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Original Research Article

Epidemiological incidence and clinicopathological features of gastrointestinal perforation in tertiary care centre

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ABSTRACT

Background: Gastrointestinal (GI) perforations remain life-threatening surgical emergencies, particularly in developing countries. The present study aims to evaluate the incidence, clinical profile and histopathological characteristics of GI perforations and their association with morbidity and mortality.
Methods: This prospective observational study included 64 patients diagnosed with gastrointestinal perforations and operated upon at a tertiary care institute in North India between August 2023 and February 2025. Clinical, intraoperative and histopathological data were recorded and analyzed.
Results: The most commonly affected age group was 21-30 years (23.43%), with a male predominance (60.94%). Ileum was the most frequent perforation site (60.9%) followed by jejunum (17.2%) and duodenum (9.4%). The predominant causes of perforation were found to be infectious (typhoid and tuberculosis) accounting for 57.8%, followed by peptic ulcer (10.9%) predominantly with neoplasm/malignancy, obstructive pathologies, iatrogenic and ischemia being the other causes.
Conclusions: GI perforations predominantly affect young males from lower socioeconomic strata and present most commonly in the ileum. Histopathology remains essential for etiological classification along with guiding both clinical management and preventive strategies. Early surgical intervention is key to reducing mortality.

Keywords: Gastrointestinal perforation, Histopathology, Ileal perforation, Mortality, Peritonitis, Typhoid

INTRODUCTION

Gastrointestinal (GI) perforations are life-threatening surgical emergencies characterized by a breach in the continuity of the GI tract wall resulting in leakage of gastrointestinal contents into the peritoneal cavity and subsequent peritonitis and sepsis.[1] Globally, the most common causes of GI perforation include peptic ulcer disease, diverticulitis, malignancies, inflammatory bowel disease, traumatic injuries and the use of non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids and anticoagulants.[2] In developing nations, infectious causes such as typhoid and tuberculosis also constitute a significant proportion of cases. Therefore, tailored preventive strategies and early diagnosis protocols are essential for effective resource utilization in resource-constrained healthcare settings.[3] Traumatic perforations are more frequently seen in the jejunum, whereas infectious perforations due to typhoid and tuberculosis predominantly affect the ileum.[4] Although such conditions are often well managed in developed countries, they continue to be a major contributor to premature mortality in low- and middle-income countries. There are also seasonal variations in etiology: peptic ulcer-related perforations are more common in winter and autumn, typhoid in rainy and summer seasons,

while traumatic perforations typically exhibit no seasonal preference.[4] It is estimated that approximately 72,000 deaths in India annually result from acute abdominal conditions, with 71% of these deaths occurring at home due to limited access to surgical care. States such as Kerala show better outcomes compared to eastern states like Odisha, Tripura and West Bengal.[5] Unlike in Western countries, where elderly patients are more commonly affected, GI perforations in India predominantly occur in younger males, often presenting after a delay of more than 24 hours, which increases the risk of complications and mortality. The highest incidence is noted in the second and third decades of life.[4]

Males and individuals from lower socioeconomic groups are more frequently affected.[6] Delayed presentation, along with comorbidities such as malnutrition and renal dysfunction, further complicates management. Therefore, early diagnosis, timely surgical intervention and adequate preventive strategies particularly for infectious causes are essential for improving outcomes.[7]

Among small bowel perforations, the ileum is the most frequently involved site, followed by the duodenum and jejunum. Around 94% of cases present with a single perforation, while approximately 6% have multiple perforations.[8] Clinical features range from classical symptoms such as abdominal pain, fever, nausea and vomiting to asymptomatic cases identified incidentally through imaging.[9]

Common electrolyte abnormalities include hyponatremia, hypokalemia and elevated serum creatinine levels. Initial management should involve prompt fluid resuscitation, correction of electrolytes and administration of broad-spectrum antibiotics. In India, exploratory laparotomy remains the mainstay of surgical treatment.

Diagnostic modalities include chest X-ray, abdominal X-ray (erect), ultrasonography (USG) and contrast-enhanced computed tomography (CECT) of the abdomen. Pneumoperitoneum is observed in 79% of X-rays, while multiple air-fluid levels are seen in approximately 28% of cases. Water-soluble contrast media offer higher diagnostic accuracy in confirming luminal leaks when X-ray findings are inconclusive. CECT is even more sensitive, capable of detecting small amounts of free air and providing additional information about abscesses, phlegmon, peritoneal fluid, foreign bodies or underlying malignancies.[10] While USG may be useful in settings where radiation exposure is a concern (e.g., pregnancy), it is less reliable due to operator dependency and reduced sensitivity in obese or uncooperative patients or those with subcutaneous emphysema.[11]

Surgical management varies based on the site of perforation and commonly includes omental patch repair, primary closure, resection with anastomosis and Billroth procedures, with or without ileostomy.[12] Postoperative complications may include surgical site infections, intra-abdominal collections, electrolyte imbalances, burst abdomen and anastomotic leaks.[4] Colonic perforation, a rare but serious complication of colonoscopy, occurs in approximately 0.1%-0.9% of procedures, most commonly at the rectosigmoid junction. Mechanisms include hydrostatic or pneumatic injury or electrocoagulation. Post-operative complications significantly affect recovery by increasing morbidity, prolonging hospitalization and elevating mortality risk. Failed closure of perforations may lead to worsening sepsis or rupture of adjacent bowel loops, necessitating urgent surgical intervention. Patients with comorbid conditions such as cardiovascular or metabolic disease experience even higher mortality. Conversely, successful closure is associated with shorter hospital stays and better outcomes.[13]

Despite ongoing advances in surgical care, challenges such as delayed presentation and limited healthcare infrastructure continue to impact outcomes adversely in developing regions. Existing literature largely reflects urban or well-resourced populations, whereas data from semi-urban or rural regions especially border districts remain sparse. Therefore, this study aims to evaluate the clinical and histopathological characteristics of gastrointestinal perforations in such settings, to guide better preventive strategies, surgical decision-making and patient prognostication.

METHODS

Study design

This study was prospective observational study.

Study setting

This study was conducted in the Department of General Surgery at Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar.

Study duration

The study duration was from 1st August 2023 to 28 February 2025.

Study participants

All patients who met inclusion criteria were enrolled for the study after providing informed consent. Causes and sites for perforation (e.g., enteric fever, nonspecific inflammation, tuberculosis, etc.) were considered. Exploratory laparotomy followed by the appropriate method of repair was performed and data was recorded clinically.

Inclusion criteria

Male and female patients above 18 years of age. All patients with acute abdomen diagnosed as gastrointestinal perforations.

Exclusion criteria

Patients who refused to give consent for surgery.

Data collection

History: Demographic information and past medical history.

Risk factors: History of typhoid disorder, small bowel malignancies, smoking, alcohol intake or drug abuse.

Clinical examination findings

Investigations: CBC, ABO-RH, RBS, RFTs and electrolytes.

Radiological investigations: CXR, abdominal X-ray, ultrasound, CT, etc.

Treatment and operative findings, histopathological findings.

Operative findings

Number of perforations and type of surgery performed were documented.

Statistical analysis

Data was collected in the study proforma and compiled at the end of the study. Descriptive statistics (mean and standard deviation) were calculated for continuous variables, while frequencies and percentages will be used for categorical variables. The level of significance was also noted.

RESULTS

The highest incidence was observed in the 21-30 years age group (23.43%), followed by 31-40 years (18.75%) and 51-60 years (17.18%). The lowest incidence is seen in the ≤20 years and 61-70 years age groups (9.37% each). Patients were between 18 and 87 years old, with an average age of 42.85±19.04 years.

Table 1: Age-wise distribution of gastrointestinal perforation cases.

Age group (in years)	Frequency	%
≤20	6	9.37
21-30	15	23.43
31-40	12	18.75
41-50	7	10.93
51-60	11	17.18
61-70	6	9.37
>70	7	10.93
Total	64	100.0

Table 2: Anatomical distribution of gastrointestinal perforation sites.

Perforation site	Frequency	%
Ileum	39	60.9
Jejunum	11	17.2
Duodenum	6	9.4
Colon	3	4.7
Gastric	2	3.1
Appendix	1	1.6
Caecum	1	1.6
Rectum	1	1.6
Total	64	100.0

Table 3: Duration of symptoms in gastrointestinal perforation cases.

Duration of symptoms (days)	Frequency	%
<5	53	82.8
5-10	9	14.1
>10	2	3.1
Total	64	100.0

The most commonly affected site is the ileum (60.94%), followed by the jejunum (17.2%) and the duodenum (9.4%). Perforations in the colon (4.7%), caecum (1.6%), appendix and rectum are relatively rare (1.6% each).

The majority of cases (82.8%) reported symptoms lasting less than 5 days, while 14.1% had symptoms persisting between 5-10 days. A small proportion (3.1%) experienced symptoms for more than 10 days before presentation. Symptoms lasted from 1 to 15 days, with an average of 3.07±2.56 days before treatment.

The primary etiopathological cause of gastrointestinal perforation were divided into traumatic injuries (9.4%) and in non-traumatic infectious (57.8%), followed by peptic ulcer/drug-induced (10.9%). Neoplastic obstruction (9.4%) and mechanical obstruction (7.8%) were also significant contributors, while ischaemic (3.1%) and congenital/diverticular causes (1.6%) were less common.

Table 5 shows that primary closure was the most common approach (46.88%), followed by resection anastomosis (12.5%) and Graham's patch repair (12.5%). Procedures involving stoma formation, like right hemicolectomy with ileostomy (9.38%) and primary closure with ileostomy (6.25%), were used in more complex cases. Less frequent interventions, including Hartmann's procedure, appendicectomy and various colectomies, each accounted for 1.56%.

The majority of cases (65.6%) had perforations measuring between 1-2 cm, while smaller perforations <1 cm were 17.18% and larger perforations (>2 cm) accounted for 17.18 % each. The size ranged from 0.5 cm to 5 cm, with an average between 2±0.59 cm.

Table 4: Etiopathological causes of gastrointestinal perforation.

Etiopathological causes		Frequency	%
Traumatic	Blunt trauma	5	7.8
	Iatrogenic	1	1.6
Non traumatic	Infectious	37	57.8
	Peptic ulcer /Drug Induced	7	10.9
	Neoplastic/Obstruction due to malignancy	6	9.4
	Mechanical obstruction	5	7.8
	Ischaemic perforation	2	3.1
	Congenital/diverticular	1	1.6

Table 5: Surgical treatment modalities for gastrointestinal perforation.

Treatment	Frequency	%
Primary closure	30	46.88
Primary closure with ileostomy	5	7.81
Resection anastomosis	8	12.50
Resection anastomosis with ileostomy	2	3.13
Graahm's patch repair	8	12.50
Right hemicolectomy with ileostomy	6	9.38
Left hemicolectomy with ileostomy	1	1.56
Sigmoid colectomy with colostomy	1	1.56
Appendicectomy	1	1.56
Hartmann's procedure	1	1.56
Colostomy	1	1.56
Total	64	100.00

Table 6: Distribution of perforation size in gastrointestinal perforation cases.

Perforation size (cm)	Frequency	%
<1	11	17.18
1-2	42	65.6
>2	11	17.18
Total	64	100.0

Table 7: Impact of perforation size on patient outcomes in gastrointestinal perforation cases.

Perforation size (cm)	Discharged		Death		Total	P value
	Number	%	Number	%		
<1	9	81.81	2	18.19	11	
1-2	38	90.47	4	6.25	42	0.609
>2	9	81.81	2	18.19	11	

Table 8: Effect of symptom duration on patient outcomes.

	Discharged		Death		Total	P value
Duration of symptoms (days)	**Number**	**%**	**Number**	**%**		
<5	55	93.22	4	7.28	59	
5-10	1	33.33	2	66.66	3	<0.001
>10	0	0	2	100.0	2	

Table 7 examines the impact of perforation size on patient outcomes in gastrointestinal perforation cases. Patients with small perforations (<1 cm) had a mortality rate of 18.19%, with 81.81% of patients being successfully discharged. Medium-sized perforations (1-2 cm) showed the best outcomes, with 90.47% of patients discharged and a 6.25% mortality rate.

Table 9: Correlation between impact of complications on the length of hospital stay.

	Length of stay (days)							P value
	<10 days		10-20 days		>20 days		Total	
Complications	**Number**	**%**	**Number**	**%**	**Number**	**%**		
No complication	11	79	6	15	0	0	17	<0.001
Complications	3	21	35	85	9	100	47	
Total	14	100	41	100	9	100	64	

For large perforations (>2 cm), the outcomes were similar to small perforations, with 81.81% of patients discharged and an 18.19% mortality rate. However, the p-value (0.609) indicates that the relationship between perforation size and patient outcomes is not statistically significant, suggesting that factors other than perforation size may play a more critical role in influencing patient outcomes.

This table shows impact of the duration of symptoms affects recovery in gastrointestinal perforation cases. Patients who received treatment within 5 days had the best outcomes with 93.22% discharged and only 7.28% deaths.

However, those with symptoms lasting 5-10 days had a significantly higher death rate (66.66%) with only 33.33% of patients discharged. Patients who waited more than 10 days had the worst outcomes with 100% mortality and no survivors. The p value (<0.001) indicates a statistically significant difference interpreting that early treatment is strongly associated with improved survival rates in gastrointestinal perforation cases.

DISCUSSION

Gastrointestinal perforation remains one of the most critical surgical emergencies, often presenting with acute abdomen and high morbidity and mortality if not managed timely. The condition requires prompt diagnosis and definitive surgical intervention, as delays significantly impact patient outcomes.

Various factors including the site of perforation, etiology, duration of symptoms and associated comorbidities play a crucial role in determining the prognosis. The present study was conducted to analyze the demographic patterns, clinical presentation, etiological distribution, surgical management and postoperative outcomes of gastrointestinal perforations while comparing the findings with existing literature. The observations from this study not only reinforce the already established concepts but also provide additional insights that may be able to help refine current surgical approaches and improve patient outcomes. In this study, both Kuppuswamy Socioeconomic Status (SES) Scale and Modified BG Prasad Scale were used to classify cases based on their socioeconomic background. The Kuppuswamy Scale was applied to urban and semi-urban populations, considering parameters such as education, occupation and total monthly family income, while the BG Prasad Scale, which is more appropriate for rural populations, classified patients based on per capita monthly income with adjustments for inflation.

The dual use of these scales allowed for a more comprehensive assessment of SES-related disparities and ensured that both urban and rural patients were categorized appropriately based on their financial and educational backgrounds.[14] In the present study, gastrointestinal perforation was most common in the 21-30 years age group (23.43%), followed by 31-40 years (18.75%) and 51-60 years (17.18%) with a mean age of 42.85±19.04 years as depicted in Table 1. It suggested that young and middle-aged adults were predominantly affected. This pattern closely matches findings by Chanania et al, who reported that 50% of cases occurred in the 21-40 years range, with a mean age of 37.91±13.15 years.[6] Similarly, Gupta et al reported a mean age of 39.44 years, though they observed the highest incidence above 50 years (36.5%), followed by 21-30 years (26%).[15] Arivuselvam et al and Narayanan et al noted an older population being more affected, with 45% and the majority of cases, respectively, occurring in those over 50 years.[16,17]

In contrast, studies by Francis et al found the most common age group to be 21-30 years supporting our finding.[18] Shakya et al reported a mean age of 37.02 years while Munim et al recorded a mean age of 38.6±14.0 years, both consistent with our result.[19,20] Pattanam et al also found the highest incidence (45%) in the 20-40 years group and Ramachandra identified the 31-40 years age group as most affected.[21,22] A contrasting demographic was seen in the Taiwanese study by Su et al, which reported a mean age of 59.3 years and significantly higher mortality among elderly patients.[26]

Lastly, Thirumalagiri et al documented a mean age of 39.84±16.05 years, with the majority of cases (42%) above 50 years, reflecting a bimodal distribution.[23] These variations highlight that while infectious causes such as typhoid and tuberculosis predominantly affect younger individuals in developing countries, degenerative and drug-induced causes tend to affect older populations in more developed healthcare systems.

Table 2 suggests that most frequently involved anatomical site in this study was the ileum which was seen in 60.94% of cases, followed by the jejunum (17.2%), duodenum (9.4%), colon (4.7%) and stomach

(1.56%), with a few involving the appendix and other sites. This pattern reflects the ongoing impact of infectious etiologies particularly typhoid and tuberculosis in endemic regions. Similar findings were observed by Singh S, Gupta et al, Thirumalagiri et al and Jade et al, who also reported ileal and small bowel predominance in their studies.[15,23,27,28]

In contrast, Kumar et al and Arivuselvam et al documented duodenal and gastric perforations as the most common sites in their respective cohorts, likely indicating a higher burden of peptic ulcer disease in the populations studied by them.[6,16,17] A mixed distribution pattern was noted by Parimal and Gupta et al, with involvement of both upper GI (gastric, duodenal) and lower GI (ileal, colonic, appendicular) sites.[16,24] These differences sufficiently highlight how regional variation in infectious disease burden, NSAID use and healthcare access influence the anatomical distribution of gastrointestinal perforations. Table 3 and Table 8 suggests clear association between delayed presentation and poor outcomes emerged in the cohort evaluated in this study. Most patients (82.8%) reached the hospital within 5 days of symptom onset, while 14.1% presented between 5-10 days and 3.1% came after 10 days. Outcomes worsened sharply with delay as mortality rose from 6.78% in early presenters to 66.66% after 5-10 days and 100% beyond 10 days. This correlation was statistically significant ($p<0.001$) thus underscoring how even moderate delays can drastically affect prognosis.

Similar patterns have been reported by Ramachandra who linked financial limitations and lack of awareness to delayed hospital visits and higher death rates.[22] Shakya et al also noted that 78.6% of patients presented after 24 hours which resulted in increased complications and poorer outcomes.[19] In another study by Munim et al delayed presentation beyond 48 hours was significantly associated with sepsis, wound complications and higher mortality.[20] Likewise Francis et al observed that most patients presented late and developed generalized peritonitis while early intervention notably reduced morbidity and mortality.[18] Taken together, these findings sufficiently reinforce the critical importance of early diagnosis and prompt surgical management in reducing complications and saving lives in gastrointestinal perforation cases.

As depicted in Table 4, Infective causes were the most common etiology in this cohort accounting for 57.8% of gastrointestinal perforations. They were primarily due to tuberculosis (20.3%) and typhoid fever (15.6%) with a strong predilection for the ileum. This was followed by peptic ulcer or drug-related causes (10.9%), malignancy and obstructive lesions (9.4%) and traumatic injuries (7.8%), while ischemic, congenital and iatrogenic causes were less frequent.

NSAID use was identified in 6.25% of cases and 10.9% of patients had an underlying malignancy. These trends strongly reflect patterns seen in multiple studies. Kumar et al, Masud et al, Dhanapal et al, Yusuf et al and Zia et al all reported typhoid and tuberculosis as dominant infective causes particularly in ileal perforations.[6,21,25,29,30] In contrast peptic ulcer-related perforations were more common in studies such as Devi et al, Gupta et al, Anish et al and Francis et al where gastroduodenal ulcers made up 36% to 70% of cases.[15,17,18,24] Contributing factors included NSAID use, alcohol and smoking especially in younger male populations, as highlighted by Anish et al.[17]

Iatrogenic perforations though rare here, are increasingly recognized. Tam et al, Jung et al, Holmer et al, all reported significant numbers of endoscopy-related perforations, especially during colonoscopy or therapeutic upper GI procedures with high surgical intervention rates and associated mortality if diagnosis was delayed.[31-33] Lastly, malignancy-associated perforations though uncommon were consistently noted by Parimal.[24] They were particularly seen in colonic lesions. Overall, the spectrum of etiologies observed here reflects both classic infective patterns still prevalent in the Indian subcontinent and emerging iatrogenic and malignant causes seen with increasing access to invasive diagnostics and aging populations.

Table 5 outlines the various treatment methods applied in the management of these perforations. Primary closure was the most frequently performed surgical procedure in our study (46.88% cases). More complex interventions such as resection with anastomosis (12.5%), Graham's patch repair (12.5%) and right hemicolectomy with ileostomy (9.38%) were chosen based on the location and extent of perforation, bowel viability and contamination. Stoma-based procedures like primary closure with ileostomy, resection with ileostomy and various colectomies were reserved for gross contamination or unstable patients.

A diversion colostomy was performed in a single case of ca cervix with rectal perforation as a palliative procedure. These patterns are consistent with the surgical strategies employed in several studies. Yashaswi et al proposed detailed guidelines for choosing between primary closure and ileostomy in ileal perforations based on presentation delay, contamination and proximity to the ileocecal junction.[35] Similarly, Gupta et al reported a predominance of omental patch repair (63.5%), simple closure and resection with anastomosis.[15]

Thirumalagiri et al also observed a preference for omental patch closure (63.54%) and simple closure (11.46%), with ileostomy and resection reserved for more severe or delayed cases.[23] Dhanpal highlighted that primary closure with lavage was the most commonly used approach in their patients, emphasizing early surgical intervention to reduce complications.[21] In the study by Shakya et al, omental patch repair (37.4%) for

duodenal perforations were the most frequent procedures.[19]

Lastly, Zia et al found that stoma formation (42.5%) was most commonly required in their cohort of mostly ileal perforations, followed by primary closure (16.4%) which mirrors the high infective burden seen in this region.[25] These collective findings suggest that while primary closure remains the mainstay of treatment, stoma-based and resection procedures are crucial for managing perforations in patients with delayed presentation, poor general condition or significant contamination.

Individualized surgical decision-making guided by intraoperative findings and physiological status of the patient is essential to optimize outcomes.

Table 6 and 7 depict that perforation size played a notable role in the clinical course of patients. The majority of cases (65.6%) had perforations measuring 1-2 cm, while 17.18% each had perforations smaller than 1 cm and larger than 2 cm. When outcomes were assessed against perforation size, the 1-2 cm group showed the best prognosis, with a discharge rate of 90.47% and a mortality rate of just 6.25%. In contrast, both <1 cm and >2 cm perforations had identical mortality rates of 18.19%, despite differing in size. However, this association between perforation size and mortality was found to be statistically insignificant (p=0.609). Correlation with hospital stay showed that larger perforations (>2 cm) were associated with longer durations of hospitalization, while smaller perforations (<1 cm) typically required shorter hospital stays.

The 1-2 cm group, which formed the bulk of the cohort, largely fell within the 10–20-day hospital stay range, reflecting an overall better recovery profile in this subset. Findings from our study showed that 1-2 cm perforations had the best outcomes, with a discharge rate of over 90% and both <1 cm and >2 cm perforations were associated with higher mortality (18.19%). Although this association did not reach statistical significance but a clear clinical trend was observed where larger perforations led to longer hospital stays and more complex post-operative courses. Similarly, Vinod et al reported a median hospital stay of 13 days with longer durations seen in patients with post-operative complications particularly when the perforations were large, delayed or associated with septicemia.[35] Together, these findings reinforce the importance of early intervention and highlight how perforation size, though not always statistically significant can still be a strong clinical marker of disease severity and resource utilization.

Most patients in this series were hospitalized for 10-20 days (64.06%), with a mean duration of 14.04±0.78 days and a range of 6 to 37 days. Shorter stays (≤10 days) were seen in 21.88% of cases, while 14.06% required hospitalization beyond 20 days. A statistically significant association was noted between presence of complications and prolonged hospital stay (p=0.001). Patients who developed sepsis, wound infections, burst abdomen or anastomotic leaks had a markedly longer mean hospital stay (15.92 days) compared to those without complications (11.9 days).

Kumar et al and Vinod et al noted a median stay of 13 days with extensions linked to septicemia and wound healing delays.[35] Studies by Mamun et al, Francis et al, Shakya et al also emphasized that delayed presentation, generalized peritonitis and infective complications were key drivers of extended hospital stays[18-20]

Devi et al highlighted that patient with colonic trauma and septic complications experienced significantly prolonged admissions.[24] Collectively, these observations support the conclusion that while perforation size and etiology play important roles, it is the development of postoperative complications that most significantly influences the length of hospitalization in gastrointestinal perforation cases. A statistically significant association was observed between the duration of symptoms prior to hospital presentation and patient outcomes (p<0.001). Patients presenting within 5 days had the most favorable outcomes with a discharge rate of 93.22%.

In contrast, those who presented between 5-10 days had a mortality rate of 66.66% and all patients who presented after 10 days succumbed resulting in a 100% mortality rate in that group. These findings strongly highlight the critical importance of early diagnosis and surgical intervention in managing gastrointestinal perforation. This observation aligns well with multiple studies in literature.

Similarly, Munim et al demonstrated a statistically significant increase in postoperative complications and mortality among patients presenting after 48 hours (p<0.05) especially in cases requiring extensive procedures like resection with anastomosis.[20] Arivuselvam et al also emphasized that early admission and prompt surgical intervention were directly associated with more favorable outcomes, while deaths were predominantly seen in patients with ileal and gastric perforations who presented late.[16] Together, these findings confirm that delayed presentation leads to systemic deterioration, sepsis and increased surgical complexity, while early intervention significantly improves survival and reduces complications.

Despite the strengths of this prospective observational study, several limitations must be acknowledged. The sample size was relatively small and confined to a single tertiary care center, which may limit generalizability to broader populations. Data from rural or remote healthcare centers were not included which possibly underrepresented certain etiological trends. Additionally, as an observational study, potential confounding factors such as nutritional status, comorbidities and prior

healthcare access were not fully controlled for, which could influence clinical outcomes.

CONCLUSION

This study highlights the epidemiological trends, clinical presentation and histopathological spectrum of gastrointestinal perforations in a tertiary care setting. The findings underscore the predominance of infectious etiologies in younger populations, particularly in resource-constrained regions. Timely surgical intervention was associated with markedly improved outcomes, affirming the critical need for early diagnosis and prompt management. By correlating histopathological findings with clinical profiles, the study adds valuable insight into the etiological classification of GI perforations which can inform future preventive and therapeutic strategies which may ultimately lead to advances in understanding in the field of emergency abdominal surgery.

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