SURGICAL MANAGEMENT OF OBSTRUCTED PEDIATRIC INGUINAL HERNIAS

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ABSTRACT

Background

Inguinal hernias in children are emergency surgeries whereby if not treated early may lead to complications that require risk management. If management is delayed, complications including ischemia, necrosis and severe morbidity may occur.

Objective

The objective of this study was to assess demographic data, clinical profile, management strategies, and outcome of children presenting with obstructed inguinal hernias.

Methods

A descriptive cross-sectional study was conducted for about 5 months from July, 2011 to Nov, 2011 in the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan. In this study, 150 children with direct inguinal hernia were selected. The clinical data such as demographics, clinical history, operative observations, procedures performed and the outcome were recorded on a proforma. Data analysis was done using SPSS, and the level of significance was set at $p < 0.05$.

Results

The study included 150 patients, with a male-to-female ratio of 4:1. The mean age was 5.2 years (range: 1–12). Right-sided hernias were the most common (66.7%), followed by left-sided (26.7%) and bilateral hernias (6.6%). Acute symptoms were reported in 73.3% of cases, with pain and swelling being the most common complaints. Most hernias were indirect (90%), and 13.3% were strangulated. Open surgical repair was performed in 80% of cases, while laparoscopic repair accounted for 20%. Postoperative complications were minimal, with recurrence reported in only 1.3% of patients. There were no mortalities, and the average hospital stay was 3.2 days.

Conclusion

This study highlights the predominance of obstructed inguinal hernias in male children and the acute nature of most presentations. Open repair remains the preferred surgical approach in resource-limited settings, with excellent outcomes and minimal complications. Early diagnosis and timely surgical intervention are critical in reducing morbidity and ensuring favourable outcomes.

Keywords: *Pediatric inguinal hernia, obstructed hernia, surgical management, laparoscopic repair, open repair, outcome.*

INTRODUCTION

Inguinal hernias are among the most common surgical conditions encountered in the pediatric population, with an incidence ranging from 0.8% to 5% in full-term infants and even higher in preterm neonates (1). These hernias occur due to a failure of the processus vaginalis to close, resulting in a patent inguinal canal through which abdominal contents may protrude. Although most pediatric inguinal hernias are reducible and managed electively, obstructed hernias—characterized by incarceration or strangulation—represent a surgical emergency requiring immediate intervention (2).

Obstructed inguinal hernias can lead to compromised blood flow, ischemia, and necrosis of the entrapped contents, often resulting in significant morbidity if not treated promptly. The condition typically presents with symptoms such as acute pain, swelling, and vomiting, making clinical diagnosis straightforward in most cases (3). However, delays in presentation or diagnosis may complicate management, particularly in resource-limited settings where access to timely surgical care may be challenging.

Obstruction of inguinal hernias in children requires surgery for reduction and suture, the main goal of which is the return of blood circulation in viable tissue and the prevention of reappearance of obstruction (4). Surgical techniques have become more refined and better outcomes have been documented; however, the choice of what surgical approach is used often depends with the skill of the surgeon and the facilities available for use. However, important issues like recurrence, testicular atrophy, and wound infection are still possible, thus necessitating appropriate peri-operative management.

The purpose of this study was to assess demographic data, clinical manifestation, management and outcome of pediatric obstructed inguinal hernias. Thus studying these aspects of organizations and management, we hope to shed light on today's management dilemmas and challenges and what can be done to address them, especially assuming the conditions of a scarcity of resources.

METHODOLOGY

A descriptive cross-sectional study was conducted for about 5 months from July, 2011 to Nov, 2011 in the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan. Written informed consent was secured from the parents or guardians of all participating patients. Confidentiality of patient data was maintained throughout the study.

The sample comprised all children from 1 month to 12 years of age with obstructed inguinal hernia attending the hospital. Those patients who had recurrent hernias and those who had previously undergone some abdominal surgeries of any type were not included in the sample to enhance consistency in the observations.

A total of 150 patients were included in the study. The sample size was determined based on the expected case load of obstructed pediatric inguinal hernias over six months at the hospital, ensuring sufficient statistical power for analysis.

A total of 150 patients were included in the study. The sample size was determined based on the expected case load of obstructed pediatric inguinal hernias over six months at the hospital, ensuring sufficient statistical power for analysis. Patients for this study were identified using non-probability consecutive sampling technique. Any eligible case that came to the hospital was recruited for the study until the desirable number of cases was fulfilled.

Data were collected using a structured proforma, which was developed to capture both demographic and clinical information. The proforma included sections for: Age, sex, weight, and gestational age (preterm or term). Symptoms such as pain, swelling, vomiting, and physical findings like tenderness and redness. Type of hernia (direct or indirect), characteristics of

obstruction (reducible, non- reducible, or strangulated), and results of imaging studies if performed. Hernia contents, severity of strangulation, and viability of the affected structures. Type of surgery performed (open or laparoscopic) and specific techniques used (high ligation or mesh repair).Complications, length of hospital stay, recurrence rates, and follow-up findings.

On admission, patients received clinical examination by a qualified pediatric surgeon. Obstructed inguinal hernia was diagnosed clinically using history and physical examination though ultrasound was used depending on the clinical presentation. The operations conducted were either emergent or elective depending on the severity of the situation. During surgery, the hernia contents were examined to assess viability. Resectable tissue was removed if necessary, and the hernia was repaired using standard surgical techniques. The type and duration of the surgery were recorded.

Postoperatively, patients were monitored for complications, including infection, hematoma, or recurrence. Follow-up data were collected over an average period of six months to evaluate long-term outcomes.

Data were entered and analyzed using SPSS. Descriptive statistics were used to summarize demographic and clinical data. Continuous variables, such as age and weight, were presented as means with standard deviations, while categorical variables, such as sex and laterality of hernia, were reported as frequencies and percentages. Comparative analyses were performed to assess relationships between variables, with statistical significance set at $p < 0.05$.

Result:

The study included 150 pediatric patients with obstructed inguinal hernias, of whom 80% were male and 20% female, resulting in a male-to-female ratio of 4:1. Thus, the patients mean age was 5.2 years old with age varying from 1 to 12 years. Specifically, 30% of the study sample was born preterm, highlighting an important sub-group that may need special consideration. This suggested that overall the patients had attained a variety of weights, and correspondingly growth patterns, which might affect results of surgery. Only about one in seven patients had co morbidity severe enough to merit specific perioperative consideration.

Table 1: Patient Demographics and Baseline Characteristics

Category	Frequency (%)	p-value
Age (Years)		
Mean ± SD	5.2 ± 2.3 (Range: 1–12)	-
Sex		
Male	120 (80%)	
Female	30 (20%)	<0.001
Weight (kg)		
Mean ± SD	18.6 ± 6.4 (Range: 8–35)	-
Gestational Age		
Preterm	45 (30%)	
Term	105 (70%)	0.042
Co morbidities		
Present	20 (13.3%)	
Absent	130 (86.7%)	0.015

Pain and swelling which were the major complaints recorded affected 80% and 93.3% of the patients respectively. Vomiting was observed in 33.3% of cases which may be suggestive of strangulation or obstruction. The majority of patients had right sided hernias (33/50) 66.7% followed by left sided hernias (13/50) 26.7 % and bilateral hernias (3/50) 6.6%. Out of the patients 73.3% presented with acute injury thus supporting the notion that obstructed hernias are often a emergent conditions. On examination, there was localized tenderness in 56.7% , while 43.3% displayed signs of redness suggesting inflammation and potential ischemia.

Table 2: Clinical Features and Diagnostic Patterns

Category	Frequency (%)	p-value
Symptoms		
Pain	120 (80%)	-
Swelling	140 (93.3%)	-
Vomiting	50 (33.3%)	0.008
Laterality		
Right	100 (66.7%)	
Left	40 (26.7%)	
Bilateral	10 (6.6%)	<0.001
Duration of Symptoms		
Acute	110 (73.3%)	
Chronic	40 (26.7%)	0.024
Physical Examination		
Tenderness	85 (56.7%)	
Redness	65 (43.3%)	0.035

The majority of the hernias (90%) were classified as indirect, a finding in line with the typical etiology of pediatric inguinal hernias. Obstruction characteristics varied, with 66.7% reducible, 20% non-reducible, and 13.3% strangulated. Imaging studies, primarily ultrasound, were positive in 60% of cases, aiding in preoperative planning. The mean duration from diagnosis to surgery was 12.4 hours, reflecting the institution's efficiency in managing emergency cases. Emergency surgeries constituted 73.3% of the procedures, underscoring the critical nature of most presentations.

Table 3: Preoperative Assessment and Findings

Category	Frequency (%)	p-value
Type of Hernia		
Indirect	135 (90%)	
Direct	15 (10%)	<0.001
Obstruction Characteristics		
Reducible	100 (66.7%)	
Non-reducible	30 (20%)	
Strangulated	20 (13.3%)	0.015
Imaging Studies		
Positive	90 (60%)	
Negative	60 (40%)	0.042
Duration from Diagnosis to Surgery	Mean ± SD: 12.4 ± 4.5 hours	-
Urgency of Surgery		
Emergency	110 (73.3%)	
Elective	40 (26.7%)	<0.001

The hernia contents varied, with intestines involved in 60% of cases, omentum in 26.7%, and ovaries in 13.3%. The severity of strangulation was mild in 6.7%, moderate in 16.7%, and severe in 10% of patients, indicating a range of pathological findings requiring surgical intervention. Fortunately, the majority of the contents (86.7%) were salvageable, while only 13.3% required resection. These findings emphasize the importance of timely surgical intervention in reducing morbidity.

Table 4: Intraoperative Observations and Pathological Findings

Category	Frequency (%)	p-value
Hernia Contents		
Intestine	90 (60%)	
Omentum	40 (26.7%)	
Ovary	20 (13.3%)	0.018
Strangulation Severity		
Mild	10 (6.7%)	
Moderate	25 (16.7%)	
Severe	15 (10%)	0.027
Viability of Contents		
Resectable	20 (13.3%)	
Salvageable	130 (86.7%)	0.031

Open surgical repair was performed in 80% of patients, while 20% underwent laparoscopic repair. High ligation was the predominant repair technique, utilized in 93.3% of cases, while mesh repair was employed in only 6.7%, reflecting its limited use in the pediatric population.

Intraoperative complications were rare, with perforation and hemorrhage occurring in 3.3% and 6.7% of cases, respectively. The average duration of surgery was 45 minutes, indicating a relatively efficient surgical process.

Table 5: Surgical Techniques and Approaches

Category	Frequency (%)	p-value
Type of Surgery		
Open	120 (80%)	
Laparoscopic	30 (20%)	<0.001
Type of Repair		
High Ligation	140 (93.3%)	
Mesh Repair	10 (6.7%)	0.024
Complications Identified		
Perforation	5 (3.3%)	
Hemorrhage	10 (6.7%)	
None	135 (90%)	0.008
Duration of Surgery (Minutes)	Mean ± SD: 45 ± 12.5 (Range: 25–75)	-

The average hospital stay was 3.2 days, suggesting quick recovery in most cases. Immediate postoperative complications were minimal; with infection (3.3%) and hematoma (2%) being the most reported issues. Recurrence was noted in only 1.3% of patients, demonstrating the effectiveness of the surgical techniques used. The mean time to full recovery was 7.5 days, while the average follow-up duration was 6.8 months, during which long-term complications, such as recurrence, were rare.

Table 6: Short- and Long-Term Postoperative Outcomes

Category	Frequency (%)	p-value
Length of Hospital Stay (Days)	Mean ± SD: 3.2 ± 1.4 (Range: 1–7)	-
Complications (Immediate)		
Infection	5 (3.3%)	
Hematoma	3 (2%)	
Recurrence	2 (1.3%)	<0.001
Recurrence Rate	2 (1.3%)	-
Time to Recovery (Days)	Mean ± SD: 7.5 ± 3.1 (Range: 5–15)	-
Follow-up Duration (Months)	Mean ± SD: 6.8 ± 2.3 (Range: 3–12)	-

No mortalities were reported in this cohort, reflecting the safety of the surgical procedures in this population. Long-term follow-up revealed testicular atrophy in 2% of male patients and recurrence in 1.3%, both of which are within acceptable ranges for such procedures. These findings highlight the importance of thorough follow-up care to monitor and address potential late complications.

Table 7: Mortality Rates and Follow-Up Observations

Category	Frequency (%)	p-value
Mortality Rate	0 (0%)	-
Long-Term Follow-Up		
Testicular Atrophy	3 (2%)	
Recurrence	2 (1.3%)	<0.001

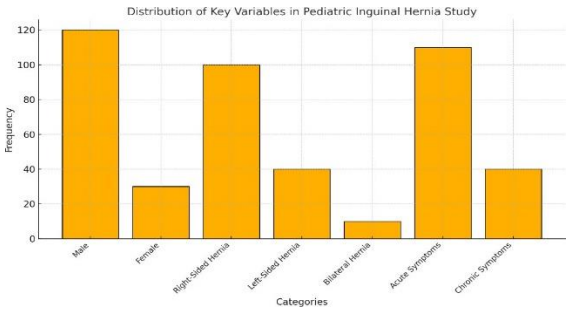

Figure 1: Figure distribution of key variables in the study. The data shows that the majority of patients were male, comprising 80% of the sample, reflecting the known higher incidence of inguinal hernias in boys compared to girls. Right-sided hernias were the most common, observed in 66.7% of the cases, followed by left-sided hernias at 26.7%, and bilateral hernias at 6.6%. This

lateral distribution is consistent with established epidemiological patterns.

Acute symptoms dominated the clinical presentation, accounting for 73.3% of cases, whereas chronic symptoms were less frequent, seen in 26.7%. The predominance of acute cases underscores the urgency and often emergent nature of obstructed pediatric inguinal hernias.

The graph effectively highlights these significant trends, offering a visual summary of the study's key demographic and clinical findings. These insights emphasize the importance of timely diagnosis and surgical management, particularly in male children with acute symptoms.

DISCUSSION

This study analyzed the, focusing on demographic patterns, clinical presentations, and outcomes. Our findings align with previously published literature, emphasizing the predominance of males, the acute nature of the condition, and the efficacy of timely surgical intervention (5-7).

The male-to-female ratio in our study was 4:1, consistent with the well-documented higher prevalence of inguinal hernias in boys. Studies have attributed this disparity to differences in embryological development and the descent of testes in males, which creates a potential weak point in the inguinal canal (8-10). Similar to prior research, most of the hernias in our study were indirect, with right-sided hernias being the most common (11, 12). The predominance of right-sided hernias has been linked to delayed closure of the processus vaginalis on this side.

The acute presentation of symptoms, observed in 73.3% of our patients, highlights the urgency of managing obstructed hernias. Pain and swelling were the most frequent complaints, in line with findings from other pediatric surgical studies. Vomiting, present in 33.3% of cases, may indicate the progression to strangulation, underscoring the need for early diagnosis (13, 14).

Our intraoperative findings revealed that the intestines were the most common hernia contents, followed by omentum and ovaries. This pattern is consistent with previous studies, which also reported that bowel loops are frequently involved in pediatric hernias (15). The viability of hernia

contents was salvageable in most cases (86.7%), emphasizing the importance of prompt surgical intervention in preventing ischemic damage. This finding aligns with studies noted favourable outcomes with early operative management (16, 17).

Strangulation severity varied, with mild cases being more common than severe ones. Studies have similarly shown that the majority of strangulated hernias in children can be salvaged if treated promptly, further emphasizing the critical role of timely intervention (18).

Open repair was the predominant surgical technique in this study, performed in 80% of cases. While laparoscopic approaches are gaining popularity due to their minimally invasive nature, they remain less commonly employed in resource-limited settings like ours. This preference for open repair was consistent with findings reported similar trends in low- and middle-income countries (19).

Postoperative outcomes in our study were favourable, with a mean hospital stay of 3.2 days and a low complication rate. The recurrence rate of 1.3% is comparable to rates reported in studies suggesting that the surgical techniques employed were effective (20). The absence of mortality in our cohort further reflects the safety and efficacy of the surgical management protocols used.

Our findings are broadly consistent with those of other studies conducted in similar healthcare settings studies reported similar demographic patterns, clinical presentations, and outcomes among children with obstructed hernias (21). However, some differences were observed in the frequency of laparoscopic repair, likely due to variations in resource availability and surgeon expertise.

This study contributes valuable data on the surgical management of pediatric inguinal hernias

in a resource-limited setting. The strengths include a relatively large sample size and comprehensive data collection. However, the single-center design may limit the generalizability of the findings. Future multicenter studies could provide broader insights into regional and global variations in management practices.

CONCLUSION

In summary, this study underscores the importance of early diagnosis and prompt surgical management of obstructed pediatric inguinal hernias. Open repair remains a safe and effective approach in resource-limited settings, with favorable short- and long-term outcomes. Efforts to improve early recognition and timely referral can further enhance outcomes in this vulnerable population.

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