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Spectrum of CT scan findings in non-traumatic acute abdominal pain: An observational study.

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Abstract

Background

Non-traumatic acute abdominal pain is a frequent emergency presentation with diverse etiologies. Clinical evaluation alone is often inconclusive, necessitating imaging. Computed tomography (CT) is increasingly recognized as a rapid and reliable modality for accurate diagnosis and management planning.

Objectives

To evaluate the spectrum of CT scan findings in patients presenting with non-traumatic acute abdominal pain and determine its diagnostic yield.

Methods

This hospital-based observational study enrolled 100 consecutive patients aged 18–78 years who presented with acute abdominal pain of non-traumatic origin. All patients underwent CT imaging. Demographic characteristics, symptom profiles, and CT findings were documented and analyzed. The diagnostic yield of CT in establishing definitive etiologies was assessed.

Results

The mean age of participants was 42.6 ± 15.8 years, with males comprising 58% and females 42%. Generalized abdominal pain was the most common presentation (62%), followed by right iliac fossa pain (24%). CT identified acute appendicitis in 28%, urolithiasis with obstructive uropathy in 20%, diverticulitis in 12%, pancreatitis in 10%, and hepatobiliary pathology in 8%. Less frequent findings included intestinal obstruction (7%), inflammatory colitis (5%), perforated viscus (4%), adnexal pathology (3%), mesenteric ischemia (2%), and miscellaneous causes (1%). No significant abnormality was observed in 10% of patients. Overall, CT provided a definitive diagnosis in 90% of cases.

Conclusion

CT scan proved highly effective in evaluating non-traumatic acute abdominal pain, offering rapid, accurate diagnoses across a wide etiological spectrum. Its routine use in emergency settings enhances decision-making and improves patient outcomes.

Recommendations

CT should be integrated into standard diagnostic protocols for acute abdominal pain in emergency care. Future studies should explore radiation dose reduction techniques, cost-effectiveness, and comparative accuracy with ultrasonography and MRI.

Keywords: *Acute abdominal pain, Computed tomography, non-traumatic abdomen, Diagnostic imaging, Emergency radiology, Appendicitis.*

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Introduction

Acute abdominal pain is one of the most common complaints encountered in emergency departments, accounting for nearly 5–10% of all emergency visits [1]. The etiologies are highly diverse, ranging from self-limiting conditions to life-threatening surgical emergencies. Timely and accurate diagnosis is crucial for guiding appropriate management and improving outcomes. However, reliance on clinical evaluation alone is often inadequate because history, physical examination, and routine laboratory tests may yield overlapping or non-specific findings [2].

Imaging plays a pivotal role in the diagnostic evaluation of acute abdominal pain. Traditionally, plain abdominal radiography and ultrasonography (USG) have been the first-line modalities because of their widespread availability, safety, and low cost. While USG is particularly useful in detecting hepatobiliary and gynecological disorders, its accuracy is frequently limited by operator dependency, body habitus, and interference from bowel gas [3,4].

In contrast, computed tomography (CT) has emerged as the gold standard for evaluating non-traumatic acute abdominal conditions due to its superior spatial resolution, ability to delineate a wide spectrum of intra-abdominal pathologies, and capacity to identify extra-abdominal causes mimicking abdominal pain [5]. Several studies have emphasized the critical role of CT in reducing diagnostic uncertainty, lowering the rate of negative laparotomies, and providing crucial information about disease extent, complications, and alternative diagnoses [6]. Furthermore, advances in multi-detector CT technology and low-dose protocols have helped optimize the balance between diagnostic accuracy and patient safety, making CT a cornerstone in modern emergency abdominal imaging.

Given these advantages, the present study was undertaken to analyze the spectrum of CT findings in patients presenting with non-traumatic acute abdominal pain and to assess its diagnostic yield in establishing definitive etiologies. By delineating the range of CT-detected pathologies, this study aims to reinforce the role of CT in emergency abdominal imaging and highlight its clinical utility in patient care.

Methodology

Study Design and Setting

This was a hospital-based descriptive cross-sectional observational study conducted in the Department of Radiodiagnosis, Abhishek I. Mishra Memorial Medical College & Research, Junvani, Durg, District Durg, Chhattisgarh, India. The study was carried out over a period of twelve months, from May 2024 to April 2025, to evaluate the spectrum of computed tomography (CT) findings in patients presenting with non-traumatic acute abdominal pain.

Study Population

A total of **100 consecutive patients**, aged 18–78 years, who presented to the emergency department with acute abdominal pain of non-traumatic origin were included. Both male and female patients were enrolled.

Sample Size Determination

The minimum required sample size was calculated using the formula:

n=Z2×p×(1−p)/d2

Where Z = 1.96 for a 95 % confidence level, p = expected proportion of diagnostic yield based on previous literature (approximately 0.9 for CT in non-traumatic acute abdomen [1,11]), and d = precision (0.06).

Substituting the values:

n=(1.96)2×0.9×0.1/(0.06)2≈96n

To compensate for potential exclusions and incomplete data, the final sample size was rounded to **100 participants**.

Inclusion Criteria

Adults (≥18 years) presenting with acute abdominal pain of less than 7 days' duration.

Patients clinically suspected to have intra-abdominal pathology and referred for a CT scan.

Patients provide written informed consent.

Exclusion Criteria

Patients with a history of blunt or penetrating abdominal trauma.

Pregnant women.

Patients with known chronic abdominal disorders such as cirrhosis, chronic pancreatitis, or inflammatory bowel disease.

Imaging Protocol

All patients underwent CT examination using a multi-detector computed tomography (MDCT) scanner. Contrast-enhanced CT was performed whenever indicated, except in patients with contraindications such as renal insufficiency or hypersensitivity to contrast media. Imaging parameters were standardized to maintain consistency across all scans.

Image Interpretation

CT images were independently reviewed by two radiologists with at least five years of post-graduate experience. Findings were categorized according to organ system involvement

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and specific pathology. Any discrepancies in interpretation were resolved by consensus discussion.

Minimization of Bias

Potential sources of bias were addressed through several strategies:
Selection bias was minimized by enrolling consecutive eligible patients who met the inclusion criteria during the study period.
Observer bias was reduced by having two independent radiologists with ≥5 years of experience interpret each scan, with consensus resolution for discrepancies.
Information bias was limited by using standardized data-collection proformas and imaging protocols.
Confounding was minimized by excluding patients with known chronic abdominal disorders and ensuring uniform imaging parameters across all participants.

Data Collection and Analysis

Demographic details, clinical presentation, and CT findings were recorded using a structured proforma. Data were compiled in Microsoft Excel and analyzed using descriptive statistics. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Results were tabulated for clarity.

Ethical Considerations

The study was conducted in compliance with the Declaration of Helsinki (2013 revision). Prior approval was obtained from the Institutional Ethics Committee of Abhishek I. Mishra Memorial Medical College & Research, Junvani, Durg. Written informed consent was obtained from all participants after explaining the nature, purpose, benefits, and potential risks of the study in their local language. Patients were assured of their right to withdraw from the study at any time without affecting their medical care.

Results

Participant Flow

A total of 112 patients presenting with non-traumatic acute abdominal pain were screened during the study period. Of these, 12 patients were excluded based on predefined criteria: 4 had a history of blunt abdominal trauma, 3 were pregnant women, 3 had known chronic abdominal disorders such as cirrhosis, chronic pancreatitis, or inflammatory bowel disease, and 2 declined to undergo CT imaging. Consequently, 100 patients met the eligibility criteria and were included in the final analysis. All enrolled participants completed the CT evaluation, and their findings were analyzed (Figure 1).

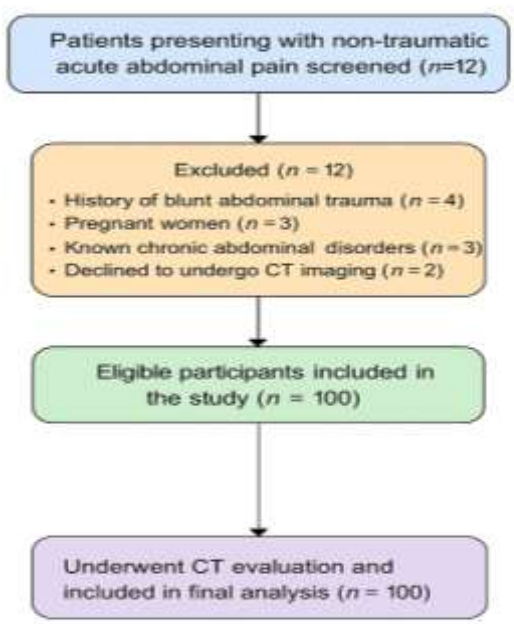

Figure 1: Participant Flow Diagram

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A total of 100 patients presenting with non-traumatic acute abdominal pain were included in the study. The mean age of the study cohort was 42.6 ± 15.8 years (range 18–78 years). Males constituted 58% of the population, while females accounted for 42% (Table 1).

Table 1. Demographic Characteristics of Study Population (n = 100)

Parameter	Value
Mean Age (years)	42.6 ± 15.8 (18–78)
Gender Distribution	Male: 58 (58%) Female: 42 (42%)

With respect to clinical presentation, generalized abdominal pain was the most common symptom, reported in 62% of patients, followed by localized right iliac fossa pain in 24%, and left hypochondrial pain in 8%. A smaller proportion (6%) presented with diffuse peritonitis-like features. Associated symptoms included nausea/vomiting (45%), fever (28%), and altered bowel habits (18%) (Table 2).

Table 2. Clinical Presentation of Patients

Symptom	Frequency (n)	Percentage (%)
Generalized abdominal pain	62	62
Localized right iliac fossa pain	24	24
Left hypochondrial pain	8	8
Diffuse peritonitis features	6	6
Nausea/Vomiting	45	45
Fever	28	28
Altered bowel habits	18	18

The CT scan revealed a broad spectrum of abdominal pathologies. Acute appendicitis was the most frequent finding, observed in 28% of cases, followed by urolithiasis with obstructive uropathy (20%) and acute diverticulitis (12%). Other diagnoses included acute pancreatitis (10%), hepatobiliary pathology such as acute cholecystitis and choledocholithiasis (8%), and intestinal obstruction (7%). Less frequent conditions identified were infective/inflammatory colitis (5%), perforated viscus (4%), ovarian/adnexal pathology (3%), mesenteric ischemia (2%), and miscellaneous causes, including abdominal tuberculosis and retroperitoneal abscess (1%) (Table 3).

Table 3. Spectrum of CT Scan Findings

CT Diagnosis	Number of Cases (n)	Percentage (%)
Acute Appendicitis	28	28
Urolithiasis with obstructive uropathy	20	20
Acute Diverticulitis	12	12
Acute Pancreatitis	10	10
Hepatobiliary pathology	8	8
Intestinal Obstruction	7	7
Infective/Inflammatory Colitis	5	5
Perforated Viscus	4	4
Ovarian/Adnexal Pathology	3	3
Mesenteric Ischemia	2	2
Miscellaneous (TB, abscess, etc.)	1	1

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In terms of diagnostic yield, CT scan established a definitive diagnosis in 90% of patients, while no significant abnormality was detected in 10% of cases, who were later managed conservatively or diagnosed with functional abdominal pain (Table 4).

Table 4. Diagnostic Yield of CT Scan

Parameter	Value	Percentage (%)
Definitive diagnosis established	90	90
No significant abnormality	10	10

Discussion

The present study assessed the role of computed tomography in patients presenting with non-traumatic acute abdominal pain. Among 100 patients, CT established a definitive diagnosis in 90%, underscoring its high diagnostic yield and reaffirming its value as a pivotal imaging tool in emergency abdominal settings.

Interpretation of Findings

In this cohort, acute appendicitis was the most common diagnosis (28%), consistent with its status as the leading surgical cause of acute abdomen globally. Previous research has shown CT accuracy for appendicitis exceeding 90%, confirming its superiority over conventional modalities [7,8]. Urolithiasis with obstructive uropathy was the second most frequent cause (20%), mirroring the growing prevalence of urinary calculi in India, likely influenced by environmental, dietary, and lifestyle determinants [9].

Other notable conditions included diverticulitis (12%) and acute pancreatitis (10%). While diverticulitis has traditionally been associated with Western populations, its rising incidence in Indian patients may reflect dietary transitions and evolving risk profiles [10]. Importantly, CT also detected less frequent but life-threatening conditions such as perforated viscus (4%) and mesenteric ischemia (2%), which are often clinically elusive. Furthermore, the identification of adnexal pathology (3%) in female patients highlights CT's broader diagnostic utility, including gynecological causes that mimic gastrointestinal emergencies.

Comparison with Literature

The study findings are consistent with international evidence emphasizing CT as the gold standard for evaluating acute non-traumatic abdominal pain. Studies have demonstrated its high sensitivity and specificity, particularly in differentiating surgical from non-surgical causes [11]. A large-scale multicenter study further confirmed that CT reduces diagnostic uncertainty, lowers negative laparotomy rates, and optimizes patient outcomes [12]. In comparison, ultrasonography, though valuable for hepatobiliary and gynecological pathologies, remains constrained by operator dependence and technical limitations, particularly in obese patients or those with excessive bowel gas [9][10].

Generalizability

The findings of this hospital-based descriptive cross-sectional study are generalizable to similar tertiary care settings where computed tomography (CT) is routinely employed for the evaluation of non-traumatic acute abdominal pain. Since the study included consecutive patients presenting with acute abdominal symptoms and followed standardized imaging protocols, the results can be applied with reasonable confidence to comparable emergency and radiology departments across India and similar healthcare environments. However, differences in population characteristics and availability of imaging resources across institutions should be considered when extrapolating these findings.

Strengths

The major strength of this study lies in its real-world setting, incorporating 100 consecutive patients, which minimized selection bias. Use of standardized imaging protocols and dual-radiologist review improved reporting consistency and diagnostic accuracy.

Clinical Implications

These results reinforce that CT should be considered an essential diagnostic modality in patients presenting with non-traumatic acute abdominal pain. It not only detects common entities such as appendicitis and urolithiasis but also identifies rarer, high-risk conditions that may be missed by clinical evaluation or ultrasonography. The ability of CT to provide rapid, comprehensive, and reliable assessment justifies its integration into standard emergency protocols, particularly when initial investigations are inconclusive [11,12].

Conclusion

This study demonstrates that computed tomography is a highly effective imaging modality in the evaluation of non-traumatic acute abdominal pain, establishing definitive diagnoses in 90% of patients. Acute appendicitis and urolithiasis emerged as the most frequent findings, while CT also identified less common but clinically significant conditions such as perforated viscus and mesenteric ischemia. By providing rapid, accurate, and comprehensive information, CT facilitates timely decision-making and improves patient outcomes. Despite concerns regarding radiation and cost, its diagnostic precision justifies its routine use in emergency settings. Integration of CT into standardized protocols is recommended to optimize the management of acute abdominal conditions.

Limitations

This study has certain limitations. As a cross-sectional observational analysis, it was confined to diagnostic evaluation and did not include assessment of treatment outcomes or long-term prognostic impact. Furthermore, surgical or histopathological confirmation was not available for all cases, which could influence diagnostic correlation accuracy. Evaluation of cost-effectiveness and radiation exposure risks was also beyond the scope of the present investigation.

Recommendations

CT scan should be considered an essential diagnostic tool in patients presenting with non-traumatic acute abdominal pain, particularly in emergency settings where clinical evaluation is inconclusive. Establishing structured CT imaging protocols, incorporating low-dose radiation techniques, and strengthening training for radiologists can further enhance diagnostic accuracy. Future multicenter studies with larger cohorts and long-term follow-up are recommended to validate findings and to assess comparative effectiveness with ultrasonography and MRI in specific patient groups.

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List of Abbreviations

CT – Computed Tomography
MDCT – Multi-Detector Computed Tomography
USG – Ultrasonography
MRI – Magnetic Resonance Imaging
IEC – Institutional Ethics Committee
SD – Standard Deviation

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This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare no conflict of interest.

Author contributions

CLNS-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript.**VL**-Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation.

Data availability

Data is available upon request

Author Biography

Dr. Chhani Lal Narsingh Sidar is currently serving as an Associate Professor in the Department of Radiodiagnosis at Abhishek I. Mishra Memorial Medical College & Research, Junvani, Durg, Chhattisgarh (India) since March 2024.
He completed his MBBS in 1992 from Gajra Raja Medical College, Gwalior (Madhya Pradesh) under Jiwaji University, and subsequently obtained his MD in Radiodiagnosis in 1998 from the same institution. Following his graduation, he worked as a Resident Medical Officer in the Radiology department at Pandit Jawaharlal Nehru Hospital and Research Centre, Bhilai, from July 1994 to April 1995.
Dr. Sidar has extensive teaching and clinical experience. He served as a **Senior Resident** from April 2017 to April 2018 and later worked as an Assistant Professor in Radiodiagnosis at Bharat Ratna Late Shri Atal Bihari Vajpayee Memorial Medical College, Rajnandgaon, Chhattisgarh, from February 2019 to March 2024.
With over two decades of clinical exposure and academic involvement, Dr. Sidar has contributed significantly to

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