03
	Non-obese	4 (14.8%)		
Gender (Male)	Obese	10 (33.3%)	2.22	0.04
	Non-obese	5 (15.6%)		
Gender (Female)	Obese	6 (30.0%)	2.14	0.05
	Non-obese	2 (9.1%)		
Diabetes Mellitus	Obese	6 (40.0%)	2.50	0.03
	Non-obese	2 (18.2%)		
Hypertension	Obese	7 (38.9%)	2.33	0.04
	Non-obese	3 (23.1%)		

DISCUSSION:

Incisional hernia remains a significant postoperative complication following abdominal surgery, contributing to patient morbidity and increased healthcare burden. The present prospective cohort study was conducted to compare the incidence of incisional hernia between obese and non-obese patients undergoing abdominal surgery at a tertiary care hospital. Our findings demonstrate a significantly higher incidence of incisional hernia among obese patients, supporting the study hypothesis.

In the current study, incisional hernia developed in 32% of obese patients compared to 14% of non-obese patients, with obese individuals having more than twice the risk (RR = 2.29) of developing incisional hernia. These findings are consistent with previous studies that have identified obesity as a major independent risk factor for incisional hernia. A study by Mudge and Hughes et al [28] reported a substantially higher incidence of incisional hernia in patients with increased body mass index, attributing this to elevated intra-abdominal pressure and impaired wound healing mechanisms. Similar results were also observed by van Ramshorst GH et al., [29] who demonstrated obesity as a strong predictor for postoperative fascial dehiscence and incisional hernia formation.

The pathophysiological explanation for this association lies in the altered wound healing process in obese individuals. Excess adipose tissue is associated with poor vascularity, increased tension on surgical wounds, and higher rates of wound infection, all of which predispose patients to incisional hernia. Sauerland S et al [30] emphasized that increased mechanical strain on the abdominal wall in obese patients compromises fascial integrity, thereby increasing the risk of hernia formation.

Our results are also comparable to those reported by Bucknall TE et al., [31] who found that obesity significantly increased the likelihood of wound complications, including incisional hernia, especially after midline laparotomies. In contrast, some studies from developed healthcare settings have reported a relatively lower incidence of incisional hernia in obese patients, possibly due to advanced surgical techniques, use of prophylactic mesh, and improved perioperative care. However, such interventions were not routinely employed in our setting, which may explain the higher observed incidence.

Stratification analysis in the present study revealed that the association between obesity and incisional hernia persisted across different age groups, genders, and comorbid conditions such as diabetes and hypertension. This finding aligns with the work of Hodgson NC et al., [32] who concluded that obesity remained an independent risk factor even after controlling for confounders. Although diabetes and hypertension are known to impair wound healing, obesity demonstrated a stronger and more consistent association with incisional hernia in our cohort.

Smoking has also been implicated as a risk factor for impaired wound healing. While smokers showed a higher frequency of incisional hernia in our study, obesity remained the dominant determinant after stratification. Similar observations were reported by Israelsson LA et al., [33] who highlighted that although smoking contributes to wound complications, its effect is often potentiated by obesity.

The relatively higher incidence of incisional hernia observed in this study compared to some international reports may be attributed to delayed presentation, limited postoperative follow-up, nutritional deficiencies, and resource constraints in developing countries. These factors underscore the importance of preoperative risk stratification, weight optimization, and vigilant postoperative monitoring, particularly in obese patients.

CONCLUSION:

Obesity is a significant and independent risk factor for incisional hernia following abdominal surgery. Preventive strategies including weight reduction, meticulous surgical technique, and consideration of prophylactic mesh placement in high-risk obese patients may help reduce postoperative complications.

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Collection and acquisition of data & grammatical corrections	Dr. Shewani
Concept & design of study & proof read	Dr. Habib ur Rehman Khan Toor
Drafting the article and finalizing the manuscript	Dr. Nimra Khatri
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