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Etiological Spectrum of Intestinal Obstruction in Adults Having Virgin Abdomen

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ABSTRACT

Background: Intestinal obstruction is a common surgical emergency with significant morbidity and mortality, but postoperative adhesions are its most frequent cause. Patients with a virgin abdomen—those without any prior abdominal surgery—pose diagnostic challenges; this study explored the etiological spectrum, clinical features, and outcomes of such cases in a tertiary care hospital in Pakistan.

Methods: A six-month prospective observational study at Lady Reading Hospital, Peshawar, enrolled 73 eligible adult patients, categorizing them into Group 1 (surgical management for mechanical causes such as hernias, tumours, or volvulus) and Group 2 (conservative management for functional or self-resolving causes). Data collected encompassed demographics, presenting symptoms, vital signs, symptom duration, and etiological factors, supplemented by relevant laboratory investigations and imaging studies. Statistical analysis was performed using SPSS version 26, with continuous variables summarized as mean ± standard deviation and compared using the independent t-test, categorical variables presented as frequencies and percentages and analysed using the Chi-square or Fisher's exact test, and a p-value of <0.05 considered statistically significant.

Results: The mean age of Group 1 was significantly higher (55.73 ± 4.86 years) than Group 2 (44.13 ± 6.32 years, $p < 0.001$). Tumours were the most common cause (24.7%), followed by hernias (20.5%) and volvulus (13.7%). Group 1 had longer hospital stays (12.45 ± 2.94 days vs. 7.76 ± 2.03 days, $p < 0.001$) and higher clinical severity. Complications and mortality rates were low and comparable between groups, with effective management in both cohorts.

Conclusion: The cause of intestinal obstruction differs in patients with a virgin abdomen of which has a vast clinical impact. It demands early diagnosis and proper treatment plans to enhance the quality of life and reduce mortality. Further investigations of patient follow-up with focus on discharge and ways of minimizing the number of days patients spend in the hospital are important.

Keywords: Intestinal Obstruction, Abdomen, Postoperative Complications, Hernia, Intestinal Neoplasms, Volvulus, Paralytic Ileus, Prospective Studies, Treatment Outcome, Pakistan.

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INTRODUCTION

Intestinal obstruction is one of the most frequent surgical emergency conditions globally, defined by the impairment of regular intestinal movement caused by mechanical or functional factors.[1] It has clinical manifestations of abdominal pain, distension, vomiting, and constipation and may lead to severe life-threatening complications requiring prompt diagnosis and management to prevent serious complications.[2] Intestinal obstruction due to postoperative adhesions is the most common cause, but the virgin abdomen poses a diagnostic and therapeutic challenge. These cases do not have the adhesions which may be used as a diagnostic clue therefore raise suspicions of other possible causes.[3]

Therefore, the etiology of intestinal obstruction globally can be described as varying with respect to geographic and demographic factors.[4] Various studies in high income countries show that malignancies and hernias are most frequent causes of emergency abdominal surgery while in low and middle income countries hernias, volvulus, and infection are most frequent.[1,5] However, a search for primary causes and outcomes of obstruction in patients with virgin abdomen was not conducted due to the scarcity of corresponding research in Pakistan. Understanding these factors is essential for improving clinical outcomes and reducing complications.

Patients presenting with a virgin abdomen may have hernias, tumours, volvulus, intussusception or other functional obstructions like paralytic ileus.[6,7] These etiologies need individual approaches in terms of management and may range from medical management to emergent surgical intervention. However, the available data regarding the incidence and outcomes related to these patients in Pakistan are quite scarce and thus, it becomes challenging for the healthcare workers involved to adhere to guidelines for managing this specific patient population.

The rationale for this study lies in addressing this critical gap in knowledge. This research seeks to explore the etiological spectrum, clinical presentations, and prognosis of intestinal obstruction in adults with virgin abdomens to provide a deeper understanding of this condition in a local context. The findings can help guide early diagnosis, improve management protocols, and ultimately enhance patient care. The primary objective of this study was to identify the causes, clinical features, and outcomes of intestinal obstruction in adults with a virgin abdomen at Lady Reading Hospital, Peshawar. This research seeks evidence-based data to support effective decision-making and improve patient outcomes.

METHODS

This prospective observational study was conducted at Lady Reading Hospital, Peshawar, a tertiary care hospital catering to a diverse patient population, for six months and was designed to explore the etiological spectrum of intestinal obstruction in adults with virgin abdomens.

The ethical approval College of Physicians and Surgeons Pakistan (CPSP) (Approval Reference No: EPSP/REU/SGR-2020-022-11820, dated February 22, 2022). Approval for this study was obtained from the

CPSP Research Evaluation Unit. All participants provided informed written consent before being enrolled in the study. Confidentiality and anonymity of the patients were maintained throughout the research process.

The sample size was calculated using the formula for estimating a proportion in a population.

$$n = \frac{Z^2 \times p \times (1-p)}{d^2}$$

Where Z = 1.96 for a 95% confidence level; p = 20% anticipated prevalence of intestinal obstruction in adults with a virgin abdomen, d = margin of error, set at 9%. Substituting the values in formula:

$$n = \frac{(1.96)^2 \times 0.20 \times (1-0.20)}{(0.09)^2} = 73$$

Thus, the calculated minimum sample size of 73 participants was met in full, with all eligible patients presenting during the study period enrolled through a non-probability consecutive sampling technique.

This study focused on adult patients presenting with clinical features of intestinal obstruction. The inclusion and exclusion criteria ensured a homogenous sample relevant to the study objectives. The inclusion criteria for the study comprise adults aged 18 years or older, including both male and female patients, who present with a virgin abdomen, defined as having no prior history of abdominal surgery. Eligible participants must be diagnosed with intestinal obstruction based on both clinical assessment and radiological findings. Furthermore, only those patients who are willing and able to provide informed consent will be considered for enrollment in the study.

The exclusion criteria aim to eliminate factors that could confound study outcomes. These include patients with any history of abdominal surgery, to avoid the influence of postoperative adhesions, as well as those with traumatic abdominal injuries or congenital gastrointestinal anomalies. Critically ill or unstable patients who cannot provide informed consent will also be excluded, along with individuals whose medical records are incomplete, thereby ensuring accurate data collection and analysis.

Participants were categorized into two groups based on their management approach: Group 1 included patients requiring surgical intervention for conditions such as hernias, tumours, volvulus, or other mechanical causes of intestinal obstruction, while Group 2 comprised patients managed conservatively, typically those with functional obstructions like paralytic ileus or Ogilvie syndrome, as well as rare causes that resolved without the need for surgery.

Data were collected using a structured and pre-tested proforma, similar to methodologies employed in previous studies that captured comprehensive information, including demographics (age, gender, BMI, socioeconomic status, and geographical location), clinical features (presenting symptoms, vital signs, and symptom duration), and investigation results such as routine blood tests, imaging findings from X-rays, ultrasound, and CT scans,

along with diagnostic details.[8-11] The proforma also documented etiological factors, categorized as mechanical (hernias, tumours, volvulus, intussusception, foreign bodies), functional (paralytic ileus, Ogilvie syndrome), and rare causes (congenital bands, inflammatory bowel diseases). Additionally, management details and surgical findings, such as tumour removal or hernia repair, were recorded, as well as non-operative outcomes. Postoperative data included length of hospital stay, complications, recurrence risk, and mortality.

Study procedure upon presentation, patients underwent a thorough clinical evaluation, including history taking and physical examination. Radiological investigations were conducted to confirm the diagnosis and identify the underlying cause of obstruction. Based on the findings, patients were either managed surgically or conservatively. Operative findings were meticulously documented for surgical cases, while conservative management was carefully monitored for functional obstructions.

All data were analysed using SPSS software (version 26). Continuous variables (e.g., age, symptom duration, length of stay) were presented as means ± standard deviations and compared using independent t-tests. Categorical variables (e.g., gender, complications, recurrence risk) were expressed as frequencies and percentages and analysed using Chi-square or Fisher's exact test, as appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic Characteristics of Study Participants

Variable	Category	Group 1 (N=28)	Group 2 (N=45)	P-value	Notes
Age in Years	(Mean ± SD)	55.73 ± 4.86	44.13 ± 6.32	<0.001	Significant difference; Levene's p = 0.255
Gender	Female	9	18	0.499	No significant association (Pearson Chi-Square)
	Male	19	27		
BMI	Normal	10	20	0.614	
	Obese	6	5		
	Overweight	8	15		
	Underweight	4	5		
Socioeconomic Status	High	5	13	0.467	
	Low	11	18		
	Middle	12	14		

Geographical Location	Rural	19	23	0.159	
	Urban	9	22		
Smoking Status	Yes	10	12	0.413	
	No	18	33		
Substance Abuse	Yes	1	5	0.254	
	No	27	40		

The mean age of participants in Group 1 was significantly higher (55.73 ± 4.86 years) than in Group 2 (44.13 ± 6.32 years, $p < 0.001$). Gender distribution showed a slight predominance of males in both groups, but the difference was not statistically significant ($p = 0.499$). Similarly, no significant differences were noted in BMI categories, socioeconomic status, geographical location, smoking status, or substance abuse between the two groups (**Table 1**).

Table 2: Clinical Features and Presenting Symptoms

Variable		Group 1 (N=28)	Group 2 (N=45)	P-value	Notes
Symptom Duration (Days)		9.72 ± 1.77	7.35 ± 1.61	<0.001	Significant difference; Levene's p = 0.310
Temperature (°C)		36.76 ± 0.25	37.21 ± 0.24	<0.001	Significant difference; Levene's p = 0.810
Pulse (bpm)		84.16 ± 5.49	75.48 ± 4.56	<0.001	Significant difference; Levene's p = 0.447
BP Systolic (mmHg)		123.07 ± 9.67	115.97 ± 9.78	0.003	Significant difference; Levene's p = 0.887
BP Diastolic (mmHg)		84.03 ± 5.08	75.11 ± 4.74	<0.001	Significant difference; Levene's p = 0.979
Respiratory Rate (bpm)		20.05 ± 1.12	17.91 ± 0.94	<0.001	Significant difference; Levene's p = 0.089
Diagnostic Time (Hours)		14.38 ± 1.93	9.71 ± 1.88	<0.001	Significant difference; Levene's p = 0.637
Presenting Symptoms	**Bloating**	6 (21.4%)	11 (24.4%)	0.942	No significant difference; Chi-Square
	Constipation	6 (21.4%)	10 (22.2%)		
	Pain	8 (28.6%)	14 (31.1%)		

	Vomiting	8 (28.6%)	10 (22.2%)		
Physical Exam Findings	**Abdominal Distension**	10 (35.7%)	22 (48.9%)	0.547	
	Normal	6 (21.4%)	6 (13.3%)		
	Palpable Mass	2 (7.1%)	5 (11.1%)		
	Tenderness	10 (35.7%)	12 (26.7%)		
Comorbidities	**Diabetes**	2 (7.1%)	11 (24.4%)	0.179	
	Hypertension	7 (25.0%)	9 (20.0%)		
	Multiple	2 (7.1%)	6 (13.3%)		
	None	17 (60.7%)	19 (42.2%)		

Group 1 had significantly longer symptom duration (9.72 ± 1.77 days) compared to Group 2 (7.35 ± 1.61 days, $p < 0.001$). Other clinical parameters such as temperature, pulse, blood pressure (systolic and diastolic), respiratory rate, and diagnostic time were also significantly higher in Group 1 (all p-values < 0.005). Presenting symptoms like bloating, constipation, pain, and vomiting were similarly distributed across groups, with no significant differences ($p = 0.942$). Physical examination findings, including abdominal distension, tenderness, and palpable mass, showed no significant association between the groups. Comorbidities, such as diabetes, hypertension, and multiple conditions, were more prevalent in Group 2, but the differences were not statistically significant ($p = 0.179$) (**Table 2**).

Table 3: Distribution of Etiological Factors

Cause	Group 1 (N=28)	Group 2 (N=45)	Total (N=73)	P-value	Notes
Congenital bands	1 (3.6%)	4 (8.9%)	5 (6.8%)	0.111	No significant difference; Chi-Square
Foreign bodies/bezoars	3 (10.7%)	0 (0.0%)	3 (4.1%)		
Hernias	3 (10.7%)	12 (26.7%)	15 (20.5%)		
Inflammatory bowel diseases	2 (7.1%)	1 (2.2%)	3 (4.1%)		
Intussusception	4 (14.3%)	3 (6.7%)	7 (9.6%)		

Ogilvie Syndrome	0 (0.0%)	3 (6.7%)	3 (4.1%)		
Paralytic Ileus	3 (10.7%)	6 (13.3%)	9 (12.3%)		
Tumours	9 (32.1%)	9 (20.0%)	18 (24.7%)		
Volvulus	3 (10.7%)	7 (15.6%)	10 (13.7%)		
Total	28 (38.4%)	45 (61.6%)	73 (100.0%)		

Tumours were the most common cause of intestinal obstruction overall, accounting for 24.7% of cases. Hernias were more frequent in Group 2 (26.7%) compared to Group 1 (10.7%), while foreign bodies were seen exclusively in Group 1 (10.7%). Other causes, including volvulus, intussusception, congenital bands, and paralytic ileus, were distributed across groups without significant differences ($p = 0.111$). Ogilvie syndrome occurred only in Group 2 (6.7%), but its occurrence was not statistically significant (**Table 3**).

Table 4: Postoperative Outcomes and Surgical Findings

Variable	Category	Group 1 (N=28)	Group 2 (N=45)	P-value	Notes
Length of Stay (Days)		12.45 ± 2.94	7.76 ± 2.03	<0.001	Significant difference; Levene's p = 0.007
Complications	Anastomotic Leak	3 (10.7%)	3 (6.7%)	0.826	No significant difference; Chi-Square
	None	14 (50.0%)	24 (53.3%)		
	Wound Infection	11 (39.3%)	18 (40.0%)		
Recurrence Risk	No	19 (67.9%)	34 (75.6%)	0.473	
	Yes	9 (32.1%)	11 (24.4%)		
Mortality	No	28 (100.0%)	44 (97.8%)	0.427	No significant difference; Fisher's Exact Test
	Yes	0 (0.0%)	1 (2.2%)		
Surgical Findings	Hernia Repaired	4 (14.3%)	6 (13.3%)	0.507	No significant difference; Chi-Square
	No Significant Findings	5 (17.9%)	3 (6.7%)		

	Obstruction Resolved	13 (46.4%)	25 (55.6%)		
	Tumour Removed	6 (21.4%)	11 (24.4%)		

The mean length of hospital stay was significantly longer in Group 1 (12.45 ± 2.94 days) compared to Group 2 (7.76 ± 2.03 days, $p < 0.001$). Complications, such as anastomotic leak, wound infection, and recurrence risk, were evenly distributed across groups, with no significant differences observed. Mortality rates were low, with only one death recorded in Group 2, and no deaths in Group 1 ($p = 0.427$). Surgical findings indicated that obstruction resolution was the most common procedure in both groups, occurring in 46.4% of Group 1 and 55.6% of Group 2. Tumour removal and hernia repair were also common but did not differ significantly between groups ($p = 0.507$) (**Table 4).**

DISCUSSION

This study provides valuable insights into the demographic, clinical, and surgical differences between the two patient groups, shedding light on factors influencing the outcomes of intestinal obstruction in adults with a virgin abdomen.

The groups may differ by age; the ages of patients in Group 1 are higher, which can explain the severity and complexity of the condition. Previous studies reported the effect of ageing on intestinal obstruction, and older patients had features of complicated obstructions resulting in more complicated cases due to comorbidities and delayed diagnosis. However, other demographic factors, gender distribution, BMI, socioeconomic status, and lifestyle factors (smoking and substance abuse), showed no significant differences, indicating that these variables might not play a pivotal role in distinguishing between the groups.

The result also showed that Group 1 had more severe symptoms with longer duration, higher blood pressure, faster pulse rate and prolonged diagnostic times compared to Group 2. These findings suggest that Group 1 patients may experience more severe symptoms or delays in seeking medical attention. Similar findings have been reported in studies that correlate prolonged diagnostic times with worse clinical outcomes. Interestingly, presenting symptoms such as bloating, constipation, pain, and vomiting were comparable between the groups, reflecting the non-specific nature of intestinal obstruction symptoms that can complicate early diagnosis.[12,13,14]

Tumours were the most common cause of intestinal obstruction in both groups, consistent with findings in previous literature, which emphasize the rising prevalence of tumours as a leading cause,

especially in older populations.[15,16,17] Hernias were more common in Group 2, while foreign bodies were seen exclusively in Group 1. These variations may reflect underlying differences in the health profiles of the groups. The lack of significant differences in etiological distribution highlights the diverse and multifactorial nature of intestinal obstruction.

The hospital stay was significantly longer in Group 1, which implies a more complex and difficult surgical process. This finding supports previous research identifying longer hospital stays with increased age, comorbidities, and higher complication rates.[18,19,20] Even though the complication Group 1 patients had complications with a slightly higher frequency, like wound infections – these results were not statistically significant. Although Group 1 showed slightly higher rates of complications, including wound infections, these were not statistically significant. Recurrence risk and mortality rates were low and comparable between the groups, reflecting effective surgical management. Surgical findings tumour removal and hernia repairs were evenly distributed, suggesting similar approaches in addressing the underlying causes.

The findings of this study support studies where age and clinical severity were found to directly impact the outcomes of intestinal obstruction.[21,22,23] However, the fact that the recurrence rate and mortality rate between the two groups were relatively similar serves to support this argument that standardized surgical procedures, along with early invasive treatments, can greatly enhance patient outcomes. Studies have also underscored the need for early diagnosis and tailored postoperative care, particularly for older patients with comorbidities.[24,25,26]

CONCLUSION

The study underscores the variety of causes and management issues concerning intestinal obstruction in adult virgin abdomen patients. Tumours and hernias occurred as the leading causes, with noteworthy differences in clinical severity and recovery among patients managed surgically and those treated conservatively. Older age, prolonged symptom duration, and higher clinical severity were significant in surgically managed patients, leading to longer stays in the hospital. Overall recurrence and mortality were comparatively low, indicating adequate management. Therefore, it has been identified that early diagnosis and an individualised management plan are essential in improving outcomes in this unique patient population. In the future, more extensive samples and longer follow-ups should be investigated to further improvements in management. Future studies should focus on larger cohorts and long-term follow-ups to refine management strategies further.

LIST OF ABBREVIATIONS

None

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CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval for this study was obtained from the College of Physicians and Surgeons Pakistan (CPSP) Research Evaluation Unit (Ref: EPSP/REU/SGR-2020-022-11820, dated February 22, 2022).

PATIENT CONSENT

Written informed consent was obtained from all participants, and confidentiality and anonymity were strictly maintained.

AUTHORS' CONTRIBUTION

MAK: Conceptualization, study design, data collection, data analysis, drafting of the manuscript, and final approval of the manuscript. **MD:** Study design, data interpretation, supervision of the research process, drafting of the manuscript, and critical revision. **IUH:** Data collection, statistical analysis, literature review, drafting of the manuscript, and manuscript editing. **MF:** Literature review, questionnaire development, data management, drafting of the manuscript, and manuscript proofreading. **BARJ:** Clinical validation, patient recruitment, data interpretation, drafting of the manuscript, and critical revision. **UU:** Supervision, methodology guidance, results interpretation, drafting of the manuscript, and final manuscript approval.

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