ORIGINAL ARTICLE

INGUINAL HERNIA AND ITS ASSOCIATED RISK FACTOR AMONG ADULTS: A CASE-CONTROL STUDY

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ABSTRACT

Objective: This study aimed to determine the frequency and risk factors of inguinal hernia and their association with BMI, and ways to reduce this problem.

Methods: A case-control study was conducted among 315 adults living in Khyber Pakhtunkhwa (KP), Pakistan, in 2024. Data were collected and analyzed by SPSS version 22 using descriptive statistics and odds ratios

Results: The inguinal hernia was more common in males (73.83%) than in females (26.16%). Among these, males and females aged 40 and older made up 56.07% and 43.92%, respectively, of those under 40. Hernia was significantly influenced by positive family history (41.12%), physical activity (44.85%), constipation (56.07%), COPD (33.64%), and multiparity (85.71%).

Conclusion: Inguinal hernias are a common issue in KP, Pakistan. They occur more often in men, and there is a strong connection between constipation, family history, and multiparity. Public health initiatives should prioritize early diagnosis and prompt treatment to minimize patient morbidity and mortality.

Key Words: Inguinal Hernia, Risk Factors, Body Mass Index, Constipation, Chest Problems, Multi-Parity

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INTRODUCTION

A hernia is defined as the abnormal protrusion of a part or structure through the tissues that typically contain it. The parts of a hernia include the sac, the neck, and the contents. Most commonly, it contains fat and is situated near the intestine. Abdominal hernias are a prevalent surgical condition affecting all ages and both sexes. About 7.5% of all surgeries are hernia operations [1]. Inguinal hernia is one of the most common surgical pathologies. It is the most prevalent form of abdominal wall hernia and occurs more frequently in adult men. Over a quarter of adult men in the United States are expected to have a medically diagnosed inguinal hernia. The lifetime risk of inguinal hernia repair is estimated at 27% for men and 3% for women [4]. Inguinal hernia repair is among the most common surgeries performed by general surgeons, with over one million repairs in the U.S. each year [5]. It is the most common hernia, accounting for 73% of cases [7]. Inguinal hernia repair is the most frequently performed operation in general surgery.

In 2003, approximately 770,000 inguinal hernia repairs occurred in the U.S. The lifetime risk of undergoing inguinal hernia repair is as high as 42.5% for men and 5.8% for women [8]. The prevalence of abdominal wall hernia is approximately 1.7% across all age groups and about 4% for those over 45 years old [12]. Inguinal hernia is very common in sub-Saharan Africa, with many cases remaining untreated, resulting in a high disease burden [11]. The earliest recorded case of an inguinal hernia was found in the Ebers Papyrus from Egypt, dated to 1552 BC. More than 3,000 years later, the diagnosis appeared in the writings of Caspe Stromayer (1559), as documented in a French monograph by Lorenz Heister in 1724 ([14]). Inguinal hernia repair is a standard surgical procedure performed on both adults and children, accounting for over 95% of all groin hernia repairs [15].

The causes of hernia development include muscle weakness and strain. Chronic coughing, as well as damage from surgery or trauma, are common contributing factors. Major risk factors include heavy lifting, obesity, pregnancy, and constipation. Smoking is particularly significant, especially in inguinal hernias. Collagen vascular disease, increased intra-abdominal pressure, and a history of open appendectomy are also considered relative

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risk factors [18]. Interestingly, studies have reported a lower incidence of inguinal hernia among overweight and obese men compared to those of normal weight. The risk among overweight men is about 80% of that in normal-weight men, and among obese men, it's approximately 50% [17]. Similar findings were observed in a community survey in Israel and a hospital-based case-control study in the Netherlands.

Additionally, advanced age, male gender, smoking, chronic cough, which increases intra-abdominal pressure, and chronic constipation are identified risk factors. The prevalence of chronic constipation is reported at 14% [19]. Despite its commonality, high prevalence, and associated complications, few studies have been conducted in Pakistan to revisit or reassess its risk factors. To our knowledge, no research has been carried out in Khyber Pakhtunkhwa to explore these factors further. While several studies link hernia to obesity, clear evidence directly associating inguinal hernia with increased body weight and BMI is lacking. We are eager to investigate whether increased body weight and BMI are directly or inversely linked to the incidence of inguinal hernia.

MATERIALS AND METHODS

A case-control study was conducted on patients from KPK province, Pakistan, between February and September 2024. Adult men and women presenting with primary inguinal hernia at (mention all hospitals) were enrolled as cases. Patients aged 18 to 95 years who visited District Headquarters Hospital with inguinal hernia were included, while those under 18, with multiple comorbidities, pregnancy, congenital disorders, recurrent inguinal hernia, or requiring emergency care were excluded.

Control subjects were selected randomly from the hospital, excluding those with other illnesses during the same period. Cases and controls were matched with cases of our study according to sex and age. Controls were taken for the case. Consent was obtained from the patient to participate in the study after a thorough explanation was provided. Controls also needed to give informed consent.

Clinical data were divided into socio-demographic details and lifestyle factors. Socio-demographic details included age, gender, marital status, address, occupation or job type, and educational level. Risk factors encompassed smoking, constipation, physical activity, and COPD.

DATA PROTOCOL

The study examined various factors that contribute to the development of inguinal hernia. Data were collected on participant characteristics, including age, body mass, height, and body mass index (BMI). Additional health information was gathered, such as smoking status, presence of chronic respiratory issues, and bowel movement habits. Family medical history was also considered, specifically whether a first-degree relative had been diagnosed with an inguinal hernia. The level of physical activity and occupation type were categorized as either strenuous or non-strenuous. The type of hernia (indirect or direct) was also documented. Subjects with BMI >30 were considered obese. Participants were grouped into different weight status categories based on their BMI. These categories included: underweight (BMI below 20), normal weight (BMI 20-24.9), overweight (BMI 25-29.9), and obese (BMI 30 or higher). SPSS version 22 was used for statistical analysis. Relative risk factors for cases were compared with controls by calculating ODDS RATIO with a 95% confidence interval.

RESULTS

A total of 315 male and female patients were interviewed. Among them, 107 had inguinal hernia, while the remaining 208 served as controls. The age range for both cases and controls was defined as 18-60 years, with a mean age between 45 and 60 years. The most common age group was 45-60 years. It is important to note that we assumed the age and gender of cases and their respective controls were the same in our study. The distribution of risk factors for inguinal hernia among the cases and controls is shown in Table 2. Male patients comprised 73.83%, and female patients made up 26.17%.

DISCUSSIONS

Inguinal hernia is a condition that primarily affects males and tends to become more common with age. In this study, individuals aged 40 years or older make up about 60 percent of cases in the KPK population. As people age, muscle weakness increases, raising the risk of hernia [21]. A positive family history of inguinal hernia is a significant risk factor, with 44% of patients having a first-degree relative with the condition. Our results also show that unilateral hernia is less often associated with a positive family history, while nearly 70 percent of cases with a family history have bilateral hernias. Men with a family history are eight times more likely to develop a primary inguinal hernia. Genetic factors also contribute to hernia development [21]. Strenuous physical activity is a significant risk factor; individuals in more active jobs are more prone to hernias [5]. Chronic constipation causes prolonged straining, increasing abdominal pressure and predispos-

Table 1: Age Distribution of Patients with Inguinal Hernia

Age in years	Number	Percentage
18-24	5	4.67
25-34	19	17.757
35-44	23	21.50
45-60	40	37.38
> 60	20	18.70
Total	107	100

Table 2: Distribution of Risk Factors For Inguinal Hernia Among Subjects And Controls

Variables	Controls N=208 No (%)	Cases N=107 No (%)	Odds Ratio OR (CI=95%)
Age			
>40	118 (56.73)	60 (56.07)	1.03 (CI=0.64-1.64)
<40	90 (43.26)	47 (43.92)	
Gender			
Male	155 (74.51)	79 (73.83)	0.96 (CI=0.57-1.64)
Female	53 (25.48)	28 (26.16)	
Parity***			
Primigravida	2 (3.77)***	4 (14.28)***	3.5 (CI=0.6-20.55)
Multipara	42 (79.25)***	24 (85.71)***	
BMI			
>25	108 (51.92)	70 (65.42)	0.57 (CI=0.35-0.92)
<25	100 (48.07%)	37 (34.57)	
Family history			
Present	26 (12.5)	44 (41.12)	4.89 (2.78-8.59)
Absent	182 (87.5)	63 (58.87)	
Smoking history			
Present	49 (23.55)	33 (30.84)	1.45 (0.86-2.44)
Absent	159 (76.44)	74 (69.65)	
Physical exercise			
Present	74 (35.57)	48 (44.85)	1.47 (0.92-2.37)
Absent	134 (64.42)	59 (55.14)	
Constipation			
Present	92 (44.23)	60 (56.07)	1.61 (1.01-2.57)
Absent	116 (55.76)	47 (43.92)	
Chronic respiratory problems			
Present	53 (25.48)	36 (33.64)	1.48 (0.89-2.46)
Absent	155 (74.51)	71 (66.35)	

ing to inguinal hernia formation. About 60 percent of our cases reported a history of chronic constipation. During defecation, especially in the squatting position, pushing the abdominal organs can increase pressure, leading to hernia [11]. Obesity and overweight were not found to be significant risk factors; in fact, excess adipose tissue may strengthen abdominal muscles, providing a stronger barrier against hernia formation [22]. Smoking is also a relevant risk factor, with 33 percent of cases having a history of long-term smoking. OBERG and colleagues suggest that smoking leads to increased collagen degeneration and abnormal synthesis in fibroblasts, which may elevate hernia risk [14]. Chronic respiratory problems, such as COPD, were present in nearly 36 percent of cases, and frequent coughing can repeatedly increase intra-abdominal pressure, potentially causing hernias [16]. Inguinal hernias are most common among multiparous women; about 85.71% of cases in our study involved multiparity, while no nulliparous women were included. A small portion, 14.28%, were primiparous. To reduce this problem, lifestyle modifications are recommended, including regular exercise focusing on core strength, avoiding heavy lifting and strenuous work, and managing constipation through dietary changes, use of fiber laxatives, and medical check-ups. Additionally, quitting smoking and seeking timely surgical treatment are advised. Our findings also reveal an inverse relationship between BMI and hernia occurrence, meaning that higher BMI is associated with fewer hernias. However, promoting higher BMI is not advisable, as it increases the risk for other serious conditions such as Type 2 diabetes and hypertension.

CONCLUSIONS

Inguinal hernia remains a common condition among adult men. Strenuous activity, age, and family history are significant risk factors for inguinal hernia in adults of KP. Other factors such as constipation, multi-parity, and COPD also contribute significantly to the development of inguinal hernia. Public health officials should take appropriate steps to ensure early diagnosis and prompt treatment, thereby reducing patient morbidity and mortality.

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Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Shah SM	✓	×	✓	×	✓	×
Ahsan MH	✓	✓	×	✓	✓	×
Saqib M	×	✓	×	×	✓	×
Mahsud A	✓	✓	✓	×	✓	✓
Nazir S	✓	✓	×	✓	✓	×
Himanshi	✓	✓	×	✓	✓	×
Yousaf S	×	✓	×	×	✓	×
Marwat MI	✓	✓	✓	×	✓	✓

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.