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Acute Abdomen: Analysis of Clinical & Radiological Profile & Its Management

Saddam Hussain^{1*}, Bijit Gogoi² & Udhab Mandal¹

¹Department of General Surgery, Jorhat Medical College & Hospital, Jorhat, Assam, India

²Department of General Surgery, Pragjyotishpur Medical College & Hospital, Guwahati, Assam, India

HIGHLIGHTS

- Appendicitis predominated clinically
- Clinical diagnosis accurate
- Ultrasonography improved accuracy
- Timely surgery effective
- Low postoperative mortality

Key Words:

Acute abdomen
Clinical diagnosis
Radiological imaging
Laparotomy
Surgical outcome

ABSTRACT

Introduction: Acute abdomen is a time-sensitive clinical syndrome requiring prompt evaluation to identify surgical pathology and prevent complications. Clinical examination and imaging jointly guide diagnosis, operative planning, and outcome. **Aim & Objective:** To analyse the clinical and radiological profile of acute abdomen, identify its aetiologies and presentations, describe management, and assess the diagnostic accuracy of clinical and radiological findings against intraoperative observations. **Materials & Methods:** This hospital-based cross-sectional study was conducted in the Department of General Surgery, Jorhat Medical College and Hospital, Assam, from November 2023 to October 2024. One hundred consecutive patients aged above 12 years presenting with acute abdomen and undergoing laparotomy were enrolled. Pregnant, traumatic, urological, and gynaecological cases were excluded. Clinical findings, laboratory investigations, abdominal radiography, ultrasonography, computed tomography, operative findings, procedures, and outcomes were recorded. Data was analysed using descriptive statistics, chi-square test, and Student's t-test. **Results:** The mean age was 39.20 ± 15.85 years, and 41–50 years was the commonest age group. Abdominal pain and tenderness occurred in 100%, vomiting in 74%, fever in 55%, and guarding in 76%. Acute appendicitis was the commonest operative diagnosis (46%), followed by perforative peritonitis and intestinal obstruction. Clinical diagnosis of appendicitis showed 96% accuracy, 100% sensitivity, and 92.6% specificity, while ultrasonography showed 97% accuracy, 100% sensitivity, and 94.44% specificity. Clinical diagnosis of intestinal obstruction achieved 94% accuracy, while plain radiography showed a 94.44% diagnostic yield. Overall, 97% of patients were discharged, while mortality was 3% across the included surgically managed patient population. **Conclusion:** Systematic clinical assessment, appropriate imaging, and timely individualized surgery provided high diagnostic reliability and favourable outcomes in acute abdomen.



* Corresponding Author: Saddam Hussain, e-mail: mshussain2011@rediffmail.com

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INTRODUCTION

Acute abdomen is a clinical syndrome characterized by sudden abdominal pain with local or systemic features that may indicate serious intra-abdominal disease. It is not a single diagnosis but a time-sensitive presentation encompassing medical, surgical, urological, vascular and gynaecological disorders [1]. Patients may develop severe pain, guarding, distension, vomiting, fever, altered bowel habits, haemodynamic instability or shock. Acute abdominal pain accounts for approximately 7-10% of emergency department visits, & a substantial proportion of patients require urgent intervention or surgery. Because delayed recognition of perforation, ischaemia, obstruction, haemorrhage or sepsis can rapidly increase morbidity & mortality, acute abdomen requires prompt, structured assessment [2]. The aetiological spectrum varies with age, sex, geographical region, comorbidities and healthcare setting. Common causes include acute appendicitis, cholecystitis, pancreatitis, intestinal obstruction, hollow-viscus perforation, incarcerated hernia, diverticulitis and intra-abdominal abscess [3]. Urological conditions such as ureteric colic & pyelonephritis, & gynaecological emergencies such as ectopic pregnancy, ovarian torsion & pelvic inflammatory disease, may produce similar clinical pictures [4]. Vascular disorders, particularly acute mesenteric ischaemia and ruptured abdominal aortic aneurysm, are less frequent but highly dangerous. Extra-abdominal illnesses, including pneumonia, myocardial ischaemia and diabetic ketoacidosis, must also be considered. Nonspecific abdominal pain remains common, demonstrating the diagnostic complexity of this presentation [2].

Clinical evaluation begins simultaneously with assessment and stabilization of airway, breathing & circulation. Haemodynamic status, mental state, oxygen saturation, temperature and urine output help identify patients requiring immediate resuscitation [5]. A focused history should define the onset, site, character, intensity, radiation and progression of pain, with aggravating or relieving factors. Vomiting, fever, anorexia, constipation, diarrhoea, gastrointestinal bleeding, urinary symptoms and menstrual or obstetric history provide important clues. Previous surgery may suggest adhesive obstruction, while medications, alcohol use and cardiovascular or metabolic disease may modify the differential diagnosis. Examination includes inspection, auscultation, percussion and palpation for tenderness, guarding, rigidity, rebound, masses and hernias. Rectal, pelvic and testicular examinations are performed when indicated. Atypical findings are common among older adults, pregnant women and immunocompromised patients [6].

Laboratory investigations support, but rarely establish, the diagnosis independently. Complete blood count & inflammatory markers may indicate infection, while electrolytes, renal function, glucose and arterial blood gas analysis assess physiological disturbance and guide resuscitation [7]. Liver tests assist in hepatobiliary disease, serum lipase supports pancreatitis, and urinalysis may identify urinary infection or haematuria. Serum lactate may raise suspicion of hypoperfusion or bowel ischaemia, although a normal value does not exclude early disease. Pregnancy testing is essential in women of reproductive age before selecting imaging or treatment. Clinical

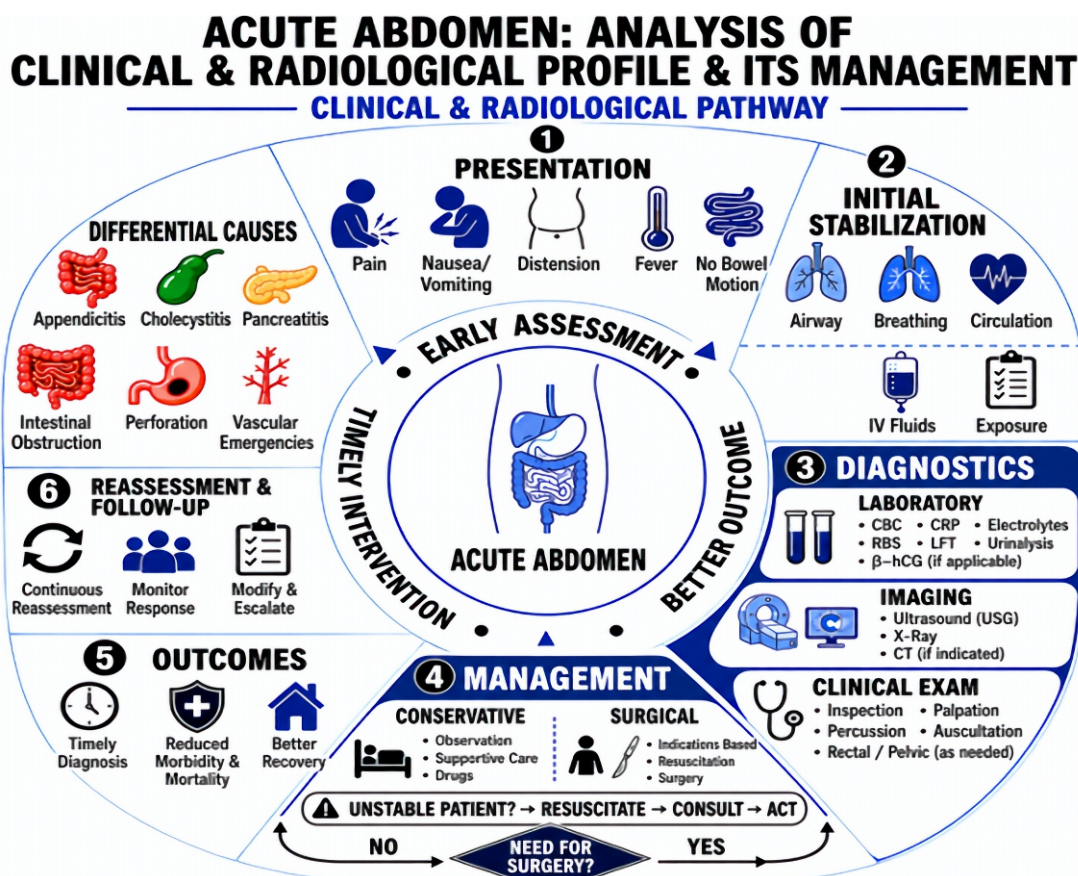


Figure 1: Clinical and Radiological Pathway for the Assessment and Management of Acute Abdomen.

and laboratory findings must therefore be integrated with appropriate radiological assessment when uncertainty persists [8]. Radiological imaging is central because many important conditions cannot be confirmed or excluded by examination alone. Plain radiography has a limited role but may demonstrate free subdiaphragmatic air, dilated bowel loops, air-fluid levels or radiopaque calculi [9]. Ultrasonography is rapid, portable, inexpensive and free from ionizing radiation. It is particularly valuable for gallbladder disease, biliary obstruction, hydronephrosis, pelvic pathology, abdominal aortic aneurysm and intraperitoneal fluid, and is preferred initially for right upper quadrant pain. Point-of-care ultrasound supports bedside decision-making in unstable patients. Its limitations include operator dependence, bowel gas, obesity, and poor visualization of deep structures [2].

Contrast-enhanced computed tomography provides comprehensive evaluation of abdominal and pelvic organs & is especially useful for generalized pain, obstruction, perforation, appendicitis, diverticulitis, pancreatitis complications, abscess and vascular emergencies. CT defines the cause, anatomical extent, severity and complications, helping distinguish patients requiring urgent surgery from those suitable for conservative or image-guided treatment. However, radiation exposure, contrast-related risks, cost and limited availability require appropriate selection. Magnetic resonance imaging provides excellent soft-tissue contrast without ionizing radiation and is useful in pregnancy when ultrasonography is inconclusive, although longer acquisition time & limited availability restrict emergency use [10].

Management depends on the underlying pathology and physiological condition. Initial treatment may include fasting, intravenous fluids, electrolyte correction, analgesia, antiemetics, nasogastric decompression, urinary catheterization and broad-spectrum antibiotics when infection, perforation or sepsis is suspected [7]. Appropriate analgesia improves comfort without preventing accurate assessment. Definitive treatment may be conservative, endoscopic, percutaneous, laparoscopic or open surgical. Stable patients with selected uncomplicated conditions may undergo observation or non-operative therapy, whereas peritonitis, uncontrolled haemorrhage, strangulation, perforation, progressive sepsis or failed conservative management generally demands urgent source control. Minimally invasive surgery is increasingly preferred in suitable stable patients because it combines diagnosis with treatment and may reduce postoperative morbidity and hospital stay [8]. **Figure 1.** Clinical and radiological pathway for the assessment and management of acute abdomen, highlighting presentation, stabilization, diagnostics, treatment strategies, follow-up, and outcomes. Despite advances in diagnostics and imaging, acute abdomen remains challenging because of atypical presentations, diagnostic delays, & clinical-radiological discordance. Analysing clinical features, imaging findings, final diagnoses, & management patterns can identify common causes, improve resource use, strengthen decision-making, support timely intervention, and generate institution-specific evidence for better overall patient outcomes.

The study aimed to analyse the clinical and radiological profile and management of acute abdomen. Its objectives were to identify the various aetiologies and clinical presentations of acute abdomen, describe their management, assess the diagnostic accuracy of clinical evaluation against intraoperative findings, and determine the accuracy of radiological findings by comparing them with operative observations for improved diagnosis and treatment.

MATERIAL & METHODS

The age distribution showed that acute abdomen was most frequently observed among patients aged 41–50 years (22%), followed by 31–40 years (21%) and 21–30 years (18%). The lowest proportions occurred among patients aged 61–70 years (5%) and above 70 years (3%). The mean age was 39.20 ± 15.85 years, with a median age of 38.50 years and an overall range of 12–76 years. These findings indicate that acute abdominal conditions predominantly affected young and middle-aged adults in the studied population.

Abdominal pain was the universal presenting symptom, reported in all 100 patients (100%), confirming its central diagnostic importance in acute abdomen. Vomiting was the second most frequent symptom, affecting 74%, followed by fever in 55% of patients. Constipation and abdominal distension were observed in 31% and 29%, respectively, suggesting gastrointestinal obstruction or impaired bowel activity in a substantial proportion. Diarrhoea was least common, occurring in only 6%, indicating that acute abdomen predominantly presented with pain, vomiting, and systemic inflammatory features (**Table 1**). Abdominal tenderness was present in all patients (100%), making it the most consistent clinical sign of acute abdomen, followed by guarding in 76%. Decreased bowel sounds and rigidity were observed in 32% and 25% of patients, respectively, indicating bowel dysfunction and peritoneal irritation in a substantial proportion. Obliteration of liver dullness was detected in 23%, suggesting possible intraperitoneal free air in selected cases. An abdominal mass was the least frequent sign, present in only 7%, showing that most patients presented with diffuse rather than localized palpable findings (**Figure 2**). Clinical diagnosis of acute appendicitis showed strong agreement with intraoperative findings, correctly identifying all 46 surgically confirmed cases, with no false-negative diagnoses. Four patients were clinically suspected to have appendicitis but did not have intraoperative confirmation, while 50 patients were correctly classified as negative. The diagnostic accuracy was 96%, with 100% sensitivity and 92.6% specificity. The highly significant association ($p < 0.0001$) demonstrates that clinical assessment was a reliable method for identifying acute appendicitis in patients presenting with acute abdomen (**Table 2**). Ultrasonographic diagnosis showed excellent agreement with intraoperative findings, correctly identifying all 46 confirmed cases of acute appendicitis with no false-negative results. Three patients were diagnosed as appendicitis on ultrasonography but were not confirmed intraoperatively, while 51 patients were

correctly classified as negative. The overall diagnostic accuracy was 97%, with 100% sensitivity and 94.44% specificity. The highly significant association ($p<0.0001$) indicates that ultrasonography was a highly reliable and effective radiological tool for diagnosing acute appendicitis in patients with acute abdomen (**Table 3**). Clinical diagnosis correctly identified 23 intraoperatively confirmed cases of perforative peritonitis, with only one false-positive diagnosis. However, 13 confirmed cases were missed clinically, resulting in moderate sensitivity of 63.89%. The specificity was very high at 98.44%, while the overall diagnostic accuracy was 86.0%. The significant association ($p<0.0001$) indicates that clinical assessment was highly reliable for confirming suspected cases but less effective for excluding occult perforative peritonitis (**Table 4**). Plain abdominal radiography was performed in 31 patients and provided diagnostic findings in 25 cases, demonstrating its important role in detecting perforation-related changes. Ultrasonography was performed in 32 patients and was diagnostic in 24, supporting its usefulness as a readily available initial imaging modality. CECT of the whole abdomen was undertaken in only six patients but was diagnostic in all six cases, indicating the highest diagnostic yield among the investigations used. These findings suggest that radiography & ultrasonography were the principal screening methods, while CECT offered definitive diagnostic clarification in selected patients with perforative peritonitis (**Figure 3**). Clinical diagnosis correctly identified 17 of 18 intraoperatively confirmed cases of intestinal obstruction, with only one false-negative result. Five patients were clinically diagnosed with obstruction but were not confirmed intraoperatively, while 77 patients were correctly classified as negative. The overall diagnostic accuracy was 94.0%, with sensitivity of 94.44% and specificity of 93.9%. The highly significant association ($p<0.0001$) indicates that clinical assessment was

highly reliable for diagnosing intestinal obstruction in patients presenting with acute abdomen (**Table 5**). Plain abdominal radiography was performed in 18 patients & was diagnostic in 17 cases, demonstrating a high diagnostic yield of 94.4% for intestinal obstruction. Ultrasonography was also performed in 18 patients & confirmed the diagnosis in 16 cases, corresponding to a diagnostic yield of 88.9%. CECT of the whole abdomen was undertaken in 14 patients and was diagnostic in 13 cases, yielding 92.9%. These findings indicate that all three radiological modalities were highly useful, with plain radiography showing the highest diagnostic yield in this study population (**Figure 4**). Acute appendicitis was the most common operative diagnosis, accounting for 46% of patients, & all underwent open appendicectomy. Perforative peritonitis was predominantly caused by duodenal perforation (21%), followed by appendicular perforation with or without abscess (8%), gastric perforation (4%), and gallbladder perforation (2%). Among intestinal obstruction cases, adhesions were the leading cause (6%), while hernias, strictures, bands, intussusception, abdominal cocoon, colonic carcinoma, & Hirschsprung's disease occurred less frequently. These findings demonstrate that operative management was individualized according to the underlying pathology, ranging from appendicectomy & perforation repair to adhesiolysis, bowel anastomosis, hernioplasty, hemicolectomy, and colostomy (**Table 6**).

The clinical outcome was favorable, with 97% of patients successfully treated and discharged from the hospital. Mortality occurred in only 3% of cases, indicating a comparatively low fatality rate among patients presenting with acute abdomen. The high discharge rate reflects effective clinical evaluation, timely radiological diagnosis, and appropriate operative management. However, the observed deaths emphasize the need for early recognition and prompt intervention in severe or complicated acute abdominal conditions (**Figure 5**).

Table 1: Symptoms of acute abdomen

Symptoms	No of patient	Percentage
Pain	100	100%
Vomiting	74	74%
Fever	55	55%
Abdominal distension	29	29%
Constipation	31	31%
Diarrhoea	6	6%

Table 2: Comparison of clinical diagnosis of acute appendicitis with intraoperative diagnosis

		Intraoperative diagnosis (Acute appendicitis)		P-value <0.0001 Accuracy 96% Sensitivity 100% Specificity 92.6%
		Yes	No	
Clinical diagnosis (Acute appendicitis)	Yes	46	4	
	No	0	50	

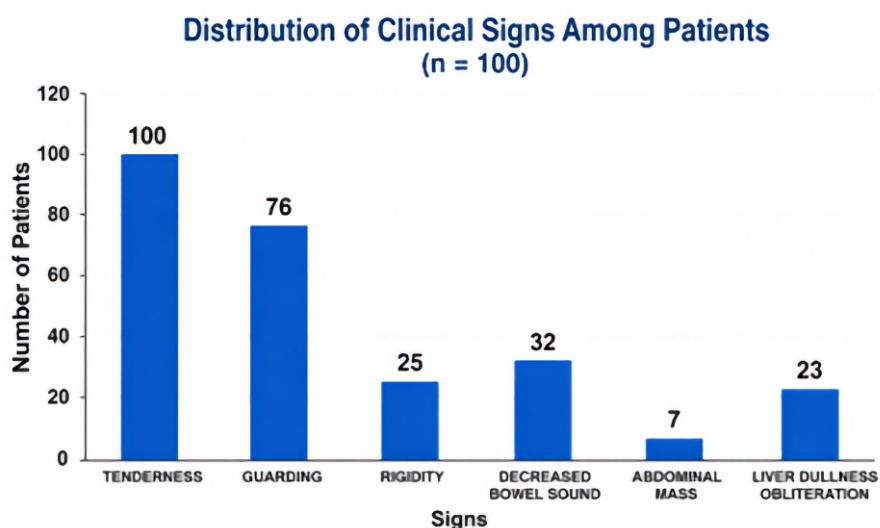


Figure 2: Bar diagram showing signs of acute abdomen

Table 3: Comparison of radiological (USG-w/a) diagnosis of acute appendicitis with intraoperative diagnosis

		Intraoperative diagnosis (Acute appendicitis)		
		Yes	No	
Radiological diagnosis (Acute appendicitis)	Yes	46	3	P-value <0.0001 Accuracy 97% Sensitivity 100% Specificity 94.44%
	No	0	51	

Table 4: Comparison of clinical diagnosis of perforative peritonitis with intraoperative diagnosis

		Intraoperative diagnosis (Perforative peritonitis)		
		Yes	No	
Clinical diagnosis (Perforative peritonitis)	Yes	23	1	P-value <0.0001 Accuracy 86.0% Sensitivity 63.89% Specificity 98.44%
	No	13	63	

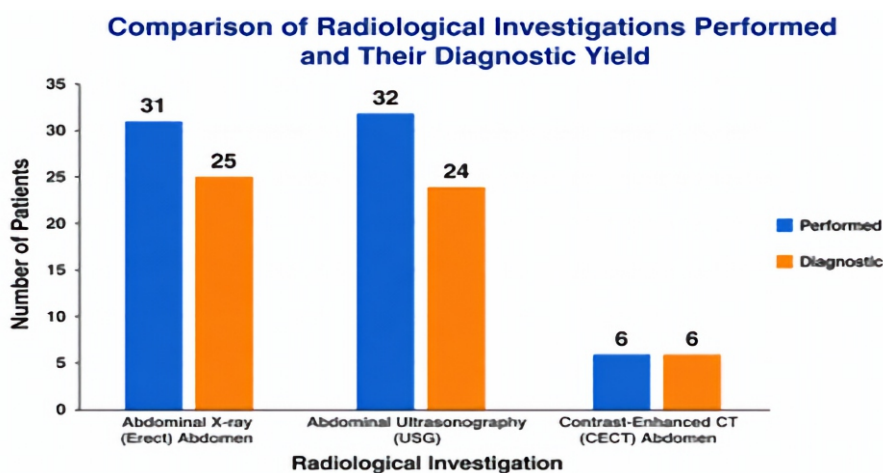
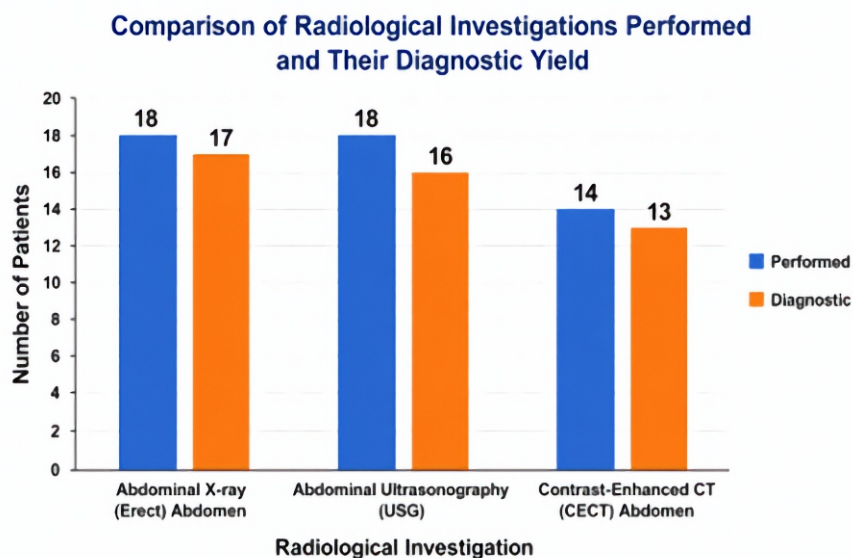


Figure 3: Bar diagram showing radiological investigations diagnostic for perforative peritonitis

Table 5: Comparison of clinical diagnosis of intestinal obstruction with intraoperative diagnosis

		Intraoperative diagnosis (Intestinal obstruction)		
		Yes	No	
Clinical diagnosis (Intestinal obstruction)	Yes	17	5	P-value <0.0001 Accuracy 94.0% Sensitivity 94.44 Specificity 93.9
	No	1	77	

**Figure 4: Bar diagram showing radiological investigations diagnostic for intestinal obstruction****Table 6: Distribution of diagnosis and operative procedure done**

	Diagnosis	Operative procedure done	Frequency	Percentage
Perforative peritonitis	Acute appendicitis	Open appendicectomy	46	46.0%
	Appendicular perforation	Open appendicectomy with peritoneal lavage	4	4.0%
	Appendicular perforation with abscess	Open appendicectomy and drainage of abscess with peritoneal lavage	4	4.0%
	GB perforation	Open cholecystectomy	2	2.0%
	DU perforation	Exploratory laparotomy and modified graham's patch repair with peritoneal lavage	21	21.0%
	Gastric perforation	Exploratory laparotomy and modified graham's patch repair with tissue edge biopsy for HPE	4	4.0%
	ileal perforation with splenic flexure growth	Exploratory laparotomy and Hartmann's procedure with end ileostomy	1	1.0%
	Obstructed hernia	Exploration and hernioplasty	3	3.0%
	Strangulated hernia	Exploration and hernioplasty	1	1.0%
	Adhesion	Exploratory laparotomy and adhesiolysis	6	6.0%
Intestinal Obstruction	Stricture	Exploratory laparotomy and end to end jejuno -ileal anastomosis	1	1.0%
	Stricture	Exploratory laparotomy and side to side ileo-transverse anastomosis	1	1.0%
	Band	Exploratory laparotomy and excision of band	2	2.0%
	Intussusception	Exploratory laparotomy and release of intussusception	1	1.0%
	Abdominal cocoon	Exploratory laparotomy and enterolysis	1	1.0%
	Carcinoma ascending colon	Exploratory laparotomy and right hemicolectomy	1	1.0%
	Hirschsprung disease	Exploratory laparotomy and transverse loop colostomy	1	1.0%
	Total		100	100.0%

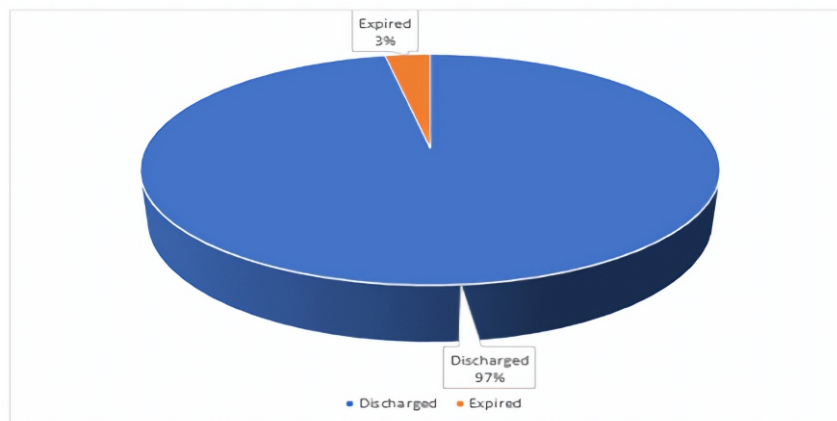


Figure 5: Pie diagram showing distribution of outcome

DISCUSSION

The age profile demonstrated that acute abdomen requiring operative intervention predominantly affected economically active adults, with the largest proportion in the 41-50 year group (22%), followed by 31-40 years (21%). The mean age was 39.20 ± 15.85 years, with a range of 12–76 years and median of 38.5 years. These findings were comparable with Rahman G. A. et al. (2018) [11], who reported a mean age of 36.3 years, and Ayenew Z. et al. (2016) [12], who observed a mean age of 33.7 ± 18.6 years. Acute appendicitis predominated among younger patients, whereas perforative peritonitis and intestinal obstruction were concentrated in the fourth to sixth decades, suggesting an age-related shift from inflammatory to perforative & obstructive pathology. Abdominal pain was universal, while vomiting, fever, constipation, distension and diarrhoea occurred in 74%, 55%, 31%, 29% and 6%, respectively. Barai B. et al. (2016) [13] similarly identified abdominal pain as the chief complaint in all patients, followed by vomiting and constipation. Tenderness was present in every patient, followed by guarding in 76%, decreased bowel sounds in 32%, rigidity in 25%, obliterated liver dullness in 23% and abdominal mass in 7%. This clinical pattern corresponded with Hagos M. et al. (2015) [14], & Jain R. et al. (2016) [15], who also reported tenderness, guarding and rigidity as major signs of surgical acute abdomen. Clinical assessment showed excellent agreement with operative findings for acute appendicitis, achieving 96% diagnostic accuracy, 100% sensitivity & 92.6% specificity. These findings closely correlated with Halbhavi et al. (2018) [16], who reported 96% diagnostic accuracy, 96.9% sensitivity and 90.48% specificity for clinical diagnosis among 150 patients evaluated against operative & histopathological findings. The slightly higher sensitivity in our findings indicates that clinical assessment successfully identified all patients with operatively confirmed appendicitis, while the comparable specificity demonstrates its reliability in excluding alternative diagnoses. These observations reaffirm that meticulous history-taking & systematic abdominal examination remain highly dependable for the early diagnosis of acute appendicitis & timely operative decision-making [17]. Ultrasonography performed slightly better, with 97% accuracy, 100% sensitivity and 94.44% specificity; this was consistent with Bhavinder Arora

et al. (2015) [17], who demonstrated strong ultrasonographic performance in appendicitis. For perforative peritonitis, clinical diagnosis showed 86% accuracy but relatively low sensitivity of 63.89%, despite specificity of 98.44%, indicating that clinical evaluation was reliable for confirmation but could miss less typical presentations. Radiological accuracy was 80.65% for plain abdominal radiography, 75% for ultrasonography and 100% for CECT, although CECT was performed in only six cases. Nasappa et al. (2018) similarly reported 94% accuracy for abdominal radiography and 100% for CT in detecting hollow viscus perforation, supporting the superior diagnostic performance of CECT [18]. For intestinal obstruction, clinical diagnosis achieved 94% accuracy, 94.44% sensitivity and 93.9% specificity. Plain abdominal radiography showed 94.44% accuracy, followed by CECT at 92.86% & ultrasonography at 88.88%; Bhavinder Arora et al. (2015) [17] reported high X-ray sensitivity in obstruction. Operative management reflected the disease distribution: open appendicectomy was most frequent, while modified Graham's patch repair with lavage was the principal procedure for duodenal and gastric perforations. Wossen M. T. et al. (2019) [19] similarly identified appendicitis as the leading surgical cause. Ultimately, 97% of patients were discharged and mortality was 3%, close to the 4% mortality reported by Gulnar N. et al. (2024) [20], supporting the value of timely clinical assessment, targeted imaging and early definitive surgery in reducing preventable morbidity and mortality overall.

CONCLUSION

This study concludes that acute abdomen predominantly affected young and middle-aged adults, with abdominal pain, tenderness, vomiting and guarding as the principal clinical features. Acute appendicitis was the commonest operative diagnosis, followed by perforative peritonitis and intestinal obstruction. Clinical assessment demonstrated high diagnostic reliability for appendicitis and obstruction, while imaging, particularly ultrasonography and CECT, improved diagnostic confirmation and detected less obvious pathology. Operative management was individualized according to the underlying cause, with appendicectomy and perforation repair being

frequent procedures. The 97% discharge rate and 3% mortality emphasize that prompt evaluation, appropriate imaging and timely surgery improve outcomes and reduce mortality.

LIMITATIONS & FUTURE PERSPECTIVES

The study was limited by its single-centre design, relatively small sample size, and short duration, which may restrict generalizability. Future research could focus on multicenter studies with larger cohorts to validate findings, evaluate long-term outcomes, and explore innovative diagnostic and management strategies for appendicular perforation, improving patient prognosis and reducing complications

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical healthcare applications. It emphasizes the importance of translating scientific observations into meaningful improvements in patient care, diagnosis, and treatment outcomes. By highlighting real world relevance, the study contributes to evidence based medical practice and supports informed clinical decision making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

AA: Acute Abdomen
AP: Acute Appendicitis
PP: Perforative Peritonitis
IO: Intestinal Obstruction
USG: Ultrasonography
CT: Computed Tomography
XR: Plain Abdominal Radiography (X-ray)
LA: Laparotomy
JMCH: Jorhat Medical College and Hospital

AUTHOR INFORMATION

Dr. Md. Saddam Hussain: Post Graduate Trainee
 Dr. Bijit Gogoi: Associate Professor
 Dr. Udhav Mandal: Post Graduate Trainee

AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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None

ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in the writing or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

AUTHOR'S NOTE

This article serves as an important educational tool for the scientific community, offering insights that may inspire future research directions. However, they should not be relied upon independently when making treatment decisions or developing public health policies.

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¹CSIR-Indian Institute of Toxicology Research (IITR),
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²Academy of Scientific and Innovative Research (AcSIR),
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³Biological E Ltd, Hyderabad, Telangana, India

HANDLING EDITOR

Dr. Karan Singh Saini^{1,2,3}

¹Ph.D. in Cancer Research from CDRI-JNU New Delhi, India

& ²Post-Doctoral Fellow from University of Illinois at
Chicago, USA

³Department of Zoology, P.M. College of Excellence,
Government Postgraduate College in Sheopur, Madhya
Pradesh, India

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