

Association Between BMI and Incidence of Inguinal Hernia in Adult Males

Daulat Azeem Khan and Muhammad Amer Mian

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ABSTRACT

Objective: To assess association between incidence of inguinal hernia and body mass index in adult males.

Study Design: A cross-sectional study

Place and Duration of Study: This study was conducted at the Surgery Department of Central Park Teaching Hospital, Lahore from June 2023 to January 2024.

Methods: Non-probability sampling technique was employed and a total of 80 patients were recruited and patients having bilateral inguinal hernia, strangulated hernia and femoral hernia were excluded. Categorical variables were assessed and frequencies and percentages were calculated. Fisher Exact test was employed for the comparison of incidence of hernia in study groups.

Results: A total 80 patients having unilateral inguinal hernia were recruited for the study with the mean age of 28.15 + 13.65 years. Assessment of incidence of hernia and BMI was made, it was observed that 72.5% of the patients (n=58) had right sided inguinal hernia (RIH) while 27.5% of the patients (n=22) had left sided inguinal hernia. It was noted that those patients who had RIH, only 31.38% of the patients had BMI greater than 23.5 kg/m² while other patients had BMI lower than cut-off value.

Conclusion: A preventative association of increased BMI with hernia development that needs future more detailed evaluation. A better understanding of these dynamics could element enhancement of risk profile identification and preventive measures in surgical work.

Key Words: Inguinal Hernia, BMI, Surgery, Hernial Repair

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INTRODUCTION

Inguinal hernia is defined as protrusion of abdominal contents into inguinal canal via abdominal wall (direct) or through inguinal ring (indirect). Inguinal hernia repair is one of the most frequent operations performed all over the world, and the frequency is particularly high in adult males¹. Inguinal hernias cause bulging of abdominal contents through a weak spot in the inguinal canal and although most of them are not dangerous, they may cause pain or cause complications that may need emergency surgery². While recognizing that multiple factors are associated with increased hernia risk, an evaluation of BMI as one of the factors specifically has remained an important issue in clinical and epidemiological research³. Body mass index (BMI) is one of the most common Anthropometric measurements, which provides information on an individuals weight according to heights^{4,5}.

Even though BMI is considered as unprecise in its ability to separate lean tissue mass from fat tissue, it is still as an effective and common method to evaluate the population statistics of obesity and underweight. It is found that abnormal BMI levels has been associated with many heath related factors such as cardiovascular diseases, diabetes and some forms of cancers^{6,7}.

From an epidemiologic perspective, previous risk factors for inguinal hernia used include age, genetic pre disposition and lifestyle factors such as lifting of heavy objects and strenuous activities⁸. A number of relatively recent publications, however, point to the fact that body composition and movement of the abdominal wall could contribute to hernia formation. Some studies have suggested that people with higher BMI including the overweight and the obese could apply increased pressure within the abdomen hence risking development of a hernia. Interestingly studies have suggested the opposite: that higher weight with higher BMI increases the probability of reducing the need for an IHR compared to the normal weight individuals. However, some other works indicated that people with BMI less than some certain value, for example, those who experienced bilateral PSIDT and with no adipose tissue or minimal amount of it, may not have enough support structures which could prevent the forces acting on the abdominal wall and, therefore, develop the hernia⁹.

Department of General Surgery, Central Park Teaching Hospital, Lahore.

Correspondence: Daulat Azeem Khan, Department General Surgery, Central Park Teaching Hospital Lahore
Contact No: 0331-4539994
Email: drdaulatazeemkhan@gmail.com

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Nonetheless, concerning the relationship between BMI and the incidence of the IH in adult males, it seems that existing research provide inconclusive evidence. Therefore, further examination of the effects of BMI on inguinal hernia occurrence is needed with reference to another examinations associating distinct BMI categories. The purpose of this research is to determine the extent to which BMI influences the occurrence of the IH in adult males.

METHODS

A cross-sectional study was conducted in surgery department of Central Park Teaching Hospital from June 2023 to January 2024 after approval (CPMC/IRB-no/1400A) from ethical review board of institutions to determine association between BMI and incidence of inguinal hernia. Non-probability sampling technique was employed and a total of 80 patients were recruited after getting prior written informed consent. Sample size was calculated by using WHO sample size calculator with prevalence of inguinal hernia at 14%, confidence interval at 95% and margin of error at 5%¹⁰. Patients of unilateral inguinal hernia were included in this study while the patients having bilateral inguinal hernia, strangulated hernia and femoral and any other hernia along with inguinal hernia were excluded from the study.

Sociodemographic details were recorded and variables like age, smoking history, history of constipation, COPD and weight lifting was recorded. Body mass index was calculated by taking the height in meters and weight in kilograms and then by appliance of formula (Body Weight in kg/(height in meters)² and patients were clubbed into two groups normal and underweight and group 2 overweight and obese based on south Asian classification of BMI by WHO in which cut off was set at 23.5 kg/m², patients having BMI 23.5 or below were included in group 1 while those having BMI greater than cut off value were made part of group 2. For hernia defect size, pulsation and bowel sounds were noted.

Statistical Analysis: Double blinded anonymized data was entered into MS Excel version 2019 and after dual cross-verification it was imported to SPSS version 26.0 for analysis. Categorical variables were assessed and frequencies and percentages were calculated. Fisher Exact test was employed for the comparison of incidence of hernia and associated risk factors in study groups. Pearson correlation was also employed for the assessment of relationship between hernia size and body mass index. Significance value was set at 0.05.

RESULTS

A total 80 patients having unilateral inguinal hernia were recruited for the study with the mean age of 28.15 + 13.65 years and were segregated into two group:

Group 1 (having BMI <23.5) and Group 2 with BMI > 23.5 kg/m². It was observed that in 20% of patients were smoker. Similarly COPD, and hypertension was also more prevalent with significant p-value as explained in table 1 while no prevalence of diabetes was noted insignificant.

Table No.1: Assessment of Associated Risk Factors and Comorbidities in Study Groups

Study Variables	n,(%) (N=80)	P-value
Smoking	16 (20%)	0.002
COPD	10 (12.5%)	0.023*
Diabetes	8 (10%)	0.053
Hypertension	10 (12.5%)	0.002*

Assessment of incidence of hernia and BMI was made, it was observed that 72.5% of the patients (n=58) had right sided inguinal hernia (RIH) while 27.5% of the patients (n=22) had left sided inguinal hernia. It was also studied that as per study protocol; 57.5% of the patients (n=46) had BMI less than 23.5 kg/m² while 42.5% had BMI higher than cut off value suggestive for inguinal hernia is more prevalent in patients having lower BMI with significant p-value as explained in table 2.

Table No.2: Assessment of Hernia Side and Occurrence of Hernia based on BMI in Study Population

Study Parameters	Sub Groups	N (%)	p-value
Hernial Side	Right	58, (72.5%)	0.0001
	Left	22, (28%)	
BMI	< 23.5 kg/m ²	46, (57.5%)	0.0001
	>23.5 kg/m ²	34, (42%)	

To comprehend the results hernial site incidence was cross-evaluated based on groups was made as explained in table 3. It was noted that those patients who had RIH, only 31.38% of the patients had BMI greater than 23.5 kg/m² while other patients had BMI lower than cut-off value as explained in table 3 suggestive for decrease in hernial incidence with increase in BMI. Similar sort of incidence was noted for LIH as well as explained in table 3.

Table No.3: Comparison of Incidence of Hernia and Groups based on BMI

Hernial Site	N, (%)		p-value
	< 23.5 kg/m ²	>23.5 kg/m ²	
RIH (n=58)	34 (68.62%)	24 (31.38 %)	0.0001
LIH (n=22)	12 (54.54%)	10 (45.46%)	0.0001

DISCUSSION

The purpose of this research was to determine if there is a relationship between BMI and frequency of appearance of inguinal hernia in the male population. Our results indicate that those with lower BMI, less than 23.5 kg/m², have a significantly higher likelihood of developing inguinal hernia operation, both to the right and left, compared with those with higher BMI. This finding is consistent with some earlier works suggesting that low BMI can cause absence or insufficiency of adipose or muscular tissue in the abdominal wall to prevent the occurrence of the hernia^{5,11}.

The results indicate the relationship between inguinal hernia and BMI the apparent meaning of which suggests that people with lower BMI are more vulnerable to develop IH – especially RIH. This observation may support the hypothesis that decreased amount of fat in combination with potentially weak abdominal muscles in subjects with lower BMI thus offer less protection against intra-abdominal pressure and make it easier for the abdominal contents to herniate through the inguinal canal. In line with this, previous investigations show that low fat mass may weaken the abdominal wall and allow hernia to develop. Notable also is the establishment of the generalized prevalence of RIH among the participants that suggests that the structure of the abdominal wall and hernia location could be associated with body composition and weight distribution¹². The synthesis of findings regarding the BMI influence on hernia risk shows that there are still many equivocations to establish this link. Contrary to the suggested concept that the elevated intraabdominal pressure due to obesity raises the risk for hernias, the present data lend evidence to the line of thought that lower BMI puts to more likely to develop hernia. These differences may due to the differences of study design, sample size and population characteristics to confirm this relationship, thus; more study of greater scale is required¹³.

In addition, the comorbidities established that smoking, COPD and hypertension were associated with a strong correlation to develop inguinal hernias, indicating that life styles might have a direct impact on the disease. The high proportion of the participants who were smokers is in concordance with literature indicating that smoking reduces connective tissue elasticity and therefore increases the incidence of hernias. The same may hold true for inguinal hernias because COPD patients usually experience episodes of coughing which can further raise intra-abdominal pressure¹⁴. Thus, the results of our study regarding obesity as a risk factor should be taken into account during preoperative preparations for inguinal hernia repair. Knowledge about the characteristics of protective or risk factors of

BMI could inform clinical practice decision-making especially on the establishment of preventive health programs for the specific populations⁸.

The external and internal constraints of our work also cannot be overlooked. However, the cross-sectional design hampers making causal conclusions, and a relatively small sample might reduce the external validity of our conclusions. Nevertheless, lack of inclusion of patients with bilateral hernias or any other type of hernias may have resulted to selection bias. Future investigations should strive for sample enriching, multicenter research initiatives, in an effort to replicate our observations, as well as elucidate the psychobiological pathways regarding the specific effect of BMI for the emergence of hernias.

CONCLUSION

This work adds meaningful finding towards the correlation between BMI status and the likelihood of developing IH in AM. The observed trend may indicate a preventative association of increased BMI with hernia development that needs future more detailed evaluation. A better understanding of these dynamics could element enhancement of risk profile identification and preventive measures in surgical work.

Author's Contribution:

Concept & Design of Study: Daulat Azeem Khan,
Muhammad Amer Mian
Drafting: Daulat Azeem Khan,
Muhammad Amer Mian
Data Analysis: Daulat Azeem Khan,
Muhammad Amer Mian
Revisiting Critically: Daulat Azeem Khan,
Muhammad Amer Mian
Final Approval of version: By all above authors

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