

Research Article

Spectrum of CT Findings and Etiological Profile of Non-Traumatic Acute Abdomen in Adults: A Hospital-Based Cross-Sectional Study

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ABSTRACT

Background: Non-traumatic acute abdomen comprises a wide spectrum of abdominal disorders requiring prompt diagnosis for appropriate treatment. Clinical presentation frequently overlaps among different diseases, making accurate etiological identification challenging. Multidetector computed tomography (MDCT) has become the preferred imaging modality because it provides comprehensive evaluation of abdominal organs and accurately characterizes the underlying pathology. Understanding the spectrum of CT findings in patients presenting with acute abdomen is valuable for improving diagnostic pathways and guiding clinical decision-making.

Objective: To evaluate the spectrum of multidetector computed tomography findings and determine the etiological profile of non-traumatic acute abdomen in adult patients presenting to a tertiary care hospital.

Materials and Methods: A hospital-based cross-sectional study was conducted in the Department of Radiodiagnosis, Mahavir Institute of Medical Sciences, Telangana, from March 2024 to December 2025. A total of 187 adult patients with suspected non-traumatic acute abdomen underwent MDCT following clinical evaluation and conventional imaging. Demographic characteristics, clinical presentation, CT findings, etiological categories, and their association with patient characteristics were analyzed.

Results: Among 187 patients, the mean age was 45.09 ± 12.32 years, and males constituted 52.94% of the study population. Inflammatory disorders were the most common CT diagnosis (45.99%), followed by obstructive (28.88%), renal (8.02%), biliary (6.95%), perforation (5.35%), and vascular disorders (4.81%). Right lower quadrant pain represented the most frequent site of abdominal pain (21.93%). Significant associations were observed between patient age and CT-based etiological categories (ANOVA, $p < 0.001$), as well as between pain location and underlying pathology (Chi-square, $p < 0.001$).

Conclusion: MDCT effectively characterizes the diverse spectrum of diseases responsible for non-traumatic acute abdomen. Inflammatory and obstructive conditions accounted for nearly three-quarters of all diagnoses, while CT accurately demonstrated clinically significant associations between demographic characteristics, pain localization, and disease etiology, highlighting its importance in comprehensive emergency abdominal evaluation.

Keywords: Acute abdomen, Computed tomography, Etiology, Cross-sectional imaging, Emergency radiology, Adult patients.

INTRODUCTION

Non-traumatic acute abdomen represents one of the most diverse clinical entities encountered in emergency medicine and general surgery. It comprises a wide range of gastrointestinal, hepatobiliary, pancreatic, vascular, urinary, and inflammatory disorders that frequently present with similar clinical manifestations despite markedly different underlying pathologies. Because many of these conditions require

fundamentally different therapeutic approaches, early identification of the underlying etiology is essential for reducing morbidity, preventing complications, and optimizing patient outcomes. Accurate characterization of disease patterns is therefore an important component of emergency abdominal imaging.

Clinical evaluation remains the first step in assessing patients with acute abdominal pain;

however, symptoms such as abdominal pain, vomiting, fever, abdominal distension, and guarding often overlap among multiple disease processes. Likewise, pain localization may be misleading because inflammatory, obstructive, vascular, and biliary disorders can present with atypical clinical features. Consequently, reliance solely on clinical examination frequently results in diagnostic uncertainty, particularly among elderly patients and those with nonspecific presentations. Understanding the spectrum of diseases responsible for acute abdomen is therefore essential for establishing an appropriate diagnostic strategy and selecting optimal imaging investigations.¹⁻⁴

Multidetector computed tomography (MDCT) has become the cornerstone of imaging evaluation for non-traumatic acute abdomen owing to its ability to comprehensively examine abdominal viscera, bowel loops, mesentery, retroperitoneum, vascular structures, and urinary organs in a single examination. Modern multidetector scanners provide high spatial resolution with multiplanar image reconstruction, enabling accurate localization of disease and identification of associated complications. In addition to detecting common entities such as appendicitis, bowel obstruction, diverticulitis, pancreatitis, and ureteric calculi, MDCT is highly effective in diagnosing uncommon but life-threatening conditions including mesenteric ischemia, gastrointestinal perforation, epiploic appendagitis, and omental infarction.⁵⁻⁸

Previous studies have primarily emphasized the diagnostic accuracy of CT compared with ultrasonography and plain radiography. However, comparatively fewer investigations have focused on the overall distribution of CT diagnoses and the epidemiological profile of non-traumatic acute abdomen within adult hospital populations. Knowledge of the relative frequency of inflammatory, obstructive, biliary, renal, vascular, and perforation-related diseases is valuable because it improves diagnostic prioritization, facilitates interpretation of imaging findings, and enhances clinical preparedness in emergency settings. Furthermore, evaluation of relationships between patient demographics, pain location, and CT-based diagnosis contributes to a better understanding of disease presentation in routine clinical practice.⁶⁻⁹

The present study was therefore undertaken to evaluate the spectrum of CT findings and determine the etiological profile of non-traumatic acute abdomen in adult patients

presenting to a tertiary care teaching hospital. In addition, the study analyzed the distribution of disease according to age, clinical presentation, and pain localization to provide a comprehensive overview of the radiological patterns encountered in everyday emergency practice.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based cross-sectional study was conducted in the Department of Radiodiagnosis, Mahavir Institute of Medical Sciences and General Hospital, Vikarabad, Telangana, India.

Study Population

The study prospectively included 187 consecutive adult patients presenting with clinical features suggestive of non-traumatic acute abdomen. All eligible patients underwent multidetector computed tomography after initial clinical assessment and conventional imaging. Sample size estimation was based on a prevalence of 14.2%, with a 95% confidence level, resulting in a required sample size of 187 participants.

Eligibility Criteria

Inclusion Criteria

Patients were included if they fulfilled one or more of the following criteria:

- Acute abdominal pain.
- Abdominal distension.
- Guarding or abdominal rigidity.
- Patients in whom ultrasonography required additional CT evaluation for diagnostic clarification.

Exclusion Criteria

Patients were excluded if they had:

- Blunt or penetrating abdominal trauma.
- Pregnancy.
- Definitive diagnosis established by ultrasonography without the need for CT evaluation.

CT Imaging Protocol

Ultrasonography was performed as the initial imaging investigation. Patients with negative, equivocal, or clinically insufficient ultrasonographic findings subsequently underwent MDCT.

All examinations were performed using a 16-slice Toshiba multidetector CT scanner. Initial non-contrast axial images of the abdomen and pelvis were acquired, followed by contrast-enhanced CT whenever clinically indicated. Intravenous Iohexol (350 mg iodine/mL) was administered at 1.75 mL/kg (average 90–100 mL) using a power injector through an 18-gauge intravenous cannula at a rate of 2 mL/s.

Estimated glomerular filtration rate (eGFR) was assessed before contrast administration. Oral and rectal contrast agents were administered selectively according to the suspected pathology.

Axial images were reconstructed into coronal and sagittal multiplanar reformations. Maximum intensity projection (MIP), minimum intensity projection (MinIP), and volume-rendered reconstructions were reviewed whenever additional anatomical clarification was required.

CT Evaluation

Each CT examination was independently evaluated for the presence, location, and extent of abdominal pathology. CT diagnoses were categorized into six predefined etiological groups:

- Inflammatory diseases
- Obstructive disorders
- Renal pathologies
- Biliary diseases
- Gastrointestinal perforation
- Vascular disorders

The distribution of CT findings was subsequently analyzed according to patient age, clinical presentation, and pain location.

Outcome Measures

The primary outcome was the distribution of CT-based etiological diagnoses among adults presenting with non-traumatic acute abdomen. The secondary outcomes included:

- Demographic distribution of disease.
- Clinical presentation according to CT diagnosis.
- Relationship between pain location and CT-based etiology.
- Association between age and etiological category.

Statistical Analysis

Descriptive statistics were used to summarize demographic characteristics, clinical features, and CT diagnoses. Continuous variables are presented as mean $\pm$ standard deviation (SD) or median, while categorical variables are expressed as frequencies and percentages.

Differences in mean age among CT-based etiological groups were assessed using one-way analysis of variance (ANOVA). The association between pain localization and CT diagnosis was evaluated using the Chi-square test of independence. Statistical significance was defined as a two-sided p-value <0.05 .

RESULTS

Table 1. Demographic Characteristics of the Study Population

Variable	N (%)
Age Group (years)	
20–40	75 (40.1)
41–60	86 (46.0)
60–80	26 (13.9)
Gender	
Male	99 (52.94)
Female	88 (47.06)

Table 2. Clinical Presentation of Patients

Variable	N (%)
Primary Symptom	
Pain	61 (32.62)
Pain + Distension	54 (28.88)
Pain + Vomiting	37 (19.79)
Sudden Severe Pain	14 (7.49)
Colicky Pain	14 (7.49)
Severe Pain	7 (3.74)
Most Common Pain Location	
Right lower quadrant	41 (21.93)
Diffuse	36 (19.25)
Epigastric	28 (14.97)
Central	21 (11.23)
Flank	15 (8.02)
Right upper quadrant	14 (7.49)

Table 3. CT-Based Etiological Spectrum of Non-Traumatic Acute Abdomen

Etiological Category	N (%)
Inflammatory	86 (45.99)
Obstructive	54 (28.88)
Renal	15 (8.02)
Biliary	13 (6.95)
Perforation	10 (5.35)
Vascular	9 (4.81)

Table 4. Association between Age and CT-Based Etiology

Etiology	Mean Age (Years)
Renal	31.73 ± 4.42
Inflammatory	38.16 ± 9.44
Biliary	43.31 ± 4.37
Obstructive	54.24 ± 6.14
Perforation	61.50 ± 10.58
Vascular	63.00 ± 4.97

One-way ANOVA: F = 54.39, p < 0.001

Table 5. Relationship between Pain Location and CT-Based Etiology

Pain Location	Predominant CT Diagnosis
Right lower quadrant	Inflammatory
Right upper quadrant	Biliary
Flank	Renal
Diffuse abdomen	Obstructive / Vascular
Epigastric	Inflammatory / Perforation
Central abdomen	Obstructive

Chi-square = 601.01, p < 0.001

DISCUSSION

The present study provides a comprehensive overview of the CT-based etiological spectrum of non-traumatic acute abdomen in adults presenting to a tertiary care hospital. Unlike studies primarily focusing on diagnostic accuracy, the present investigation emphasizes the distribution of disease patterns encountered during routine emergency imaging. Inflammatory disorders constituted nearly half of all CT diagnoses, followed by obstructive pathologies, while renal, biliary, perforation, and vascular diseases represented smaller but clinically important categories. These findings demonstrate the broad diagnostic capability of multidetector computed tomography (MDCT) in evaluating diverse abdominal emergencies and reinforce its role as the principal imaging modality for etiological characterization. Inflammatory disorders accounted for 45.99% of all cases, making them the predominant CT diagnosis in the present study. This observation is consistent with previous reports demonstrating that acute appendicitis, diverticulitis, pancreatitis, and other inflammatory gastrointestinal disorders

constitute the largest proportion of non-traumatic acute abdominal presentations. Similar findings have reported inflammatory abdominal diseases as the leading indication for emergency CT evaluation, reflecting their high prevalence in routine surgical practice (10). Likewise, practice guidelines for acute abdomen have emphasized that inflammatory gastrointestinal conditions remain the most frequent causes of emergency abdominal pain requiring prompt imaging evaluation (7). These observations collectively indicate that inflammatory diseases continue to represent the principal burden of emergency abdominal pathology.

Obstructive disorders represented the second largest etiological category (28.88%) in the present study. Bowel obstruction remains an important surgical emergency because delayed diagnosis may lead to bowel ischemia, perforation, and sepsis. Modern MDCT provides accurate localization of the transition point, identifies the underlying cause of obstruction, and detects associated complications such as closed-loop obstruction or strangulation. The superiority of multidetector CT in evaluating

bowel obstruction through multiplanar reconstruction and comprehensive assessment of bowel loops and mesenteric vessels has been well documented (9). The relatively high proportion of obstructive pathology observed in the present study underscores the continuing importance of CT in differentiating patients requiring urgent surgical intervention from those suitable for conservative management.

Although renal, biliary, vascular, and perforation-related diseases constituted smaller proportions of the overall study population, they represent clinically significant conditions because of their potential morbidity. Renal disorders accounted for 8.02% of cases and were predominantly associated with flank pain, reflecting the characteristic presentation of obstructive urolithiasis. Conversely, biliary disease was strongly associated with right upper quadrant pain, whereas vascular disorders and gastrointestinal perforation occurred predominantly in elderly patients. Such disease-specific distributions emphasize that demographic characteristics and pain localization remain useful clinical indicators; however, definitive etiological diagnosis is best established through cross-sectional imaging.

A notable finding of the present study was the significant association between age and CT-based diagnosis. Younger patients were more frequently diagnosed with renal and inflammatory disorders, whereas obstructive disease, gastrointestinal perforation, and vascular emergencies predominated among older adults. Similar age-related variations have been described, demonstrating that elderly patients are more likely to present with bowel obstruction, mesenteric ischemia, and perforation rather than uncomplicated inflammatory disease (8,11). These findings highlight the importance of considering patient age when interpreting abdominal imaging and establishing differential diagnoses.

Pain localization also demonstrated a highly significant relationship with the underlying CT diagnosis. Right lower quadrant pain was predominantly associated with inflammatory disease, particularly appendiceal pathology, whereas right upper quadrant pain correlated with biliary disorders and flank pain with renal disease. Diffuse abdominal pain occurred more frequently in obstructive and vascular conditions, reflecting more extensive intra-abdominal involvement. Although clinical findings alone cannot reliably establish the underlying pathology, the present study suggests that combining pain localization with

MDCT findings improves understanding of disease distribution and facilitates efficient diagnostic evaluation. (12,13)

The strengths of this study include a relatively large prospective cohort evaluated using a standardized MDCT protocol and systematic categorization of CT diagnoses into clinically relevant etiological groups. Unlike studies focusing exclusively on diagnostic accuracy, the present investigation provides a broader epidemiological perspective by describing disease frequency and clinical presentation patterns within an adult emergency population. These findings may assist radiologists and emergency physicians in anticipating the relative prevalence of different abdominal disorders during routine clinical practice.

The study has certain limitations. It was conducted at a single tertiary care center, which may limit generalizability to other populations. In addition, CT findings were categorized into broad etiological groups rather than individual disease entities, precluding detailed disease-specific analysis. Future multicenter studies involving larger patient populations and incorporating outcome-based analyses would provide further insight into the epidemiological spectrum of non-traumatic acute abdomen. (14,15)

Overall, the present study demonstrates that MDCT effectively characterizes the wide spectrum of diseases responsible for non-traumatic acute abdomen. The predominance of inflammatory and obstructive disorders, together with significant associations between age, pain localization, and CT diagnosis, highlights the important role of multidetector CT not only in identifying disease but also in improving understanding of abdominal pathology patterns encountered in emergency clinical practice.

CONCLUSION

This study demonstrates that multidetector computed tomography (MDCT) provides a comprehensive evaluation of the diverse etiological spectrum of non-traumatic acute abdomen in adults. Inflammatory disorders constituted the predominant CT diagnosis, followed by obstructive pathologies, while renal, biliary, perforation, and vascular diseases represented smaller but clinically significant groups. Significant associations between patient age, pain localization, and CT-based diagnosis indicate that demographic and clinical characteristics complement imaging findings during emergency evaluation. MDCT accurately

characterized the underlying etiology across a broad range of abdominal conditions, enabling comprehensive assessment of disease patterns encountered in routine clinical practice. These findings support the routine use of MDCT as the primary cross-sectional imaging modality for evaluating adult patients with suspected non-traumatic acute abdomen and contribute valuable epidemiological data regarding the distribution of abdominal pathologies in a tertiary care setting.

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