**Scholars Journal of Applied Medical Sciences**
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Radiology

# Ultrasonographic Evaluation of Acute Appendicitis in Children

Dr. Mohammad Mahbub Hossain[1]*, Dr. Mahmuda Monowara[2], Dr. Mst. Meherun Nesa[3]

[1]Associate Professor, Department of Radiology and Imaging, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh
[2]Professor (CC), Department of Radiology and Imaging, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh
[3]Medical Officer, Department of Radiology and Imaging, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh

**DOI:** https://doi.org/10.36347/sjams.2026.v14i04.002 | **Received:** 28.01.2026 | **Accepted:** 23.03.2026 | **Published:** 06.04.2026

***Corresponding author:** Dr. Mohammad Mahbub Hossain
Associate Professor, Department of Radiology and Imaging, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh

**Abstract** **Original Research Article**

***Background:*** Acute appendicitis is the most common cause of emergency abdominal surgery in children. Early and accurate diagnosis is essential to prevent complications such as perforation and abscess formation. Ultrasonography (USG) is widely used as a first-line, non-invasive imaging modality in pediatric patients due to its safety, availability and diagnostic utility. This study aimed to evaluate the ultrasonographic findings in children with suspected acute appendicitis. ***Methods:*** This prospective observational study was conducted in the Department of Radiology & Imaging at Bangladesh Shishu Hospital from January 2024 to December 2024. A total of 120 children presenting with clinical suspicion of acute appendicitis were included. Patients underwent detailed clinical assessment and abdominal ultrasonography. Data were analyzed using SPSS 25. ***Results:*** The highest proportion of patients were aged 10–13 years (44, 36.7%) and 71 (59.2%) were male. Right lower abdominal pain was the most common symptom (114, 95.0%), followed by abdominal tenderness (108, 90.0%) and nausea or vomiting (83, 69.2%). Ultrasonographic evaluation revealed a non-compressible tubular appendix >6 mm in 89 patients (74.2%), appendiceal wall thickening in 81 (67.5%), increased periappendiceal echogenic fat in 52 (43.3%), periappendiceal fluid collection in 26 (21.7%), appendicolith in 17 (14.2%) and abscess formation in 9 (7.5%). ***Conclusion:*** Ultrasonography is an effective and reliable diagnostic tool for evaluating suspected acute appendicitis in children. Its use can facilitate early diagnosis, detect complications and reduce unnecessary surgical interventions in the pediatric population.

**Keywords:** Acute appendicitis, Children, Ultrasonography, Pediatric imaging.



## INTRODUCTION

Acute appendicitis is one of the most common causes of emergency abdominal surgery in children, representing a significant portion of pediatric surgical admissions worldwide [1]. It is characterized by inflammation of the vermiform appendix, which can lead to serious complications such as perforation, peritonitis and abscess formation if not diagnosed and treated promptly [2]. Early and accurate diagnosis is particularly important in children, as their clinical presentation is often atypical and they may not be able to clearly articulate the severity or location of their pain [3]. This can result in delayed diagnosis, increased morbidity, or unnecessary surgical interventions.

The clinical diagnosis of acute appendicitis in children relies on a combination of history, physical examination and laboratory investigations, including total leukocyte count and markers of inflammation such as C-reactive protein [4]. However, these parameters alone are often insufficient for a definitive diagnosis, particularly in younger children or in cases with atypical symptoms. Misdiagnosis may lead to negative appendectomy or missed perforation, highlighting the need for reliable imaging techniques [5].

Ultrasonography (USG) has emerged as a first-line imaging modality for evaluating suspected appendicitis in pediatric patients [6]. Its advantages include being non-invasive, widely available, cost-effective and free from ionizing radiation, which is particularly important for the pediatric population [7]. High-frequency ultrasonography can directly visualize the appendix and identify key features of inflammation, such as a non-compressible tubular structure, appendiceal wall thickening, increased periappendiceal echogenicity, periappendiceal fluid collection and the presence of an appendicolith [8]. Color Doppler ultrasonography may further enhance diagnostic accuracy by demonstrating increased vascularity associated with inflammation [9].

The effectiveness of ultrasonography in diagnosing acute appendicitis depends on several factors, including the skill of the operator, patient cooperation and body habitus [10]. Despite these limitations, multiple studies have demonstrated that ultrasonography provides high sensitivity and specificity for diagnosing appendicitis in children. In addition, it can help identify alternative diagnoses, such as mesenteric lymphadenitis, intussusception, ovarian cysts, or urinary tract infections, which may present with similar clinical features [11].

Given the clinical challenges and the pivotal role of imaging, this study aims to evaluate the ultrasonographic findings in children with suspected acute appendicitis, determine its diagnostic accuracy and assess its utility in the context of Bangladeshi pediatric patients. The findings may provide valuable insights into improving early diagnosis, reducing complications and optimizing management strategies in children with acute appendicitis.

## METHODOLOGY & MATERIALS

This prospective observational study was conducted in the Department of Radiology & Imaging at Bangladesh Shishu Hospital from January 2024 to December 2024. A total of 120 pediatric patients who presented with clinical suspicion of acute appendicitis were included in the study. Children aged between 2 and 15 years presenting with symptoms such as right lower abdominal pain, fever, nausea, vomiting, anorexia, or abdominal tenderness suggestive of acute appendicitis were considered eligible for inclusion. Patients were enrolled consecutively after obtaining informed consent from their parents or guardians.

All enrolled patients underwent detailed history taking and clinical examination. Ultrasonographic evaluation of the abdomen was performed using a high-frequency linear transducer by experienced radiologists to identify features suggestive of acute appendicitis, such as a non-compressible blind-ended tubular structure with an outer diameter greater than 6 mm, appendiceal wall thickening, periappendiceal fluid collection, increased echogenicity of surrounding fat, or the presence of an appendicolith. Relevant demographic and clinical information was recorded using a structured data collection sheet.

Children who had a previous history of appendectomy, those with known chronic gastrointestinal diseases, abdominal trauma, or patients with incomplete clinical or ultrasonographic data were excluded from the study. Patients in whom another definite cause of abdominal pain was confirmed during evaluation were also excluded.

Collected data were checked for completeness, coded and entered into a computer database for analysis. Statistical analysis was performed using SPSS version 25. Descriptive statistics such as frequency, percentage, mean and standard deviation were calculated where appropriate.

## RESULTS

**Table I: Age Distribution of the Study Population (n = 120)**

| Age group (years) | Frequency | Percentage (%) |
|---|---|---|
| 2–5 | 19 | 15.8 |
| 6–9 | 37 | 30.8 |
| 10–13 | 44 | 36.7 |
| 14–15 | 20 | 16.7 |
| **Total** | **120** | **100** |

Table I shows the age distribution of 120 children with suspected acute appendicitis, with the highest proportion in the 10–13 years group (44, 36.7%), followed by the 6–9 years group (37, 30.8%), the 14–15 years group (20, 16.7%) and the 2–5 years group (19, 15.8%).

**Table II: Gender Distribution of the Patients (n = 120)**

| Gender | Frequency | Percentage (%) |
|---|---|---|
| Male | 71 | 59.2 |
| Female | 49 | 40.8 |
| **Total** | **120** | **100** |

As shown in Table II, among 120 children with suspected acute appendicitis, 71 (59.2%) were male and 49 (40.8%) were female, yielding a male-to-female ratio of approximately 1.45:1.

**Table III: Clinical Presentation of the Children with Suspected Acute Appendicitis (n = 120)**

| Clinical features | Frequency | Percentage (%) |
|---|---|---|
| Right lower abdominal pain | 114 | 95.0 |
| Nausea / vomiting | 83 | 69.2 |
| Fever | 67 | 55.8 |
| Loss of appetite | 76 | 63.3 |
| Abdominal tenderness | 108 | 90.0 |
| Rebound tenderness | 59 | 49.2 |

Table III summarizes the clinical presentation of the 120 children with suspected acute appendicitis, with right lower abdominal pain being the most common symptom (114, 95.0%), followed by abdominal tenderness (108, 90.0%), nausea or vomiting (83, 69.2%), loss of appetite (76, 63.3%), fever (67, 55.8%) and rebound tenderness (59, 49.2%).

**Table IV: Ultrasonographic Findings Among the Patients (n = 120)**

| Ultrasonographic findings | Frequency | Percentage (%) |
|---|---|---|
| Non-compressible tubular appendix (>6 mm) | 89 | 74.2 |
| Appendiceal wall thickening | 81 | 67.5 |
| Periappendiceal fluid collection | 26 | 21.7 |
| Appendicolith | 17 | 14.2 |
| Increased periappendiceal echogenic fat | 52 | 43.3 |
| Abscess formation | 9 | 7.5 |

Table IV presents the ultrasonographic findings among the 120 children with suspected acute appendicitis, revealing a non-compressible tubular appendix measuring >6 mm in 89 patients (74.2%), appendiceal wall thickening in 81 (67.5%), increased periappendiceal echogenic fat in 52 (43.3%), periappendiceal fluid collection in 26 (21.7%), appendicolith in 17 (14.2%) and abscess formation in 9 (7.5%).

## DISCUSSION

Acute appendicitis remains a common surgical emergency in children and timely diagnosis is crucial to prevent complications such as perforation, abscess formation and peritonitis. In this study, the highest proportion of children with suspected acute appendicitis was observed in the 10–13 years age group (44, 36.7%), followed by the 6–9 years group (37, 30.8%), which is consistent with the findings reported by Islam *et al.,* who observed peak incidence between 8–13 years [8]. The male predominance in our study (71 males, 59.2%; male-to-female ratio 1.45:1) aligns with other pediatric studies, as reported by Ikram *et al.,* and Darbyshire et al., highlighting a slightly higher incidence of appendicitis in boys [12,13].

Clinically, right lower abdominal pain was the most common presenting symptom in our cohort (114, 95.0%), followed by abdominal tenderness (108, 90.0%), nausea or vomiting (83, 69.2%), loss of appetite (76, 63.3%), fever (67, 55.8%) and rebound tenderness (59, 49.2%). These findings are comparable to reports by Rashid *et al.,* and Hosain *et al.,* which emphasize that pain and tenderness are the most reliable clinical indicators in children, while systemic features like fever and vomiting are less consistently present [14,15]. Our data reinforce the importance of integrating clinical features with imaging to reduce misdiagnosis and negative appendectomy rates.

Ultrasonography in our study revealed a non-compressible tubular appendix measuring >6 mm in 89 patients (74.2%), appendiceal wall thickening in 81 (67.5%), increased periappendiceal echogenic fat in 52 (43.3%), periappendiceal fluid collection in 26 (21.7%), appendicolith in 17 (14.2%) and abscess formation in 9 (7.5%). These results are in agreement with previous studies: Ali *et al.,* reported appendiceal diameters >6 mm in 72–78% of confirmed cases, while Ikram *et al.,* found wall thickening in 65% and periappendiceal fat changes in 42% of children [12,16]. The presence of appendicolith and abscess in our study also corresponds closely with findings by Banerjee *et al.,* and Tong *et al.,* who noted appendicolith in 12–15% and abscess in 6–8% of pediatric cases, supporting ultrasonography's role in identifying complicated appendicitis [17,18].

Our study reinforces that ultrasonography is a reliable first-line imaging modality for diagnosing pediatric appendicitis, consistent with Darbyshire *et al.,* Bahrami *et al.,* and Balbo *et al.,* who demonstrated sensitivities ranging from 75–90% and specificities of 85–95% [13,19,20]. The detection of a non-compressible appendix with wall thickening and surrounding inflammatory changes remains the most important sonographic criterion. Furthermore, the ability to identify complications such as abscess formation or the presence of appendicolith is essential for surgical planning, as highlighted by Banerjee *et al.,* and Zouari *et al.,* [17, 21].

While computed tomography provides high diagnostic accuracy, its use is limited in children due to radiation exposure and ultrasonography offers a safe, non-invasive alternative without compromising diagnostic confidence. Our findings emphasize that in the Bangladeshi pediatric population, ultrasonography can significantly reduce reliance on CT scans, which aligns with observations by Hawrami *et al.,* and Davis *et al.,* [22,23].

**Limitations of the study**

This study has a few limitations, including its single-center design and relatively small sample size, which may limit the generalizability of the findings. Therefore, future multicenter studies with larger sample sizes are recommended to further validate the diagnostic utility of ultrasonography in children with suspected acute appendicitis.

## CONCLUSION

In conclusion, our study demonstrates that ultrasonography is an effective, reliable and safe modality for evaluating suspected acute appendicitis in children. The observed ultrasonographic features, including non-compressible tubular appendix, wall thickening, periappendiceal fat changes, fluid collections and appendicolith, closely correlate with previous international findings, reinforcing the utility of ultrasound as a first-line diagnostic tool. Incorporating ultrasonography with careful clinical assessment can improve diagnostic accuracy, guide management and reduce unnecessary surgical interventions in pediatric patients.

**Financial Support and Sponsorship:** No funding sources.

**Conflicts of Interest:** There are no conflicts of interest.

## REFERENCES

1. Ashjaei B, Mehdizadeh M, Alizadeh H, Najm N, Moghtaderi M. Evaluating the value of different sonographic findings in diagnosis of acute appendicitis in children. African Journal of Paediatric Surgery. 2022 Jan 1;19(1):13-7.
2. Baykara AS, Baykara S. Acute appendicitis in children: evaluation of the diagnostic efficacy of ultrasonography and computed tomography. Cureus. 2023 Aug 21;15(8).
3. Zouari M, Hbaieb M, Issaoui A, Krichen E, Safi F, Dhaou MB, Mhiri R. Ultrasound assessment in children with suspected appendicitis: time to revise diagnostic criteria: a prospective cohort study. Surgical Infections. 2024 May 1;25(4):300-6.
4. Roberts K, Moore H, Raju M, Gent R, Piotto L, Taranath A, Ee M, Linke R, Goh DW. Diagnostic ultrasound for acute appendicitis: the gold standard. Journal of Pediatric Surgery. 2024 Feb 1;59(2):235-9.
5. Cho SU, Oh SK. Accuracy of ultrasound for the diagnosis of acute appendicitis in the emergency department: A systematic review. Medicine. 2023 Mar 31;102(13):e33397.
6. Arredondo Montero J, Bardají Pascual C, Antona G, Ros Briones R, López-Andrés N, Martín-Calvo N. The BIDIAP index: a clinical, analytical and ultrasonographic score for the diagnosis of acute appendicitis in children. Pediatric Surgery International. 2023 Apr 10;39(1):175.
7. Levy S, Hiller N, Lev-Cohain N, Goldberg SN, Mizrahi I, Simanovsky N. Ultrasonographic features can predict outcome of conservative management of acute appendicitis in children. Emergency Radiology. 2022 Feb;29(1):59-65.
8. Islam MR, Haque MF, Ahsan A. Role of Ultrasonography in the Diagnosis of Acute Appendicitis. SAS J Surg. 2022 Nov;11:669-74.
9. Nandan R, Samie AU, Acharya SK, Goel P, Jain V, Dhua AK, Khan MA, Yadav DK. Pediatric appendicitis score or ultrasonography? In search of a better diagnostic tool in Indian children with lower abdominal pain. Indian Journal of Pediatrics. 2023 Dec;90(12):1204-9.
10. Atalar H, Keşaplı M, Karakoyun ÖF, Karaca A. Emergency Physicians' Point of Care Ultrasonography (POCUS) Competency Assessment for the Diagnosis of Acute Appendicitis in Pediatric Cases. Eurasian Journal of Emergency Medicine. 2022 Jun 29.
11. Pop GN, Costea FO, Lungeanu D, Iacob ER, Popoiu CM. Ultrasonographic findings of child acute appendicitis incorporated into a scoring system. Singapore Medical Journal. 2022 Jan;63(1):35.
12. Ikram M, Ikram H, Memon ZA, Haq IU, Akbar S, Jahangir S, Ullah I, Wali R, Ullah N. Diagnostic accuracy of abdominal ultrasound for detection if acute appendicitis taking operative findings as gold standard. International Journal of Health Sciences. 2024;8(S1):717-26.
13. Darbyshire AR, Towers A, Harrison R, Taylor M, Carter NC, Toh SK, Mercer SJ. Routine ultrasound for suspected appendicitis in children: a single-centre retrospective cohort study. The Annals of The Royal College of Surgeons of England. 2023 Jan;105(1):72-6.
14. Rashid MS, Hossain M, Morshed GM, Islam KS, Islam MM, Tablu AH. Outcomes of Conservative Treatment of Uncomplicated Acute Appendicitis in Children. Sch J App Med Sci. 2023 Sep;9:1756-60.
15. Hosain MY, Hossain MJ, Azad MM, Reza S, Kabir MS. Use of Different Haematological Parameter as a Predictor of Complicated Appendicitis. Sch J App Med Sci. 2024 Jun;6:796-802.
16. Ali MS, Islam MM, Ali MM, Choudhury SA, Jahan M. Role of Ultrasonography in the Diagnosis of Acute Appendicitis. SAS J Med. 2024 Sep;9:891-7.

17. Banerjee A, Ratan SK, Neogi S, Goswami B, Dixit R, Panda SS. Role of ultrasonography and inflammatory markers in predicting complicated appendicitis. Journal of Indian Association of Pediatric Surgeons. 2022 Jul 1;27(4):448-54.
18. Tong L, Nataraja RM, VanHaltren K, Sulaksana TH, Vinycomb TI, Pacilli M. The utility of sonographic signs to diagnose simple and complicated appendicitis in children. Pediatric surgery international. 2023 Feb 11;39(1):114.
19. Bahrami M, Mirgaloyebayat H, Mohajeri Z, Mohammadi H, Afshari SA, Fazeli P, Masaeli D, Nourian SM. The diagnostic value of the computed tomography scan and ultrasonography in acute appendicitis. American Journal of Nuclear Medicine and Molecular Imaging. 2023 Feb 15;13(1):11.
20. Balbo S, Pini CM, Raffaldi I, Delmonaco AG, Castagno E, Guanà R, Di Rosa G, Bondone C. Accuracy of point-of-care ultrasound in the diagnosis of acute appendicitis in a pediatric emergency department. Journal of Clinical Ultrasound. 2024 Jun;52(5):485-90.
21. Zouari M, Ameur HB, Krichen E, Kraiem N, Dhaou MB, Mhiri R. Appendicolith on ultrasound is predictive of complicated appendicitis in children. Pediatric Emergency Care. 2022 Oct 1;38(10):e1650-1.
22. Hawrami CS, Ricci E, Hailu KT, Salib K, Nandeesha SS, Kasagga A, Hamid P. Accuracyof Ultrasound and CT Scans in the Diagnosis of Acute Appendicitis in Children: A Systematic Review. Journal For International Medical Graduates. 2024 Apr 18;3(1).
23. Davis J, Chima M, Kasmire K. Radiation-free diagnosis of pediatric appendicitis: accuracy of point-of-care ultrasonography and magnetic resonance imaging. Pediatric Emergency Care. 2022 Jan 1;38(1):e246-50.