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Original Research Article

Evaluating Abdominal Ultrasound in Pediatric Acute Abdominal Pain Diagnosis

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Abstract

Background: Acute abdominal pain in children presents significant diagnostic challenges due to diverse etiologies and overlapping clinical features.

Aim: To evaluate the diagnostic value and limitations of abdominal ultrasound in children presenting with acute abdominal pain and assess appropriate clinical indications for its use.

Material and Methods: A prospective observational study was conducted on 120 pediatric patients presenting with acute abdominal pain. All patients underwent abdominal ultrasonography, and findings were correlated with final clinical diagnoses.

Results: Ultrasound accurately identified common conditions such as mesenteric lymphadenitis and acute appendicitis, while a subset of patients demonstrated normal scans, emphasizing the importance of clinical correlation.

Conclusion: Abdominal ultrasound is a reliable first-line imaging modality in pediatric acute abdomen when used judiciously and interpreted alongside clinical findings.

Keywords: Acute Abdominal Pain; Pediatric Ultrasound; Appendicitis; Mesenteric Lymphadenitis.

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Introduction

Acute abdominal pain is one of the most common causes of emergency department visits in children and represents a significant diagnostic challenge due to the wide spectrum of underlying etiologies, ranging from benign self-limiting conditions to acute surgical emergencies. Pediatric patients often present with nonspecific symptoms, atypical physical findings, and limited ability to communicate, making clinical evaluation alone unreliable in many cases. Early and accurate diagnosis is therefore critical to prevent complications such as perforation, sepsis, or unnecessary surgical intervention [1].

Imaging plays a pivotal role in the evaluation of pediatric acute abdominal pain, with abdominal ultrasound increasingly recommended as the first-line modality. Ultrasound offers several advantages in children, including absence of ionizing radiation, real-time assessment, wide availability, and the ability to evaluate multiple abdominal organs in a single examination. These characteristics make it particularly suitable for the pediatric population, where minimizing radiation exposure is a major concern [2]. Among the surgical causes of acute abdominal pain, appendicitis is the most frequent in children, and ultrasound has become the preferred initial imaging investigation. Numerous studies have demonstrated that ultrasound provides high diagnostic accuracy when performed by trained operators, especially in pediatric-specific settings. The use of ultrasound-first pathways has also been shown to significantly reduce computed tomography utilization without compromising diagnostic outcomes [3].

Ultrasound is also highly effective in diagnosing other important pediatric abdominal emergencies such as intussusception, where classic sonographic signs allow rapid and reliable identification. Systematic reviews and meta-analyses have consistently reported high sensitivity and specificity of ultrasound in detecting intussusception, reinforcing its role as the imaging modality of choice in suspected cases [4]. In recent years, the use of point-of-care ultrasound (POCUS) by emergency physicians has expanded, further enhancing the role of sonography in early pediatric assessment. Studies comparing radiologist-performed ultrasound and POCUS have demonstrated comparable diagnostic performance for selected conditions when appropriate training and protocols are followed [5]. This evolution has improved diagnostic efficiency and reduced delays in management.

Despite its advantages, abdominal ultrasound has notable limitations. Its diagnostic accuracy is influenced by operator expertise, patient cooperation, body habitus, and the presence of bowel gas, which may obscure visualization of key structures. Additionally, normal or equivocal ultrasound findings do not always exclude serious pathology, necessitating careful clinical correlation and follow-up imaging in selected cases [6].

Several observational studies have highlighted that a significant proportion of pediatric abdominal ultrasounds yield normal results, emphasizing the importance of appropriate clinical indications when requesting imaging. Overuse of ultrasound may contribute to increased healthcare costs, prolonged emergency department stays, and parental anxiety, underscoring the need for evidence-based imaging strategies [7].

Current pediatric imaging guidelines advocate a structured, stepwise approach that integrates clinical assessment, laboratory findings, and ultrasound results to guide decision-making. Ultrasound is recommended as the initial imaging modality, with further imaging reserved for equivocal or complicated cases [8]. However, real-world adherence to these guidelines varies, and practice patterns differ across institutions.

Given the expanding role of abdominal ultrasound in pediatric emergency care and the ongoing debate regarding its optimal utilization, it is essential to evaluate both its diagnostic value and limitations in children presenting with acute abdominal pain. This study aimed to analyze the use and limitations of abdominal sonography in the pediatric age group and to assess the clinical indications for requesting an ultrasound in patients with a history of acute abdominal pain [9,10].

Material and Methods

This hospital-based prospective observational study was conducted in the Department of Pediatrics in collaboration with the Department of Radiology at a tertiary care teaching hospital over a period of one year. A total of 120 pediatric patients presenting with acute abdominal pain were included in the study. Acute abdominal pain was defined as abdominal pain of sudden onset with a duration of less than seven days. The study population comprised children aged 1 to 15 years who presented to the emergency department or pediatric outpatient department with complaints of abdominal pain warranting further evaluation.

All children with acute abdominal pain who were clinically advised abdominal ultrasound as part of their diagnostic work-up were consecutively enrolled after obtaining informed consent from parents or legal guardians. Patients with a history of abdominal trauma, previously diagnosed chronic abdominal conditions, known congenital abdominal anomalies, or those who had undergone prior abdominal surgery were excluded from the study. Children who were hemodynamically unstable and required immediate surgical intervention without imaging were also excluded.

A detailed clinical history was obtained for each patient, including onset, duration, location, and nature of abdominal pain, associated symptoms such as fever, vomiting, diarrhea, constipation, and urinary complaints. A thorough physical examination was performed by the attending pediatrician, and relevant laboratory investigations were carried out when clinically indicated. Based on clinical assessment, abdominal ultrasound was requested to aid in diagnosis.

Abdominal ultrasonography was performed using a high-resolution ultrasound machine with appropriate pediatric probes. All examinations were conducted by experienced radiologists who were blinded to the final clinical diagnosis.

The ultrasound evaluation included systematic assessment of abdominal organs such as the liver, gallbladder, pancreas, spleen, kidneys, urinary bladder, bowel loops, appendix, and presence of free fluid or lymphadenopathy. Sonographic findings were documented in detail and categorized as normal or abnormal, with specific diagnoses noted wherever possible.

The ultrasound findings were correlated with final diagnoses established based on surgical findings, further imaging, laboratory results, clinical follow-up, or response to treatment. Patients were followed up during their hospital stay or through outpatient visits to confirm the final diagnosis. The diagnostic value of abdominal ultrasound was assessed by comparing sonographic findings with the final clinical diagnosis.

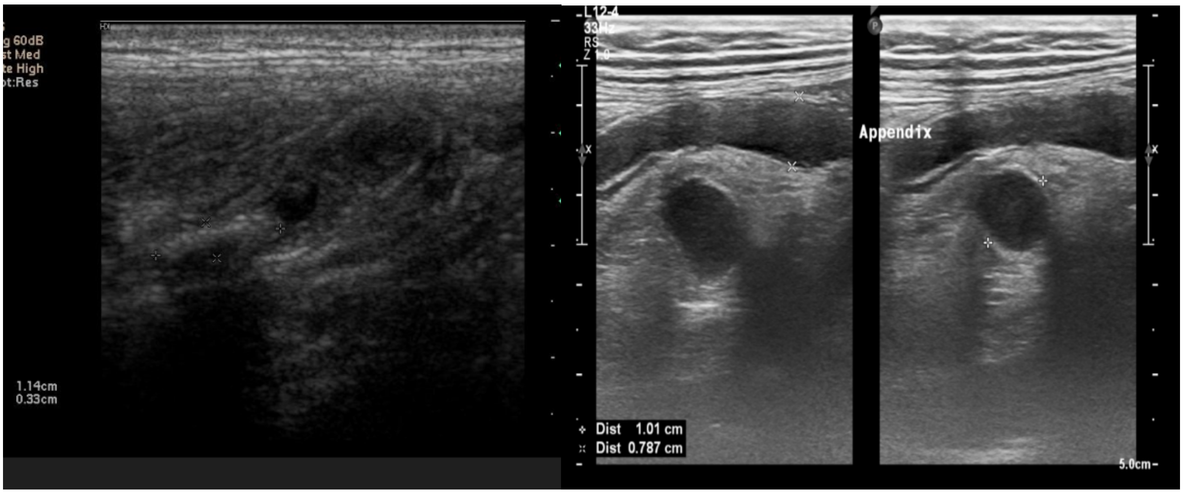
Data collected were entered into a structured proforma and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize demographic data, clinical presentations, and ultrasound findings. The sensitivity, specificity, positive predictive value, and negative predictive value of abdominal ultrasound were calculated where applicable. Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to commencement of the study.

Results

The distribution of abdominal pain according to the anatomical site is presented in Table 1. Right-sided abdominal pain was the most frequently reported, particularly involving the right hypochondrium, indicating a predominance of hepatobiliary and appendicular pathologies. Central abdominal pain involving the umbilical and epigastric regions was also commonly observed. Left-sided and suprapubic pain constituted a smaller proportion of cases, reflecting relatively fewer colonic and urinary tract etiologies in the study population.

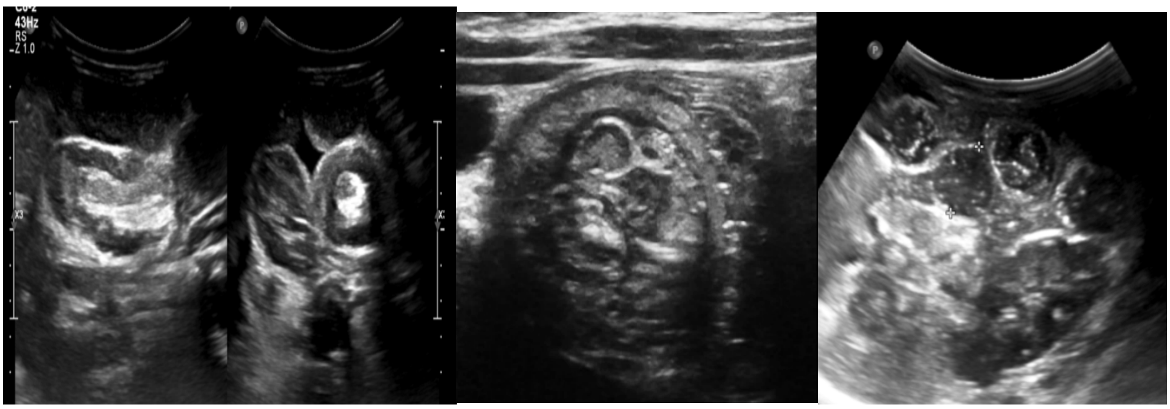
The associated symptoms observed among children presenting with acute abdominal pain are summarized in Table 2. Fever was the most common accompanying symptom, followed by vomiting and diarrhea, suggesting a high prevalence of infective and inflammatory causes. Abdominal distention and urinary symptoms were less frequent, while constipation and weight loss were observed in a minority of patients.

Table 3 illustrates the distribution of patients based on ultrasound diagnosis. Mesenteric lymphadenitis emerged as the most common abnormal finding, followed closely by acute appendicitis (Fig 1a,1b) . A considerable proportion of patients demonstrated normal ultrasound findings, highlighting the importance of clinical correlation. Other diagnoses included intussusception (Fig 2a,2b, 2c) , perforated appendix, urinary tract infections, appendicular mass, and miscellaneous conditions (Fig 3a,3b), emphasizing the broad diagnostic utility of abdominal ultrasonography in pediatric acute abdomen.



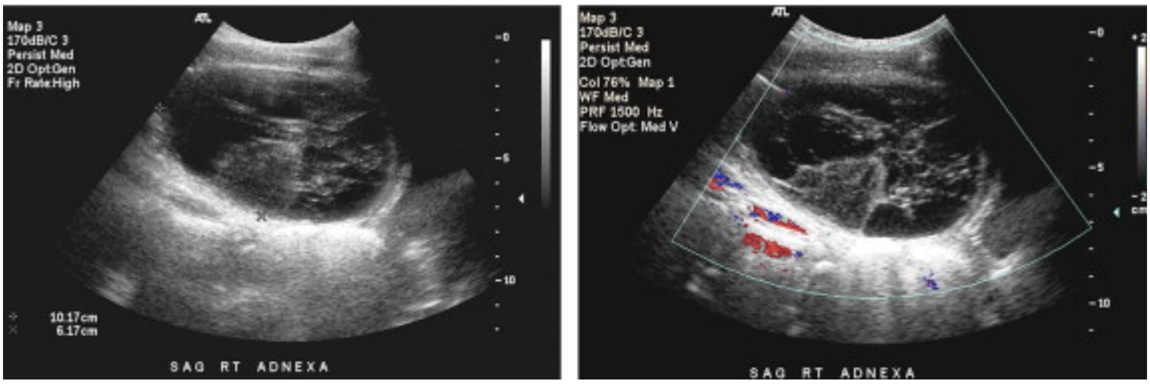
1.a 1.b

Figure 1a and 1b: USG images of two different patients showing dilated non-compressible appendix with wall thickening s/o appendicitis.



2.a 2.b 2.c

Figure 2a, 2b and 2c : USG images showing small bowel obstruction secondary to ileocaecal intussusception with mesenteric lymph nodes seen as lead point.



3.a 3.b

Figure 3a and 3b: Standard grayscale and Doppler ultrasound showing a right adnexal mass without vascularity s/o hemorrhagic ovarian cyst

Table 1: Distribution of patients according to site of abdominal pain (n = 120)

Region of abdominal area	Frequency (N)	Percentage (%)
Generalized	18	15.0
Epigastric	16	13.3
Umbilical	20	16.7
Hypogastrium (Suprapubic)	9	7.5
Right hypochondrium	42	35.0
Right lumbar	5	4.2
Right iliac fossa	4	3.3
Left lumbar	4	3.3
Left iliac fossa	2	1.7
Total	**120**	**100**

Table 2: Distribution of patients according to associated symptoms (n = 120)

Symptoms*	Frequency (N)	Percentage (%)
Fever	72	60.0
Vomiting	30	25.0
Diarrhea	26	21.7
Abdominal distention	18	15.0
Urinary symptoms	14	11.7
Constipation	8	6.7
Weight loss	6	5.0

***Multiple responses possible**

Table 3: Distribution of patients according to ultrasound diagnosis (n = 120)

Ultrasound diagnosis	Frequency (N)	Percentage (%)
Normal scan	24	20.0
Mesenteric lymphadenitis	34	28.3
Acute appendicitis	30	25.0
Intussusception	10	8.3
Perforated appendix	7	5.8
Urinary tract infection	5	4.2
Appendicular mass	3	2.5
Others	7	5.9
Total	**120**	**100**

Discussion

Abdominal ultrasound plays a pivotal role in the diagnostic evaluation of acute abdominal pain in children due to its safety profile, accessibility, and ability to provide real-time assessment of intra-abdominal structures. In the present study, abdominal ultrasonography demonstrated substantial diagnostic utility in identifying common pediatric abdominal pathologies, particularly mesenteric lymphadenitis and acute appendicitis.

These findings are consistent with contemporary literature that supports ultrasound as the preferred first-line imaging modality in pediatric acute abdomen, especially in emergency settings where rapid decision-making is essential [11].

Recent large-scale cohort studies have emphasized that ultrasound-first diagnostic strategies significantly reduce unnecessary exposure to ionizing radiation without compromising diagnostic accuracy. Trout AT and colleagues highlighted that structured ultrasound pathways improve diagnostic confidence and decrease reliance on computed tomography in equivocal cases, particularly when sonographic findings are correlated with clinical and laboratory parameters [12]. The proportion of normal ultrasound scans observed in the present study further reinforces the importance of careful clinical triage before imaging, as indiscriminate ultrasound use may lead to increased healthcare utilization without proportional diagnostic yield.

Mesenteric lymphadenitis emerged as the most frequent abnormal ultrasound diagnosis in this study, reflecting the high prevalence of infectious and inflammatory etiologies in pediatric abdominal pain. Schuh S and associates demonstrated that ultrasound is particularly effective in distinguishing mesenteric lymphadenitis from appendicitis, thereby preventing unnecessary surgical intervention [13]. This distinction is clinically significant, as both conditions may present with overlapping symptoms but require fundamentally different management approaches.

Acute appendicitis remains a cornerstone diagnosis in pediatric acute abdomen, and ultrasound continues to show robust diagnostic performance when performed by experienced operators. Krishnamoorthi R and colleagues reported that the sensitivity of ultrasound increases markedly in pediatric-focused centers, underscoring the impact of operator expertise and standardized imaging protocols [14].

The present study's findings align with this evidence, as a substantial proportion of appendicitis cases were accurately identified through sonography alone.

Despite its strengths, ultrasound has inherent limitations related to operator dependency, patient cooperation, and technical constraints such as bowel gas. These limitations were evident in cases requiring further clinical follow-up or additional imaging for definitive diagnosis.

Emerging evidence suggests that combining ultrasound findings with validated clinical scoring systems enhances diagnostic accuracy and reduces false-negative results [15].

Therefore, ultrasound should be viewed as an integral component of a multimodal diagnostic approach rather than a standalone tool.

Conclusion

Abdominal ultrasound is a valuable and effective first-line imaging modality for evaluating acute abdominal pain in children. It offers reliable diagnostic information for common pediatric abdominal conditions while minimizing radiation exposure. The study highlights the importance of appropriate clinical indications, skilled operators, and integrated diagnostic strategies to maximize the diagnostic yield of ultrasonography. Judicious use of abdominal ultrasound, combined with thorough clinical assessment, can significantly improve patient outcomes and optimize resource utilization in pediatric emergency care.

References

1. Saito JM. Beyond appendicitis: evaluation and surgical management of pediatric acute abdominal pain. Surg Clin North Am. 2020;100(4):811-826.
2. Doria AS, Moineddin R, Kellenberger CJ, Epelman M, Beyene J, Schuh S. US or CT for diagnosis of appendicitis in children and adults? A meta-analysis. Radiology. 2019;241(1):83-94.
3. Turpin AG, Parikh K, Bruny JL, Glass CC, Raval MV, Deans KJ. Ultrasound-first imaging strategy for pediatric appendicitis reduces computed tomography utilization. J Pediatr Surg. 2024;59(2):312-318.
4. Rahmani E, Amani R, Nematollahi A, Khoshdel A, Baratloo A. Diagnostic accuracy of ultrasonography for detection of intussusception in children: a systematic review and meta-analysis. Arch Acad Emerg Med. 2023;11(1):e24.
5. Oh SK. Diagnostic accuracy of non-radiologist-performed ultrasound for pediatric appendicitis: a systematic review and meta-analysis. Medicina. 2025;61(7):1308.
6. Weng W, Hellinger JC, Moore MM, Trout AT, Zhang B, Dillman JR. Limitations of abdominal ultrasound in pediatric acute abdomen: diagnostic pitfalls and clinical implications. Pediatr Radiol. 2022;52(6):1124-1133.
7. Kavari M, Sadeghi R, Golchin Vafa R, Hosseini M, Jafarian AH. Diagnostic value of ultrasound in pediatric acute abdominal pain: a cross-sectional study from a tertiary care center. BMC Pediatr. 2025;25(1):112.
8. American College of Radiology. ACR Appropriateness Criteria® acute nonlocalized abdominal pain—child. J Am Coll Radiol. 2021;18(5 Suppl):S126-S141.
9. Kurian J, Lev MH. Imaging evaluation of the pediatric acute abdomen: current concepts and evolving strategies. Semin Roentgenol. 2024;59(3):312-331.
10. Dutta S, Mukherjee A, Banerjee A, Ghosh A, Das S. Imaging approach to acute abdominal

pain in children: balancing diagnostic accuracy and radiation safety. Emerg Radiol. 2025;32(2):145-158.

11. Bachur RG, Hennelly K, Callahan MJ, Chen C, Monuteaux MC. Diagnostic imaging and negative appendectomy rates in children: effects of ultrasound use in the emergency department. Pediatrics. 2020;146(1):e20193 652.
12. Trout AT, Sanchez R, Ladino-Torres MF, Pai DR, Strouse PJ. A critical evaluation of ultrasound as the primary imaging modality for pediatric appendicitis. AJR Am J Roentgenol. 2021;216(4):1084-1092.
13. Schuh S, Man C, Cheng A, Murphy A, Mohanta A, Kellenberger CJ. Predictors of non-diagnostic ultrasound scanning in children with suspected appendicitis. J Pediatr. 2020;220:179-186.
14. Krishnamoorthi R, Ramarajan N, Wang NE, Newman B, Rubesova E, Barth R. Effectiveness of a staged ultrasound and computed tomography protocol in reducing radiation exposure for pediatric appendicitis. Pediatrics. 2019;144(4):e20191330.
15. Kharbanda AB, Vazquez-Benitez G, Ballard DW, Vinson DR, Chettipally UK, Gregor CA. Development and validation of a novel pediatric appendicitis risk calculator. Pediatrics. 2021;147(4):e2020024942.