

## ORIGINAL ARTICLE

**Impact of High BMI on Wound Complications in Open Paraumbilical Hernia Repair**HASSAN SHAHAB<sup>1</sup>, OMER BIN KHALID<sup>2</sup>, BUSHRA JAWAID<sup>3</sup>, SUMBLA SALMAN<sup>4</sup>, UNAIZA ERUM<sup>5</sup>, KOMAL FAHEEM<sup>6</sup><sup>1</sup>Postgraduate Resident, DUHS, Karachi<sup>2</sup>Assistant professor, DUHS, Karachi<sup>3,4,5,6</sup>Postgraduate Resident, DUHS, KarachiCorrespondence to: Omer bin Khalid, Email: [omerkhalid@gmail.com](mailto:omerkhalid@gmail.com), Cell: 0312-2040064**ABSTRACT****Background/Objective:** Few studies have clearly shown a correlation between obesity and wound complications. We analyzed the correlation between body mass index and the complication rate of mesh-based open paraumbilical hernia repair.**Method:** This observational study after the approval from the institute review board using non-probability consecutive sampling, recruited 150 participants scheduled to have open mesh surgery for paraumbilical hernia repair from 01/may/2022 to 30/Oct/2022 at Department of General Surgery, Civil Hospital Ruth Pfau, DUHS, Karachi and divided into two groups; BMI 26-30 (n=62) and BMI 31-36 (n=88). Completed surveys were analyzed for demographic and clinical data, hernia features, surgical procedures, and patient outcomes.**Results:** The average age of the participants in the present study was 44.32 years, with an average BMI of 30.97 kg/m<sup>2</sup>. Out of 150 recruited participants 78 were female and 72 were males. Mean hernia width of the recruited participants was 10.12, with average operative time of the participants was 101.58 minutes. The Mean± S.D of hospital stay (days) of both study groups was 0.82±0.61 and 2.55±0.77 years, and a significant association (0.000) in their mean difference was observed. 26% participants in BMI (26-30) and 58% participants in BMI (26-30), got readmitted to hospital and a significant association (0.000) in their mean difference was observed. 13% participants in BMI (26-30) and 43% participants in BMI (26-30), got wound infection and a significant association (0.000) in their mean difference was observed.**Practical implication:** this study will help to understand what type of surgery procedures can be beneficial in different BMI classes.**Conclusion:** The developing SSI and SSOPI after paraumbilical hernia repair rise steadily with increasing BMI. More research is needed to see whether dropping some pounds before surgery will mitigate this correlation.**Keywords:** paraumbilical hernia repair, BMI, Wound infections, Wound classification.**INTRODUCTION**

We are now seeing an epidemic of obesity. In recent years, obesity has emerged as one of the health care system's most pressing challenges. The World Health Organization estimates that 65% of the world's population is obese. Increased adoption of Western cuisine and lifestyle has also contributed to the epidemic of rising body mass index (BMI) in emerging countries<sup>1</sup>. Recent research reveals that one-quarter of the population in Pakistan is affected by overweight and 10% by obesity<sup>2</sup>. Increased body mass index (BMI) has been linked to poor outcomes after paraumbilical hernia procedures, and this correlation has been widely described in the medical literature<sup>3</sup>. Patients who are overweight have a greater chance of developing a hernia following abdominal procedures, and they also have a higher risk of experiencing a recurrence of their hernia than patients who are not overweight<sup>4</sup>. In addition, people who are overweight have a higher chance of experiencing medical issues, a longer recovery time, and higher overall healthcare expenses after hernia surgery<sup>5</sup>. Managing patients who are overweight and have ventral hernias is becoming more of a challenge for general surgeons as the global obesity epidemic spreads. Despite the fact that minimally invasive paraumbilical hernia repair procedures have lower rates of wound morbidity, many patients are not suitable for such an approach<sup>6, 7</sup>. Indeed, greater and more intricate abnormalities are generally related with increasing BMI and often need an open approach. Although there is evidence that a higher body mass index (BMI) increases the risk of hernia recurrence and other problems after paraumbilical hernia surgery, not enough information is available to determine whether or not this increased risk is linear with BMI<sup>8</sup>. By controlling for common confounders on clinical characteristics, hernia-specific variables, and operative details, present study aimed to (1) determine the association between increasing body mass index and 30-day SSI and SSOPI after open paraumbilical hernia repair with mesh, and (2) specify how increasing patient BMI affects the odds for such wound complications.

**METHODOLOGY**

Following permission from the Institutional Review Board (IRB), the first step was to locate all hospital outpatients who had participated in the clinical trial. Inclusion criteria required patients to have had elective paraumbilical hernia repair and to have completed 30-day follow-up. The whole spectrum of paraumbilical hernias and wound classifications recognized by the Centers for Disease Control and Prevention (CDC) were covered. We did not include inguinal hernia repairs, ventral hernia repairs, paraumbilical hernia repairs without mesh installation, minimally invasive paraumbilical hernia repairs, or emergency paraumbilical hernia repairs in our study. In addition, we did not include patients who did not record their body mass index or who did not have a full 30 days of follow-up. Infections such as SSI and SSOPI were considered, and wound complications were defined using Haskins et al<sup>9</sup>. In accordance with the above state criteria 150 participants were recruited, who were scheduled to have open mesh surgery for paraumbilical hernia repair from 01/may/2022 to 30/Oct/2022 at Department of General Surgery, Civil Hospital Ruth Pfau, DUHS, Karachi and divided into two groups; BMI 26-30 (n=62) and BMI 31-36 (n=88). Treatment consists of two days of intravenous (I/V) Amoxicillin + Clavulanic Acid followed by three days of oral (PO) treatment for each patient. Antibiotics prescribed for SSI cases was adjusted based on the sensitivity of organisms cultured from wound drainage. Their wounds were monitored throughout the duration of their stay, and the results were documented. Patients were monitored for 30 days following surgery at an outpatient clinic, where they were observed every other week to record any wound-related complications that fall into the aforementioned categories.

The Centers for Disease Control and Prevention define SSI as an infection that is either superficial, deep, or in an organ space. Any SSI, as well as wound cellulitis, non-healing incisional wounds, fascial disruptions, skin or soft tissue ischemia, necrosis, wound serous or purulent drainage, stitch abscess, seroma, hematoma, infected or exposed mesh, or the development of an enterocutaneous fistula that necessitates a procedural intervention, all fall under the umbrella term of SSOPI. Wound opening, debridement, percutaneous drainage, suture excision, and partial

or whole mesh removal are all examples of possible procedural procedures. Completed surveys were analyzed for demographic and clinical data, hernia features, surgical procedures, and patient outcomes. Medians and interquartile ranges (IQRs) were used to characterize continuous data, whereas counts and percentages were used to characterize categorical variables. Patients with higher BMIs who developed SSI or SSOPI was compared to patients with lower BMIs using the chi-square test, which compares categorical factors. Quantitative characteristics of the two study groups was compared using an independent t-test. P value  $\leq 0.05$  was considered statistically significant.

**RESULTS**

Table 1 represent the demographic and clinical parameters of the participants recruited in the present study. The average age of the participants in the present study was 44.32 years, with an average BMI of 30.97 kg/m<sup>2</sup>. Out of 150 recruited participants 78 were female and 72 were males. Among the other complications Diabetes were observed in 35% of the participants, followed by 28% smoking, 17% Chronic Obstructive Pulmonary Disease and Previous History of Abdominal Wall SS. Majority of the recruited participants were had ASA class II (37%) (Figure 1). Majority of the recruited participants were had wound grading 4 (27%) (Figure 2). Mean hernia width of the recruited participants were 10.12, with average operative time of the participants was 101.58 minutes. In 30-day follow-up period 63% of the participants had SSOPI and 37% had SSI.

Table 1: Clinical and demographic parameters of study participants

Parameters	n (%)
<b>Age</b>	
Mean	44.32
S. D	7.2
Median (IQR)	43.5 (28-63)
<b>BMI</b>	
Mean	30.97
S. D	2.9
Median (IQR)	31(26-26)
<b>Gender</b>	
Female	78 (52%)
Male	72 (48%)
<b>Other Complications</b>	
Diabetes	53 (35%)
Immunosuppression	1 (0.6%)
Previous History of Abdominal Wall SS	26 (17%)
Chronic Obstructive Pulmonary Disease	26 (17%)
Smoking	44 (29%)
<b>ASA Class</b>	
1	23 (15%)
2	55 (37%)
3	49 (33%)
4	23 (15%)
<b>Wound grading</b>	
2	37 (25%)
3	38 (25%)
4	40 (27%)
5	35 (23%)
<b>Hernia Width</b>	
Mean	10.12
S. D	2.7
Median (IQR)	10 (3-15)
Recurrent Hernias	72 (48%)
<b>Operative time (Minutes)</b>	
Mean	101.58
S. D	37.07
Median (IQR)	90 (60-268)
Subcutaneous Flapped Raised	85 (57%)
Myofascial release performed	73 (47%)
<b>Mesh type</b>	
Permanent synthetic	57 (38%)
Absorbable synthetic	63 (42%)
Biologic	30 (20%)
<b>Mesh Position</b>	

Onlay	33 (22%)
Sublay	45 (30%)
Interperitoneal	66 (44%)
Inlay	16 (11%)
Fascial Closure	86 (57%)
Drains Used	78 (52%)
30-day SSI	55 (37%)
30-Day SSOPI	95 (63%)

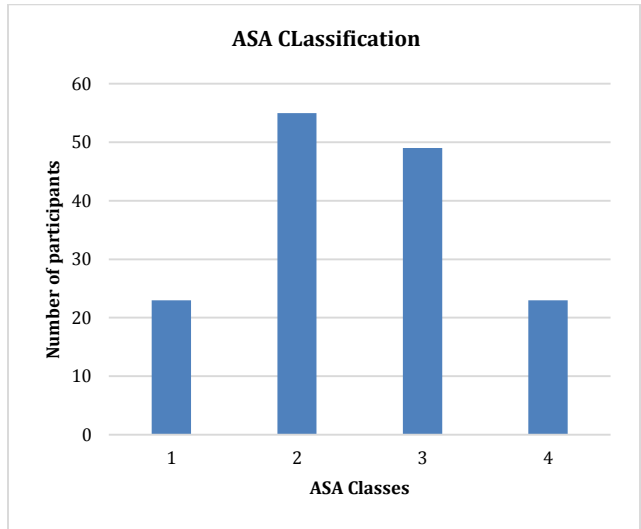


Figure 1: ASA classification of the study participants

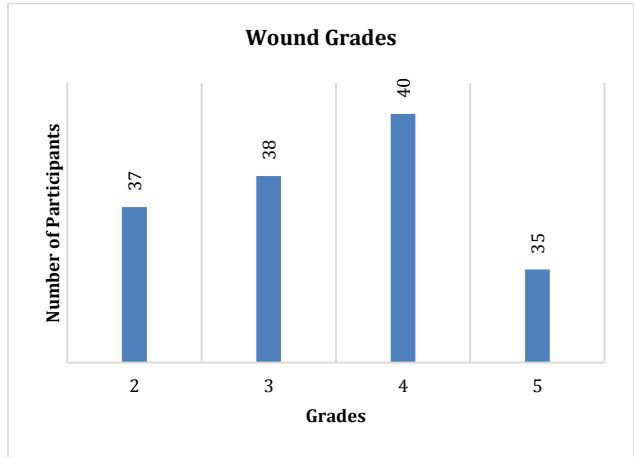


Figure 2: Wound Grading of the study participants

The Mean  $\pm$  S.D of age of both study groups was 44.8 $\pm$ 7.05 and 43.9 $\pm$ 7.3 years, with no significant association (0.843) in their mean difference (Table 2). In Study group BMI (26-30), 55% were female participants, while 45% were males. In Study group BMI (26-30), females and males were 44%. The Mean  $\pm$  S.D of operation time (minutes) of both study groups was 87.22 $\pm$ 17 and 99.5 $\pm$ 36.4 years, and a significant association (0.002) in their mean difference was observed. The Mean  $\pm$  S.D of hospital stay (days) of both study groups was 0.82 $\pm$ 0.61 and 2.55 $\pm$ 0.77 years, and a significant association (0.000) in their mean difference was observed. 26% participants in BMI (26-30) and 58% participants in BMI (26-30), got readmitted to hospital and a significant association (0.000) in their mean difference was observed. 13% participants in BMI (26-30) and 43% participants in BMI (26-30), got wound infection and a significant association (0.000) in their mean difference was observed. In 30-day follow-up period 61% of the participants had SSOPI and 39% had SSI in BMI (26-30)

group, while in BMI (31-36) group 65% of the participants had SSOPI and 35% had SSI.

Table 2: Comparison of clinical parameters between study groups

Parameter	BMI 26-30 (n=62)	BMI 31-36 (n=88)	P- Value
Age			0.843
Mean	44.8	43.9	
S. D	7.05	7.3	
Median (IQR)	45 (32-63)	43 (28-59)	
Gender			0.606
Female	34 (55%)	44 (50%)	
Male	28 (45%)	44 (50%)	
Operative time (Minutes)			0.002****
Mean	87.22	99.5	
S. D	17	36.4	
Median (IQR)	98.5 (60-150)	90(65-268)	
Hospital Stay			0.000****
Mean	0.82	2.55	
S. D	0.61	0.77	
Median (IQR)	0.5 (0.5-2)	2 (1-5)	
Readmission to hospital	16 (26%)	58 (66%)	0.000****
Wound Infection	8 (13%)	43 (49%)	0.000****
30-SSI	24 (39%)	31 (35%)	0.709
30-SSOP	38 (61%)	57 (65%)	

## DISCUSSION

The overall cost of care for a patient might quickly skyrocket by more than 300% if they have wound problems after undergoing hernia repair (HR) 10. An increase in long-term care costs is also anticipated since wound infection doubles the chance of hernia recurrence<sup>11</sup>. As a matter of fact, Poulouse et al.<sup>12</sup> calculated that a 1% decrease in hernia recurrence rates would result in \$32 million in savings from procedures. Our results are consistent with those from other large national datasets, and there is a substantial body of research documenting the negative impact of higher BMI on surgical outcomes following hernia repair. Patients with a body mass index (BMI)  $\geq 30$  found to have an increased risk of postoperative superficial SSI and deep SSI as well as wound dehiscence following HR, according to a study by Kaoutzanis et al.<sup>7</sup>, who queried the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database. In a review of elective and emergency open hernia repairs in the ACS-NSQIP database, Mrdutt et al.<sup>13</sup> found that patients who are overweight or obese have a higher risk of SSI, wound dehiscence, reoperation, and death compared to patients who are of normal weight individuals (NWI) undergoing open HR. In a linear fashion, the odds ratio for complications increased from Odds ratio (OR) 1.2 in the overweight to OR 2.8 in the class III obese, when comparing those who had elective HR to those who underwent NWI. In a similar vein, Owei et al.<sup>14</sup> conducted a study of the ACS-NSQIP data and discovered that obese people had higher chances of wound and medical problems than NWI. Additionally, there was a direct correlation between BMI and the risk of problems. While the aforementioned studies agree that being overweight or obese increases the risk of problems, there is much debate and a lack of evidence on what BMI level this link begins to occur at. Multivariable logistic regression from Owei<sup>14</sup> has not confirmed an independent association between a BMI of 25-30 kg/m<sup>2</sup> and increased odds for complications. Mrdutt et al.<sup>13</sup> reported a 20% increase in the odds of all complications for overweight individuals undergoing elective open HR compared to NWI in the same setting. More recently, Pernar et al.<sup>15</sup> used data from a single institution consisting of 922 individuals to try to establish a BMI

threshold for open HR. After controlling for potential confounders, this study indicated that a BMI of 40kg/m<sup>2</sup> was independently related with problems. No significant difference was found in the research between NWI and the obese individuals with a BMI below this cutoff.

Our study's results should be regarded with caution due to a few caveats. To begin, the study analyzed data from a hospital database that was being kept prospectively. Since present research was designed to detect associations, not causes, present study found that there was a connection between BMI and wound complications in the present analyses. Higher BMI is indicative with an increased risk of wound complications in paraumbilical hernia repair patients.

## CONCLUSION

Increases in body mass index are related with higher relative log chances of 30-day SSOPI and SSI after HR with mesh. If there is any evidence that losing weight before surgery will help prevent these issues, further research is needed.

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