Prevalence of Incarceration of Inguinal Hernia in Adults

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ABSTRACT

Background: Incarceration of inguinal hernia refers to a condition in which a segment of the intra-abdominal content becomes trapped in the hernia sac, which can lead to complications such as bowel obstruction, strangulation, and tissue necrosis. Emergency surgical intervention involves higher complexity and risks compared to elective repairs. Therefore, carries a greater risk of post-operative complications and prolonged hospital admission. Research on the prevalence of incarceration of inguinal hernia in adults with associated risks can highlight opportunities for preventive measure and early intervention strategies. The objective of the study is to quantify how common incarcerated inguinal hernias are among adult populations in consideration of various risk factors.

Methods: A descriptive cross-sectional study was conducted at the department of surgery, Combined Military Hospital, Rawalpindi, Pakistan from 22nd August 2024 to 21st September 2024 to explore the prevalence of incarceration among 100 adults, both men and women, who presented with incarcerated inguinal hernia. Data were collected purposively from hospital records using a pre-tested check list. Ethical issues were properly addressed. Statistical Package for Social Sciences (SPSS) version 25.0 was used to analyze data. The patients were grouped according to their age into following categories: the young adults (up to 30 years and 31 to 40 years), aged adults (41 to 50 years and 51 to 60 years), elderly adults (61 to 70 years followed by 71 years and above).

Results: This study examined the demographics and potential risk factors for inguinal hernia. The sample included 67% men and 33% women, with an average age of 50.39 years. Hernia cases were most common among individuals aged 51-60 (32%) and those over 70 (24%), suggesting higher susceptibility in older adults. While BMI did not correlate significantly with hernia prevalence, 48% of cases fell within the normal BMI range. No significant association was found between gender or common comorbidities (constipation, 12%; haemorrhoids, 4%) and hernia risk, nor was there a notable connection with heavy weightlifting, which affected only 12% of the cases.

Conclusion: A strong relation between age and incarceration rate of the adult patients who presented themselves with inguinal hernia.

Keywords: Inguinal Hernia, Incarceration, Prevalence, Hernia Repair, Strangulation, Adults.

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INTRODUCTION

Inguinal hernias represent one of the most common surgical conditions worldwide, particularly affecting the adult population. An inguinal hernia occurs when a portion of the abdominal contents, such as the intestines, protrudes through a weakened spot in the abdominal wall, specifically the inguinal canal.[1] This condition often leads to discomfort, and in severe cases, it can progress to more critical complications such as incarceration and strangulation.

Incarceration occurs when the herniated contents become trapped outside the abdominal cavity and cannot be returned to their original position, causing bowel obstruction and increasing the risk of tissue strangulation. Strangulation, in turn, leads to compromised blood flow to the incarcerated tissues, resulting in tissue necrosis if left untreated. These complications are surgical emergencies and can be life-threatening if not addressed promptly.[2]

The prevalence of hernia incarceration has been shown to vary significantly based on several demographic factors, including age, sex, and overall health status. Notably, older adults are considered to be at a higher risk for incarceration due to age-related decreases in muscle tone and elasticity, comorbidities, and delayed diagnosis.[3,4] Existing literature highlights this trend, but there remains a lack of comprehensive studies that explore the specific relationship between age and the risk of hernia incarceration in a diverse adult population.

This study aims to fill that gap by focusing on the prevalence of inguinal hernia incarceration across different age groups within the adult population. Specifically, the study seeks to establish whether age is a significant factor as well as associated risks contributing to the likelihood of hernia incarceration and to provide data that may guide preventive strategies and treatment protocols.

Understanding these relationships is vital for clinicians to develop better risk stratification models and determine when early surgical intervention is warranted, especially in elderly patients who may be asymptomatic until complications arise. The insights from this study will contribute to the growing body of evidence on hernia management and potentially influence clinical decision-making to reduce the prevalence of strangulation and other severe complications.

MATERIALS AND METHOHS

Study Design

This cross-sectional study was designed to investigate the prevalence of incarceration among adult patients, both male and female, presenting with incarcerated inguinal hernias.

Ethical Approval and Patient Consent

Ethical approval was obtained from the Ethics Review Board.

Study Population

The study included a total of 100 adult patients diagnosed with inguinal hernia who sought treatment at the Department of Surgery, CMH, Rawalpindi, Pakistan. Patients were stratified into six age groups: the young adults (up to 30 years and 31 to 40 years), aged adults (41 to 50 years and 51 to 60 years), elderly adults (61 to 70 years followed by 71 years and above). These age groupings were based on prior research on the age distribution of inguinal hernia and its associated risk factors.

Inclusion and Exclusion Criteria

Participants were included if they were diagnosed with inguinal hernia based on clinical and sonographic examination and if their medical records were complete and accessible. Patients with recurrent hernias, a history of prior hernia surgery, or severe

comorbid conditions, such as chronic obstructive pulmonary disease (COPD), were excluded from the study. Patients with confounders such as smoking and diabetes were also excluded from the study. Pregnant women were also excluded.

Data Collection

Data were collected purposively through review of medical records using a pre-tested check list. Incarceration was confirmed through both clinical evaluation and imaging studies. The data were structured to include respondent identification numbers, age group, and an incarceration indicator categorized as "Yes" or "No."

Statistical Analysis

Data were analyzed by using Statistical Package for Social Sciences (SPSS), version 25.0. Chi-square test was used to see the association between the age groups and the incidence of incarcerated hernias. P-value <0.05 was considered as statistically significant.

RESULTS

This study was a cross-sectional study conducted at Combined Military Hospital, Rawalpindi, Pakistan among 100 adult patients during the period of 22nd August 2024 to 21st September 2024.

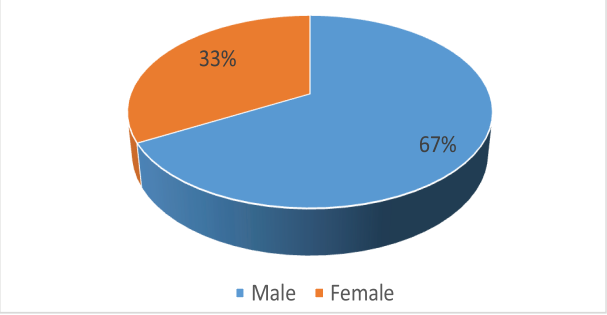

Fig-1: Distribution of respondent by sex (n=100)

Fig-1 reveals that out of 100 respondents 67(67%) were males and 33(33%) were females and male female ratio 2:1.

Table-I: Demographic Profile of the study Population (n=100)

Variable	Frequency	Percent
Gender		
Male	67	67.0
Female	33	33.0
Age Group (years)		
Up to 30	21	21.0
31-40	13	13.0
41-50	11	11.0
51-60	20	20.0
61-70	20	20.0
>70	15	15.0
Mean(±SD) age of entire group: 50.39±17.80 years Mean(±SD) age of Male: 53.01±17.31 years Mean(±SD) age of female: 45.06±17.84 years		

The mean age of the entire group was 50.39±17.80 years and males exhibited a greater mean age (53.01±17.31 years) than females (45.06±17.84 years) as shown in Table-I. The study population was divided into several age categories, with the most significant representation in the 51-60- and 61-70-year brackets, each accounting for 20% of the sample, followed by those aged up to 30 years at 21% (Table-I).

Table-II: Clinical Profile of the study Population (n=100)

Body Type (Based on BMI)	Frequency	Percent
Under Weight (<18 kg/m^2)	12	12.0
Normal (18-25 kg/m^2)	39	39.0
Over Weight (25-29 kg/m^2)	34	34.0
Obese (>29 kg/m^2)	15	15.0
Total	100	100.0
Haemorrhoids		
Positive	11	11.0
Negative	89	89.0
Total	100	100.0
Constipation		
Positive	24	24.0
Negative	76	76.0
Total	100	100.0
Heavy weight lifting		
Yes	14	14.0
No	86	86.0
Total	100	100.0
Incarceration of Inguinal Hernia		
Positive	25	25.0
Negative	75	75.0
Total	100	100.0

Table-II shows that 39% of study participants fell within the normal range (18-25 kg/m²), 34% were defined as overweight (25-29 kg/m²), 15% were deemed obese (>29 kg/m²), and 12% were identified as underweight (<18 kg/m²). 11% of study contributors indicated the presence of haemorrhoids, constipation observed in 24% of individuals, while 14% of individuals reported a history of lifting heavy weights, indicating minimal exposure to this risk factor within the sample (Table-II). The prevalence of incarcerated inguinal hernia in the studied population was 25%, whereas 75% exhibited no occurrence (Table-II).

Table-III: Association of different study confounders with prevalence of incarceration of inguinal hernia in adults (n=100)

Gender	**Incarceration of Inguinal Hernia**		**Total n(%)**	***p*-Value x^2-Square**
	Positive n(%)	**Negative n(%)**		
Male	19(76.0)	48(64.0)	67(67.0)	0.269
Female	6(24.0)	27(36.0)	33(33.0)	
Total	25(100.0)	75(100.0)	100(100.0)	
Constipation	**Incarceration of Inguinal Hernia**		**Total n(%)**	***p*-Value x^2-Square**
	Positive n(%)	**Negative n(%)**		
Positive	3(12.0)	21(28.0)	24(24.0)	0.105
Negative	22(88.0)	54(72.0)	76(76.0)	
Total	25(100.0)	75(100.0)	100(100.0)	
Haemorrhoids	**Incarceration of Inguinal Hernia**		**Total n(%)**	***p*-Value x^2-Square**
	Positive n(%)	**Negative n(%)**		
Positive	1(4.0)	10(13.3)	11(11.0)	0.196
Negative	24(96.0)	65(86.7)	89(89.0)	
Total	25(100.0)	75(100.0)	100(100.0)	
Heavy weight lifting	**Incarceration of Inguinal Hernia**		**Total n(%)**	***p*-Value x^2-Square**
	Positive n(%)	**Negative n(%)**		
Yes	3(12.0)	11(14.7)	14(14.0)	0.739
No	22(88.0)	64(85.3)	86(86.0)	
Total	25(100.0)	75(100.0)	100(100.0)	
Body Types (based on BMI)	**Incarceration of Inguinal Hernia**		**Total n(%)**	***p*-Value x^2-Square**
	Positive n(%)	**Negative n(%)**		
Under Weight (<18 kg/m^2)	5(20.0)	7(9.3)	12(12.0)	0.138
Normal (18-25 kg/m^2)	12(48.0)	27(36.0)	39(39.0)	
Overweight (25-29 kg/m^2)	7(28.0)	27(36.0)	34(34.0)	
Obese (> 29 kg/m^2)	1(4.0)	14(18.7)	15(15.0)	
Total	25(100.0)	75(100.0)	100(100.0)	
Age Group (years)	**Incarceration of Inguinal Hernia**		**Total n(%)**	***p*-Value x^2-Square**
	Positive n(%)	**Negative n(%)**		
Up to 30	2(8.0)	19(25.3)	21(21.0)	0.030
31-40	2(8.0)	11(14.7)	13(13.0)	
41-50	5(20.0)	6(8.0)	11(11.0)	
51-60	8(32.0)	12(16.0)	20(20.0)	
>60	8(32)	27	2035	
>70	6(24,0)	9(12.0)	15(15.0)	
Total	25(100.0)	75(100.0)	100(100.0)	

A statistically significant association (p=0.030) was identified between age and the occurrence of inguinal hernia. The age group 51-60 had the greatest prevalence at 32%, succeeded by individuals over 70 years at 24% (Table-III). No statistically significant association was seen between BMI categories and the incidence of inguinal hernia (p=0.138); nevertheless, the highest incidence was recorded among participants with a normal BMI (48%), whereas obese persons exhibited a lower incidence (4.0%) (Table-III). Gender did not exhibit a significant association with hernia incidence (p=0.269), but 76% of cases occurred in men (Table-III). No substantial relation was seen between constipation and the incidence of hernia (p=0.105), however a greater proportion of hernia occurrences (88%) were observed among those without constipation (Table-III). Haemorrhoids had no substantial relation with hernia incidence (p=0.196), with just 4% of hernia occurrences occurring in those with haemorrhoids (Table-III). No substantial relation was detected between heavy weightlifting and hernia occurrence (p=0.739), with just 12% of hernia cases arising in those who reported engaging in heavy lifting (Table-III).

DISCUSSION

Incarceration of inguinal hernias, especially in the elderly, presents a significant clinical challenge, as it can lead to severe complications like strangulation and bowel obstruction. Age is a critical factor, with older patients being more vulnerable to such complications due to decreased muscle elasticity, comorbidities, and delayed diagnosis. There is lack of comprehensive studies that explore the specific relationship between age and the risk of hernia incarceration in a diverse adult population. However, some relevant studies have been discussed here.

The mean age of the present study and for recent studies are similar if not identical, especially with reference to Liu, et al. (2021) and Lee, et al. (2021). Recent studies have highlighted the effectiveness of laparoscopic techniques in managing acutely incarcerated hernias. Liu, et al. (2021) demonstrated the safety and feasibility of laparoscopic approaches in treating acutely incarcerated or strangulated hernias, emphasizing quicker recovery and fewer postoperative complications compared to open surgery.[1] Similarly, Lee, et al. (2021) with their mean age confirmed the efficacy of laparoscopic transabdominal preperitoneal hernioplasty for incarcerated inguinal hernias, showing promising results in emergency settings.[2]

With respect to the current study, Ferranti, et al (2024) and Chen, et al. (2020), all demonstrated that advanced age led to complications of inguinal hernia. Ferranti, et al (2024) explored the implications of incarcerated inguinal hernias in the elderly, underscoring the need for timely intervention to reduce morbidity and mortality. In addition, Chen, et al. (2020) highlighted that with the elderly population being at heightened risk, early surgical management is critical to prevent complications such as bowel ischemia and strangulation.[3,4]

Although not identical but rather like the mean age of the studies of Dadashzadeh, et al. (2022) and Huckaby, et al. (2020) are similar.[5,6] However, nonoperative management in some cases, like incisional hernias, carries a significant risk of incarceration. Dadashzadeh, et al. (2022) conducted a population-based analysis, showing that delaying surgery for incisional hernias leads to higher rates of incarceration and poorer outcomes, stressing the importance of timely intervention.[5] Huckaby, et al. (2020) further underscored the excess mortality linked to delayed repairs of acutely incarcerated hernias, advocating for prompt surgical attention to avoid complications.[6]

Like this study, Althawadi, et al. (2024), Tajti, et al. (2020) and Danish, et al. (2022) reported a similar mean age for incarcerated hernias. Unique presentations of incarcerated hernias continue to be reported in the literature. Althawadi, et al. (2024) detailed a case of a large incarcerated intraparietal hernia mimicking acute appendicitis, demonstrating the diagnostic complexities of these conditions.[7] Tajti, et al. (2020) documented a rare case of gallbladder incarceration in an inguinal hernia, highlighting the diverse anatomical variations that can occur.[8] Danish, et al. (2022) also reported an unusual case of an incarcerated inguinal hernia containing the sigmoid colon, which required specialized surgical intervention.[9]

Manual reduction techniques, like taxis, have been revisited, particularly during the COVID-19 pandemic, when operating room availability was limited. East, et al. (2020) and Pawlak, et al. (2021) advocated for taxis as a useful technique in managing acute inguinal hernias, potentially avoiding emergency surgery in select cases.[11,12] This nonoperative approach, though not suitable for all cases, offers an alternative when surgical resources are constrained.

Also Akay and Akici, et al. (2020) has a mean age that are consistent with the current study. Laparoscopic repair continues to be favored for incarcerated hernias due to its minimally invasive nature and positive outcomes. Akay and Akici, et al. (2020) argued that laparoscopic repair should be the first line of treatment for incarcerated hernias, given its lower complication rates and faster recovery [12]. Sartori, et al. (2023) supported this in their systematic review, which affirmed the efficacy

of laparoscopic approaches for treating acute incarcerated groin hernias.[13]

In rare but notable cases, incarcerated hernias can involve the sigmoid colon or even transplanted ureters. Sabra, et al. (2020) presented a case of perforated sigmoid colon cancer manifesting as an incarcerated inguinal hernia, further emphasizing the complex interplay between hernias and other abdominal conditions.[14] Similarly, Merani, et al. (2021) discussed cases of transplant ureter incarceration within inguinal hernias, providing a management algorithm that offers insight into treating these unusual but critical cases.[15]

However, it is important to acknowledge the limitations of the present study. Firstly, the respondents were selected from a single tertiary level hospital which may not represent the broader populations. Another limitation involves the potential underreporting of asymptomatic hernias that later progress to strangulation.

CONCLUSION

A strong association was observed between age and incarceration rate of the adult patients who presented themselves with inguinal hernia. The evidence underscores the importance of timely hernia repair in the elderly to prevent the life-threatening complication of strangulation. Early elective surgery should be considered in elderly patients presenting with inguinal hernias, even in the absence of symptoms, to avoid the need for emergency surgery, which carries higher morbidity and mortality rates. Future research should focus on developing risk stratification tools for predicting which patients are most at risk for hernia strangulation based on age, comorbidities, and hernia characteristics.

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

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