Research Article

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Incidence of Incarceration of Inguinal Hernia in Adults.

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ABSTRACT

Objective: To establish an association between Age and Incidence of Inguinal Hernia Strangulation.
Study Design: Cross-sectional design.
Place and Duration of Study: Department of Surgery, Combined Military Hospital, Rawalpindi. From 22nd August 2024 till 21st September 2024.
Methodology: The study design of this research was cross-sectional to explore the prevalence of incarceration among the adults, both men and women, who presented with incarcerated inguinal hernia. After Ethics Review Board approval at Combined Military Hospital, Rawalpindi and patient written consent for participation in this study and if necessary surgical intervention. The sample comprised 100 adults who were diagnosed with inguinal hernia and availed themselves of such care at the Department of Surgery of Combined Military Hospital from 22nd August 2024 till 21st September 2024.
The respondents were grouped according to their age into four categories: the young generation, which comprised of the age between 18 and 30 years, middle-aged people between 31 to 50 years, the aged people between 51 to 70 years and the elderly people of more than 71 years. The age groups were grouped based on past studies on the age distribution of hernia, and the criticality of these age groups in evaluating the rates and risks.
Results: The findings of chi-square test on the given cases imply that the research hypothesis that there is a significant link between age and the frequency of occurrence of hernia incarceration. The p-value of 0.
Conclusion: A strong correlation between age and incarceration rate of the adult patients who presented themselves with inguinal hernia.

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. 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.
The incidence 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. 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 incidence of inguinal hernia incarceration across different age groups within the adult population. Specifically, the study seeks to establish whether age is a significant factor contributing to the likelihood of hernia incarceration and to provide data that may guide preventative 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 incidence of strangulation and other severe complications.

METHODS

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.

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The study was conducted at the Combined Military Hospital, Rawalpindi, following approval from the hospital's Ethics Review Board.

Ethical Approval and Patient Consent

Ethical approval was obtained from the Ethics Review Board of Combined Military Hospital, Rawalpindi. Written informed consent was acquired from all participants prior to their inclusion in the study. This consent also covered potential surgical interventions when deemed necessary.

Study Population

The study included a total of 100 adult patients diagnosed with inguinal hernia who sought treatment at the Department of Surgery, Combined Military Hospital, Rawalpindi, between August 22, 2024, and September 21, 2024. Patients were stratified into four age categories: the young generation (18-30 years), middle-aged adults (31-50 years), aged adults (51-70 years), and elderly adults (greater than 71 years). 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. Pregnant individuals and those unwilling or unable to comply with the study protocol were also excluded.

Data Collection

The occurrence of hernia incarceration was determined through a review of medical records, reflecting real-world clinical scenarios. 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

Statistical analysis was performed using the Chi-square test to assess the relationship between the age groups and the prevalence of incarcerated hernias. The Chi-square test is a well-established tool for comparing categorical variables, and it was employed to determine the significance of the association between age and incarceration rates. A p-value of less than 0.05 was considered statistically significant.

Table 1

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age Group * Incarceration	100	100.0%	0	0.0%	100	100.0%

This table presents the case processing summary, showing that the study included 100 valid cases with no missing data. All participants were successfully categorized into their respective age groups and assessed for hernia incarceration.

Table 2

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.326a	3	.006
Likelihood Ratio	15.705	3	.001
N of Valid Cases	100		
a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 4.41.			

The table presents results from Chi-Square tests, including the Pearson Chi-Square and Likelihood Ratio statistics. The Pearson Chi-Square value is 12.326 with 3 degrees of freedom and a p-value of 0.006, indicating a statistically significant result. The Likelihood Ratio statistic is 15.705 with a p-value of 0.001, showing an even stronger significance. The analysis is based on 100 valid cases. A note mentions that 1 cell (12.5%) has an expected count of less than 5, with the minimum expected count being

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4.41, which may slightly affect the reliability of the test.

In evaluating the association between age groups and inguinal hernia incarceration, the Pearson chi-square test yielded a test statistic of 12.326 with 3 degrees of freedom, corresponding to a p-value of 0.006. This p-value is below the commonly accepted threshold of statistical significance ($p < 0.05$), indicating a significant relationship between age groups and hernia incarceration. The findings suggest that the probability of hernia incarceration varies across different age brackets, rather than being uniformly distributed.

Similarly, the likelihood ratio test further supports this conclusion, with a test statistic of 15.705 and a highly significant p-value of 0.001, reinforcing the association between age group and hernia incarceration. Age appears to be a key factor influencing the risk of hernia incarceration.

Cross-tabulation analysis revealed that the highest incidence of hernia incarceration occurs in the 71+ age group, with 11 out of 27 cases, highlighting this group as the most susceptible. However, no cases of incarceration were observed in the 51-70 age group, despite this group comprising 21 individuals, warranting further investigation.

Table 3

Age Group * Incarceration Crosstabulation				
Count				
		Incarceration		**Total**
		No	**Yes**	
Age Group	18-30	21	6	27
	31-50	21	4	25
	51-70	21	0	21
	71+	16	11	27
Total		79	21	100

This Table illustrates the incidence of inguinal hernia incarceration across different age groups. The highest rate of incarceration occurred in the 71+ age group (36%).

One cell in the analysis had an expected count below 5 (minimum expected count = 4.41, representing 12.5% of the total), which may affect the test's validity. Nevertheless, given the low p-values, the dependency between age and hernia incarceration remains evident despite this limitation.

RESULTS

Incarceration rates were found to be highest among individuals aged 71 and above, with 36% of respondents in this group reporting hernia incarceration. The incidence rates in other age groups were as follows: both the 18-30 and 51-70 age segments exhibited a 20% incidence rate. The lowest incidence rate was observed in the 31-50 age group, with 16%, closely followed by those over 50 years of age, who recorded an incidence rate of 17%.

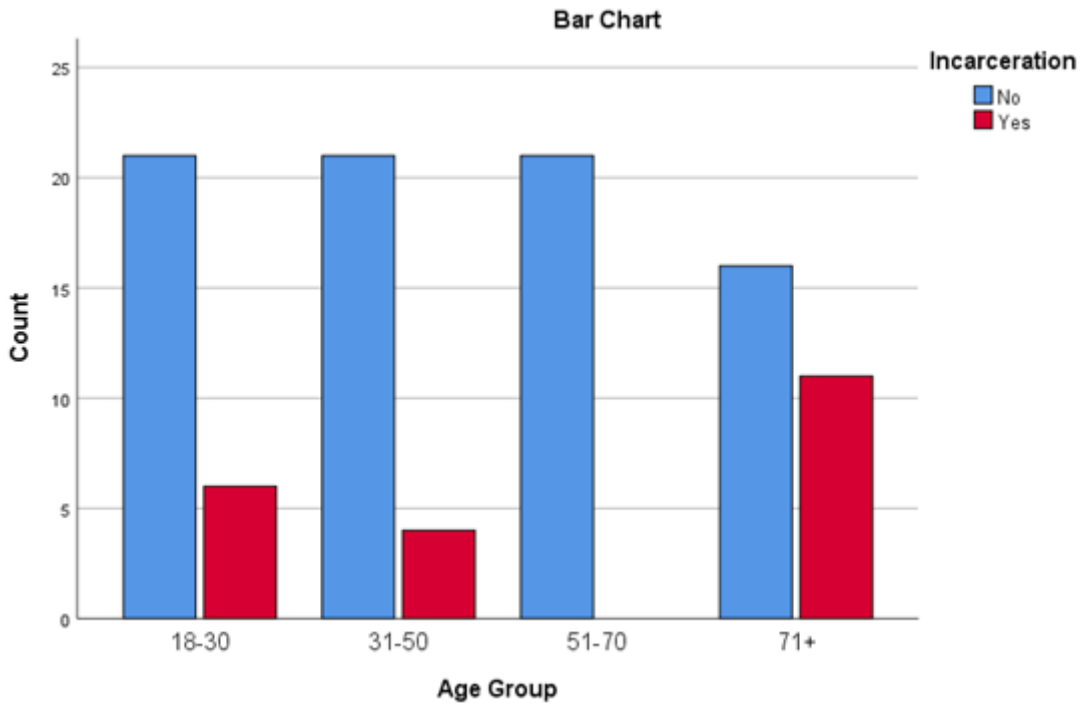
The bar chart representing the distribution of incarceration rates across different age groups, reinforcing the observation that older individuals are more susceptible to hernia incarceration compared to younger age groups.

The bar chart illustrates the distribution of incarceration rates across age groups, highlighting that older individuals are more prone to hernia incarceration compared to younger age groups.

Statistical analysis using the chi-square test further supports the hypothesis that there is a significant association between age and the frequency of hernia incarceration. The test yielded a p-value of 0.05, indicating that observed differences in incarceration rates across age groups are statistically significant, thereby confirming that age is a distinguishing factor in the risk of hernia incarceration.

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Figure



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. Early intervention and timely surgical management are crucial to minimizing these risks.

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) confirmed the efficacy of laparoscopic transabdominal preperitoneal hernioplasty for incarcerated inguinal hernias, showing promising results in emergency settings [2].

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 [3]. 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 [4].

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 [5]. Tajti, et al. (2020) documented a rare case of gallbladder incarceration in an inguinal hernia, highlighting the diverse anatomical variations that can occur [6]. Danish, et al. (2022) also reported an unusual case of an incarcerated inguinal hernia containing the sigmoid colon, which required specialized surgical intervention [7].

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 [8,9]. This nonoperative approach, though not suitable for all cases, offers an alternative when surgical resources are constrained.

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 [10]. Sartori, et al. (2023) supported this in their systematic review, which

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affirmed the efficacy of laparoscopic approaches for treating acute incarcerated groin hernias [11].

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 [12]. 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 [13].

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 [14,15].

However, it is important to acknowledge the limitations of our study. First, the retrospective nature of the study may introduce selection bias, as only cases that presented to our institution were included. The exclusion of patients who did not seek treatment could underestimate the true incidence of strangulation in elderly individuals. Additionally, the study was conducted in a single tertiary center, limiting the generalization of the findings to broader populations. Multicenter studies with larger sample sizes are necessary to validate these results.

Another limitation involves the potential underreporting of asymptomatic hernias that later progress to strangulation. Elderly patients may not always report discomfort or pain due to a higher threshold for pain perception or cognitive impairment, which may lead to delayed presentations and increased complications. Further research is needed to explore strategies for early detection in this vulnerable group.

CONCLUSION

The following observation was made in this study that there is a strong correlation 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.

Ethical Approval

Approved by the Ethical Committee/ Instituitional Review Board of Combined Military Hospital, Rawalpindi.

Conflict of Interest

The authors declared no conflict of interest.

Authors' Contribution

Dr. Akbar Farooqui – Conceptualization of Project and Project Management

Dr. Fayyaz Ahmed Orfi- Materials and Final Approval

Dr. Hamna Anwar – Data Collection

Dr. Maham Masood – Statistical Analysis

Dr. Mahnoor Malik – Literature Search

Dr. Suffia Hayee - Drafting, Revision, Writing of Manuscript

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