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Etiological Spectrum of Ileal Perforation in Patients Presenting to Surgical Emergency

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ABSTRACT

Background: Ileal perforation is a serious surgical emergency where a full thickness defect develops in the ileal wall and intestinal contents leak into the peritoneal cavity. Knowledge about etiological spectrum of ileal perforation is important for early diagnosis and proper surgical management in emergency departments. **Objective:** To determine the etiological spectrum of ileal perforation in patients presenting to surgical emergency. **Study Design:** Cross sectional study. **Duration and Place of Study:** This study was conducted from 16 March 2025 to 16 June 2025 in Accident and Emergency Department of Khyber Teaching Hospital, Peshawar. **Methodology:** A total of 258 patients aged 18–70 years of both genders presenting with acute abdomen and requiring laparotomy for perforated viscus were included. Etiological causes were categorized as ischemia, inflammation, malignancy, traumatic, iatrogenic, foreign body associated and unknown cause. Data were analyzed using statistical package for social sciences version 25. **Results:** Mean age was 43.95 ± 15.79 years and mean body mass index was 27.84 ± 3.12 kilograms per square meter. Male patients were 166 (64.3%) and females were 92 (35.7%). Rural residents were 152 (58.9%) and urban residents were 106 (41.1%). Inflammation was most common cause 64 (24.8%), followed by ischemia 52 (20.2%), trauma 36 (14%), malignancy 19 (7.4%), diverticula associated 13 (5%), iatrogenic 13 (5%), and foreign body associated 4 (1.6%). **Conclusion:** Inflammation and ischemia were the most common causes of ileal perforation, while many cases remained without clear etiology.

INTRODUCTION

Ileal perforation is a serious surgical emergency characterized by a full-thickness defect in the ileal wall, resulting in leakage of intestinal contents into the peritoneum.[1] This condition is known to cause peritonitis and sepsis, and it is associated with significant morbidity if not treated in a timely fashion.[2] The ileum, being the distal part of the small bowel, is predisposed to a variety of pathological conditions that affect the integrity of the bowel wall. Patients with ileal perforation usually present with severe abdominal pain, abdominal distension, fever, and signs and symptoms of peritonitis.[3] This condition is mainly diagnosed based on clinical presentation, with imaging evidence such as pneumoperitoneum on abdominal X-rays and CT scans.[4]

The etiological spectrum for ileal perforation is extensive and varied, with various pathophysiological conditions that result in compromised integrity of the ileal wall.[5] One such cause is ischemic damage to the ileum, where compromised blood flow through the mesenteric vessels causes necrosis and ileal perforation.[6] This may be seen in conditions such as thrombosis of the mesenteric vessels or severe hypotension. Obstructive causes are another possible cause for ileal perforation due to increased intraluminal pressures from conditions such as intestinal obstruction caused by adhesions, volvulus, or stricture formation.[7] Erosive causes include inflammatory conditions such as Crohn's disease, where compromised integrity is seen due to chronic inflammation.[8] Similarly, infectious causes are common in developing countries, with typhoid fever being one of the most common causes for ileal perforation due to necrosis of Peyer's patches.[9]

Other etiologies that are part of the etiological spectrum include traumatic and iatrogenic injuries, and also malignant conditions.[10] Traumatic perforation may result from direct trauma to the abdominal region, either from a blunt trauma or a penetrating trauma.[11] Iatrogenic causes may result from endoscopic, surgical, and instrument-related injuries. Malignant conditions, both primary and secondary, may also affect the bowel wall and lead to perforation.[12]

Perforation of the ileum is a critical surgical emergency that is accompanied by considerable morbidity and

mortality. There is a scarcity of literature from Peshawar addressing the different aetiologies of perforation of the ileum. Hence, the present study was undertaken to highlight the aetiological spectrum of perforation of the ileum in the local population.

METHODOLOGY

A cross-sectional study was carried out in the Accident and Emergency department of Khyber Teaching Hospital, Peshawar. The study was conducted for a period from 16th March 2025 to 16th June 2025. Prior to start of the study, ethical permission was taken from the Institutional Review Board. The sample size was calculated by using OPENEPI sample size calculator. Considering the anticipated population proportion of 1.49% which was the frequency of least common etiology of perforated viscus due to unknown cause reported in previous study,[13] with confidence level 95% and margin of error 1.48%, the required sample size was calculated as 258 patients. Patients of both genders having age between 18–70 years and presenting to Accident and Emergency department with acute abdomen and requiring laparotomy for perforated viscus were included. Perforation was considered when a full thickness defect in intestinal wall was present. Patients presented with clinical suspicion including acute severe abdominal pain having visual analogue score 8–10, fever, nausea, vomiting, decreased bowel movement and guarding. Confirmation was made through radiological imaging showing intraperitoneal air under diaphragm on erect X-ray abdomen or CT abdomen/pelvis showing discontinuity of bowel wall, extraluminal air bubbles near bowel wall or abrupt bowel wall thickening with or without phlegmon. Patients who previously had laparotomy for some other condition, patients undergoing elective laparotomy procedures, those who were operated in other hospitals, and those patients who did not follow follow-up with histopathology reports were excluded from the study. After selection of eligible patients, written informed consent was taken from the patients or from legal guardians after explaining the objectives and procedure of the study. Detailed clinical history was taken by trained surgical resident at the time of presentation. Information regarding onset and nature of abdominal pain, associated symptoms, past surgical history and presence of comorbid conditions was obtained. Patients were clinically examined with focus on vital signs, abdominal tenderness, abdominal distension and signs of peritoneal irritation. Symptoms including acute abdominal pain, fever, nausea, vomiting, constipation, decreased bowel movement and guarding were also documented based on patient interview or available medical records. Presence of comorbid conditions such as diabetes mellitus, hypertension, atrial fibrillation, coronary artery disease and inflammatory bowel disease were also recorded.

After initial assessment, patients underwent necessary investigations including X-ray abdomen erect view and CT abdomen or pelvis when required. Patients diagnosed with suspected perforated viscus were shifted to operation theatre and emergency laparotomy was performed by consultant surgeon. During laparotomy the site of perforation and intra-abdominal findings were examined carefully and samples were sent for histopathology where required. Per operative findings along with radiological findings and clinical information were used to determine the etiological factor responsible for perforation. All observations were recorded on standardized data collection form and information was stored securely. Etiologies of perforated ileum were categorized into ischemia, inflammation, malignancy, traumatic, iatrogenic, foreign body associated and unknown cause. Iatrogenic perforation was considered when perforation occurred as result of medical or surgical intervention and it was identified from patient medical records or reports. Ischemic perforation was taken when insufficient blood supply caused necrosis of bowel wall and rupture which was identified during per operative examination. Malignant perforation is defined as perforation occurring due to the invasion of the ileal wall by a malignant tumor. The diagnosis is confirmed by an assessment done during surgery. Inflammatory perforation is diagnosed when an underlying condition such as Crohn's disease causes perforation of the ileal wall due to the weakening of the wall. The diagnosis is confirmed by an assessment done during surgery. Traumatic perforation is diagnosed when the perforation occurs as a result of trauma to the ileal wall. The diagnosis is confirmed based on the patient's history regarding the trauma. Foreign body-associated perforation is diagnosed when an object passes through the gastrointestinal tract and perforates the ileal wall. The diagnosis is confirmed based on the patient's history regarding the ingestion of the object. An unknown cause of perforation is diagnosed when no specific underlying cause is identified.

All collected data were entered and analyzed using SPSS version 25. Normally distributed continuous variables were presented as mean ± standard deviation while non-normal data were presented as median with interquartile range. Qualitative variables including gender, residence, socioeconomic status and etiology of perforated viscus were expressed as frequencies and percentages.

RESULTS

The study included a total of 258 patients, with a mean age of 43.95 ± 15.79 years and a mean BMI of 27.84 ± 3.12 kg/m^2. Among the study participants, majority were male 166 (64.3%) while female patients were 92 (35.7%). In terms of residential background, more than half of the patients were from rural areas 152 (58.9%), whereas urban residents constituted 106 (41.1%) of the total study population (Table-I).

Table I

Demographics of the study population

Demographics	Mean ± SD / n (%)
Age (years)	43.95 ± 15.79
BMI (kg/m^2)	27.84 ± 3.12
Gender	
Male n (%)	166 (64.3%)
Female n (%)	92 (35.7%)
Residence	
Rural n (%)	152 (58.9%)
Urban n (%)	106 (41.1%)

Regarding the comorbid conditions which was found among the patients, diabetes mellitus were the most

frequently observed comorbidity, it was present in 49 patients (19.00%), this was closely followed by hypertension which was seen in 47 patients (18.20%). Coronary artery disease were present in 14 patients (5.40%), and inflammatory bowel disease was found among 15 patients (5.80%). Atrial fibrillation was the least common among the recorded comorbidities and it was found in 12 patients only (4.70%) (Table-II).

Table II

Frequency of Comorbidities Among Patients with Ileal Perforation

Comorbidities	Frequency	% Age
Diabetes Mellitus	49	19.00%
Hypertension	47	18.20%
Atrial Fibrillation	12	4.70%
Coronary Artery Disease	14	5.40%
Inflammatory Bowel Disease	15	5.80%

With respect to the etiological distribution of ileal perforation, inflammation was the most commonest identified cause and it was responsible in 64 patients (24.8%), whereas ischemia was second most frequent etiology and was found in 52 patients (20.2%). Trauma were accounting for 36 cases (14%), and malignancy were identified in 19 patients (7.4%). Both diverticula associated perforation and iatrogenic causes was each present in 13 patients (5%), while foreign body associated perforation was least frequent among the identified etiologies and it was only found in 4 patients (1.6%). A notable proportion of cases that is 57 patients (22.1%) remains without a identifiable cause and were classified as unknown etiology (Table-III).

Table III

Etiological Spectrum of Ileal Perforation

Etiology	Frequency	% Age
Inflammation	64	24.8%
Ischemia	52	20.2%
Trauma	36	14%
Malignancy	19	7.4%
Diverticula Associated	13	5%
Iatrogenic	13	5%
Foreign Body Associated	4	1.6%
Unknown	57	22.1%

DISCUSSION

In the present study, the mean age of patients was found to be 43.95 ± 15.79 years, which indicates that ileal perforation occurs mainly in middle-aged people. This may be due to a decrease in immunity with age, along with increased exposure to various risk factors, infections, trauma, and malignancy, among others. Male patients were more frequently affected than females, with 166 patients (64.3%) compared with 92 females (35.7%). This may be due to increased exposure of males to environmental factors, trauma, and unhygienic food habits, which may increase the risk of bowel pathologies. Diabetes mellitus as a comorbidity was found in 49 patients (19.00%), which is an important risk factor for bowel perforation as diabetes mellitus compromises the perfusion of the bowel wall, leading to decreased immunity, which may result in bowel perforation. Hypertension was found in 47 patients (18.20%), and it is known that hypertension, if prolonged, may result in vascular compromise, leading to decreased mesenteric blood flow, which may result in ischemic changes in the bowel wall, leading to perforation. Inflammation was found in 64 patients (24.8%), which may result in full-thickness necrosis of the bowel wall, leading to perforation. In a significant number of patients, 57 (22.1%), no cause for bowel perforation was found, and they were categorized as unknown cause of bowel perforation, which may be due to diagnostic challenges in resource-constrained facilities. Ischemia was found in 52 patients, as decreased blood flow to the ileum may result in hypoxic damage, leading to necrosis of the bowel wall, resulting in perforation of the bowel wall.

The mean age of patients in present study was 43.95 ± 15.79 years, which is somewhat comparable to findings of Jameel *et al.* [14] who reported mean age of 41.4 ± 16.5 years, suggesting that ileal perforation predominantly affects middle aged adults. However, Singh *et al.* [15] and Jain *et al.* [16] reported younger mean ages of 31–40 years and 31 years respectively, this difference may be due to the fact that those studies included more typhoid related perforations which tends to affect younger population. Male predominance was observed in present study with 166 males (64.3%) and 92 females (35.7%), this finding is consistent with Singh *et al.* [15] who reported male to female ratio of 3.5:1 and Jain *et al.* [16] who found 89% male patients. Safirullah *et al.* [17] also reported similar male predominance with 352 males (61.1%). This consistent male predominance across studies can be explained by greater outdoor exposure, unhygienic dietary habits, and higher risk of trauma among males.

Regarding etiological spectrum, inflammation was the most common identified cause in present study 64 (24.8%), which is in agreement with Noonavath *et al.* [18] who found nonspecific inflammation in 78.57% of pediatric cases and Singh *et al.* [15] who reported non-specific ileitis as most common histopathological finding in 44% of cases. Ischemia was second most frequent etiology 52 (20.2%) in present study, however this finding was not prominently reported in most comparable studies, which may reflects the older mean age of patients in present study as ischemic bowel disease is more common in elderly and middle aged population with vascular comorbidities. Notably, a significant proportion of cases in present study 57 (22.1%) remained of unknown etiology, this is a important finding and may be because of limited diagnostic facilities and unavailability of advanced histopathological workup in resource constrained settings, similar diagnostic limitations was also highlighted by Krishna *et al.* [19] who emphasized challenges in identifying etiology in low and middle income countries.

Trauma was responsible in 36 patients (14%) in present study, which is comparatively higher than Bhanuprakash *et al.* [20] and Masud *et al.* [21] who reported trauma in 13% and 12% respectively, suggesting that traumatic ileal perforation carries a relatively consistent burden across different surgical centers. Malignancy was found in 19 patients (7.4%), which is somewhat similar to Krishna *et al.* [19] who reported malignancy in 5.8% of cases, and both findings suggest that malignancy though not the leading cause, remains a clinically important etiology of ileal perforation that should not be overlooked during evaluation.

The present study has a number of limitations that must be taken into consideration while interpreting the results. Firstly, the study was based on a cross-sectional study design from a single center. This might restrict the results from being generalized for a larger population or for different geographical locations. Secondly, the cross-sectional study design does not allow for the establishment of any causality between etiological factors and ileal perforation. Thirdly, the study sample size was relatively small. This might affect the results. Fourthly, the study was based on hospital records that might be incomplete.

CONCLUSION

The conclusion drawn from the study is that the disease is mostly prevalent among middle-aged males. The burden of the disease is greater in the rural population. The most common cause of the disease is inflammation/ischemia. A large number of cases were of unknown etiology.

REFERENCES

1. Ashok, E., Ekka, N. M., Sinha, D. K., Gaurav, K., Kumar, B., Ahmad, N., Kumar, D., Chandra, S., & Choudhary, P. P. (2024). Clinical presentations, treatments, and complications of Ileal perforation at a tertiary center: A cross-sectional study. *Cureus*. https://doi.org/10.7759/cureus.72027
2. Kumar, D., Garg, I., Sarwar, A. H., Kumar, L., Kumar, V., Ramrakhia, S., Naz, S., Jamil, A., Iqbal, Z. Q., & Kumar, B. (2021). Causes of acute peritonitis and its complication. *Cureus*. https://doi.org/10.7759/cureus.15301
3. Dev, S., Pokhrel, K. M., Mulmi, U., Devkota, S., Dev, B., & Bhattarai, A. (2023). Chicken bone-induced ileal perforation peritonitis mimicking duodenal perforation peritonitis: A case report. *Annals of Medicine & Surgery*, *85*(12), 6202-6205. https://doi.org/10.1097/ms9.0000000000001404
4. Bourakkadi Idrissi, M., & Dkhissi, Y. (2024). Pneumoperitoneum and Chilaiditi syndrome: Navigating a diagnostic conundrum. *Journal of Surgical Case Reports*, *2024*(2). https://doi.org/10.1093/jscr/rjae056
5. Sharma, A., Sharma, R., Sharma, S., & Jhanwar, A. (2012). Ileal perforation in a patient with acquired immune deficiency syndrome. *Indian Journal of Sexually Transmitted Diseases and AIDS*, *33*(2), 116. https://doi.org/10.4103/0253-7184.102123
6. Audu, C. O., Schechtman, D. W., & Davis, F. M. (2023). Mesenteric ischemia. *Clinics in Colon and Rectal Surgery*, *37*(06), 417-423. https://doi.org/10.1055/s-0043-1777667
7. Kushram, B., Kori, A., Thakur, D. K., Kumar, A., & Singh, M. (2025). Assessment of intestinal obstruction: Clinical presentation, pathological findings and management. *Bioinformation*, *21*(04), 892-896. https://doi.org/10.6026/973206300210892
8. Li, Q., & Wang, J. (2024). The effect of protein nutritional support on inflammatory bowel disease and its potential mechanisms. *Nutrients*, *16*(14), 2302. https://doi.org/10.3390/nu16142302
9. Eswaravaka, S., Suhrid, C., Rao, B., Prabhakar, S., & Pandya, J. (2024). Revisiting physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM) and Portsmouth-POSSUM (P-POSSUM) scores: Are they valid in cases of Ileal perforation? *Cureus*. https://doi.org/10.7759/cureus.65733
10. Hameed, T., Kumar, A., Sahni, S., Bhatia, R., & Vidhyarthy, A. K. (2020). Emerging spectrum of perforation peritonitis in developing world. *Frontiers in Surgery*, *7*. https://doi.org/10.3389/fsurg.2020.00050
11. Skelhorne-Gross, G., & Kenny, J. (2023). Blunt and penetrating injury to the bowel: A review. *Clinics in Colon and Rectal Surgery*, *37*(06), 424-429. https://doi.org/10.1055/s-0043-1777668
12. Lee, S. B. (2026). Iatrogenic colon perforation: Endoscopic management or surgery. *Clinical Endoscopy*, *59*(1), 33-39. https://doi.org/10.5946/ce.2025.182
13. Onken, F., Senne, M., Königsrainer, A., & Wichmann, D. (2022). Classification und treatment algorithm of small bowel perforations based on a ten-year retrospective analysis. *Journal of Clinical Medicine*, *11*(19), 5748. https://doi.org/10.3390/jcm11195748
14. Jameel, A., Anwar, I., & Laique, M. H. (2023). Etiological spectrum of surgical acute abdomen among patients attending emergency department. *Pakistan Journal of Medical and Health Sciences*, *17*(5), 94-96. https://doi.org/10.53350/pjmhs202317594
15. Singh, S., Satsangi, A., Yadavalli, S. D., Singh, B., & Patil, G. (2020). Nontraumatic small bowel perforation: A review of demographics, aetiological factors, clinical presentation, radiological findings along with hematological and histopathological evaluation. *World J Surg Surgical Res. 2020; 3*, *1244*.
16. Jain, D. N. (2024). A study to evaluate clinico-etiological factors responsible for small bowel perforation. *African Journal of Biomedical Research*, 1508-1513. https://doi.org/10.53555/ajbr.v27i3s.2338
17. Ullah, S., Khan, M., Mumtaz, N., & Naseer, A. (2009). Intestinal obstruction: a spectrum of causes. *Journal of Postgraduate Medical Institute*, *23*(2). https://www.jpmi.org.pk/index.php/jpmi/article/view/87
18. Noonavath, R, Verma, A, Ratan, S. K. (2026). A retrospective review of ileal perforation in children – 5 years audit from tertiary care centre. *J Neonatal Surg*, **15(1)**:53-58. https://www.jneonatalsurg.com/index.php/jns/article/view/9935
19. Njarekkattuvalappil, S. K., Thomas, M., Kapil, A., Saigal, K., Ray, P., Anandan, S., Nagaraj, S., Shastri, J., Perumal, S. P., Jinka, D. R., Thankaraj, S., Ismavel, V., Zachariah, P., Singh, A., Gupta, M., Ebenezer, S. E., Thomas, M. S., Ghosh, D., Kataria, K., … John, J. (2021). Ileal perforation and enteric fever: Implications for burden of disease estimation. *The Journal of Infectious Diseases*, *224*(Supplement_5), S522-S528. https://doi.org/10.1093/infdis/jiab258
20. Bhanuprakash, K. R, Aruna, M. S, Shetty, K. K. (2018). Clinical study and management of small bowel perforation in a tertiary care teaching institute. *International Surgery Journal*, *5*(3), 855. https://doi.org/10.18203/2349-2902.isj20180481
21. Masud, M., Khan, A., Adil, M., Gondal, Z. I., Aquil, A., Jahangeer, M. H., & Baig, S. (2016). Etiological spectrum of perforation peritonitis. *Pakistan Armed Forces Medical Journal*, (5), 756.