https://doi.org/10.3329/cbmj.v15i1.87613

Clinical Study on Management and Outcome of Perforated Appendicitis in a Tertiary Level Hospital in Bangladesh

*Islam R[1], Khondker MIMNS[2], Russell ATM[3], Islam MM[4], Rabbani MG[5], Mia MS[6]

Abstract

Perforated appendicitis remains a significant surgical emergency in developing countries. Understanding its clinical profile and outcomes is crucial for improving management in resource-limited settings like Bangladesh. A cross-sectional, descriptive study was conducted in the Department of Surgery, Mymensingh Medical College Hospital, Mymensingh, Bangladesh, between October 2013 and March 2014, to analyze the clinical presentation, management, and outcomes of perforated appendicitis in a tertiary hospital. Our study included 100 intraoperatively confirmed perforated appendicitis cases among 759 acute appendicitis admissions. Data on demographics, clinical features, management, and outcomes were analyzed. Perforation rates were highest in children <15 years (39%) and low-income groups (32%). All patients presented with abdominal pain (74% migratory) and fever (67%), with 82% showing leukocytosis. Delayed presentation (>3 days) occurred in 85% of cases. All patients received IV antibiotics (95% metronidazole, 75% ceftriaxone), and 98% underwent appendectomy. Postoperative complications included wound infection (25%) and intra-abdominal abscess (10%). Mean hospital stay was prolonged (45% required 8-10 days of hospitalization). Delayed presentation significantly contributed to perforation rates. Despite complications, prompt surgery and antibiotics yielded favorable outcomes, underscoring the importance of early intervention strategies in resource-limited settings.

CBMJ 2026 January: vol. 15 no. 01 P:89-95

Keywords: Abdominal pain, appendectomy, delayed presentation, perforated appendicitis, surgical outcome

Introduction

Acute appendicitis remains the most common abdominal surgical emergency worldwide, with perforated appendicitis representing its most severe complication.[1] The global incidence of appendiceal perforation varies significantly, ranging from 16% in developed nations to 30-50% in developing countries like Bangladesh.[2,3] This disparity highlights critical healthcare access issues and underscores the need for improved management protocols in resource-limited settings. The pathophysiology of perforated appendicitis involves progressive luminal obstruction, typically by fecaliths (30-40% of cases) or lymphoid hyperplasia, leading to increased intraluminal pressure, vascular compromise, and eventual wall necrosis.[5,6] Delayed presentation remains the most significant risk factor for perforation, with studies showing 85% of perforations occur when treatment is delayed >48 hours from symptom onset.[7] Pediatric and elderly populations are particularly vulnerable, demonstrating 3-5 times higher perforation rates due to atypical presentations and diagnostic challenges.[8] Clinical diagnosis remains challenging, as only 50-70

1. *Dr. Ryhan Islam, Resident Surgeon, Department of Surgery, Jamalpur Medical College, Jamalpur, Bangladesh.
2. Prof. M I M Nasim Sobhani Khondker, Ex-Professor & Head, Department of Surgery, Mymensingh Medical College Hospital, Mymensingh.
3. Dr. Abu Taher Mohammad Russell, Junior Consultant (In Situ) Surgery, Upazilla Health Complex, Sreepur, Magura
4. Dr. Muhammad Moinul Islam, Junior Consultant, Department of Surgery, Sarkari Karmachari Hospital, Fulbaria, Dhaka.
5. Dr. Md. Golam Rabbani, Registrar, Department of Surgery, Rangpur Medical college Hospital, Rangpur.
6. Dr. Mohammad Salauddin Mia, Medical Officer, Department of Surgery, National Gastroliver Institute & Hospital, Dhaka.

Address of Correspondence:
Email: dr.ryhanislam@gmail.com

percent of patients present with classic migratory pain, fever, and right iliac fossa tenderness.[9] Laboratory markers like leukocytosis (>11×10⁹/L) show 82-85% sensitivity but poor specificity (45-50%).[10] Imaging modalities, particularly ultrasonography, demonstrate variable accuracy (72-78% sensitivity) in detecting perforation signs like peri-appendiceal fluid or abscess formation.[11] Management controversies persist regarding optimal antibiotic regimens and surgical timing. Current evidence supports broad-spectrum antibiotics covering Gram-negative and anaerobic organisms, with ceftriaxone-metronidazole combinations achieving 85-90% efficacy.[12] Surgical intervention remains definitive, though the optimal approach (open vs laparoscopic) continues to be debated in perforated cases[13]

In Bangladesh, where 60% of the population lacks immediate surgical access, these challenges are magnified, resulting in prolonged hospital stays (8-10 days) and complication rates (25-30%) exceeding global benchmarks.[3,4] This study evaluates the management and outcomes of perforated appendicitis at a tertiary Bangladeshi hospital, aiming to identify modifiable factors influencing perforation rates and postoperative outcomes. Our findings may inform context-specific protocols to reduce morbidity in resource-constrained environments.

Methods

This descriptive, cross-sectional study was conducted in the Department of Surgery, Mymensingh Medical College Hospital, Mymensingh, Bangladesh, from October 2013 to March 2014. Among 759 patients admitted with acute appendicitis, 100 consecutive cases of intraoperatively confirmed perforated appendicitis were enrolled through purposive sampling.

Inclusion criteria: Patients were included if they had: (1) clinical suspicion of perforated appendicitis confirmed during laparotomy, (2) underwent operative management, and (3) an age of >5 years. Cases with incomplete medical records or those managed conservatively were excluded.

Exclusion criteria: We excluded: (1) conservatively managed cases, (2) patients with other abdominal pathologies discovered during surgery, (3) elective appendectomies, and (4) cases where alternative diagnoses were found intraoperatively.

All patients underwent emergency appendectomy after clinical, laboratory (TLC, neutrophil count), and ultrasonographic evaluation. Intraoperative findings, including peritoneal contamination and appendix position, were documented. Postoperatively, patients received IV antibiotics (metronidazole and ceftriaxone) and were monitored for complications.

Data on demographics, clinical presentation, management, and outcomes was collected using structured patient data sheet. Statistical analysis was performed using SPSS 16.0 for Windows, Data was presented as frequency and percentage. Chi-square test was applied for comparison. A p-value <0.05 was considered statistically significant.

The study was approved by the Institutional Review Board of Mymensingh Medical College, Mymensingh, Bangladesh.

Results

During the six-month study period, a total of 759 patients were admitted with acute appendicitis. Among them, 100(13.2%) had perforated appendicitis confirmed during surgery. The highest proportion of perforations occurred in November (n=22), while March showed the highest perforation rate (18% of

monthly admissions) (Fig. 1). Demographic analysis revealed that 39% of perforations occurred in patients aged <15 years, followed by 32% in the 16–30-year age group (Table-I). Male predominance was observed (56% male vs. 44% female). Ultrasonography detected peri-appendiceal collections in 10% and abscesses in 8% of cases (Fig. 2). All patients received intravenous antibiotics (95% metronidazole, 75% ceftriaxone) for a mean duration of 4.3 days (Table-II). Delayed presentation (>72 hours from symptom onset) was the most significant risk factor (85% of perforations) (Fig. 3). Surgical management included appendectomy in 98% of cases, with 92% receiving peritoneal lavage (Table-III). Postoperative complications occurred in 63% of patients, including wound infections (25%), intra-abdominal abscesses (10%), and paralytic ileus (8%) (Fig. 4). The mean hospital stay was 8.2±2.4 days, with 45% requiring 8-10 days of hospitalization. Three patients (3%) required ICU admission but recovered completely (Table-IV). Overall, mortality rate was 1%, with one death attributed to septic shock in a patient presenting after 7 days of symptoms.

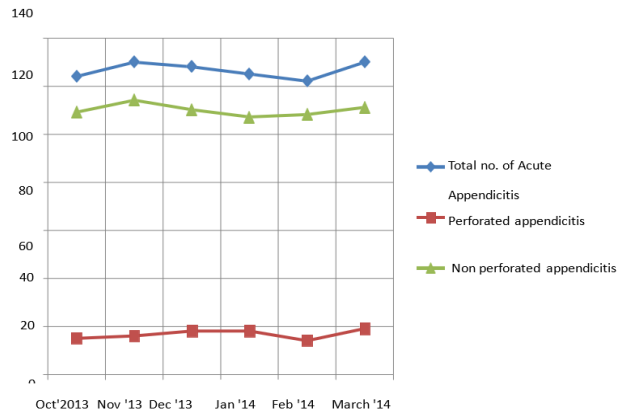

Fig. 1: Incidence of acute appendicitis and perforated appendicitis (n= 100)

Table-I: Frequency of perforation according to age (n=100)

Age group (in years)	Appendicitis			
	Acute		Perforated	
	Frequency	Percentage	Frequency	Percentage
<15	80	10.55	39	39
16-30	518	68.25	32	32
31-40	110	14.49	11	11
41-50	38	5.01	7	7
> 50	13	1.70	11	11
Total	**759**	**100**	**100**	**100**

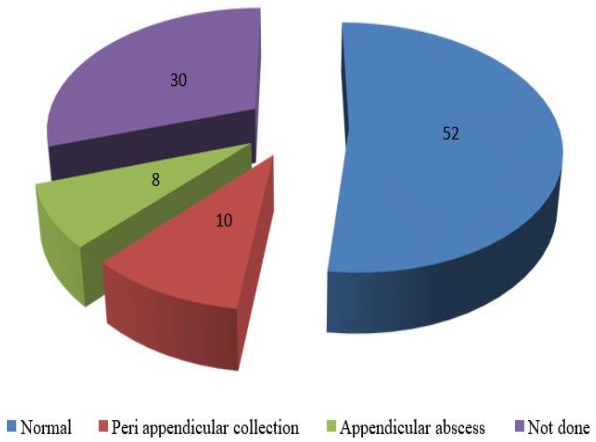

Fig. 2: Ultrasonogram findings of abdomen (n=100)

Table-II: Use of intravenous antibiotics (n=100)

Antibiotics	Frequency	Percentage
Inj. Metronidazole	95	95
Inj. Ceftriaxone	75	75
Inj. Ciprofloxacin	30	30
Inj. Amikacin	15	15
Inj. Gentamicin	5	5
Inj. Cefuroxime	3	3
Duration of use of intravenous antibiotics		
2-3 days	10	10
3-5 days	74	74
> 5 days	16	16

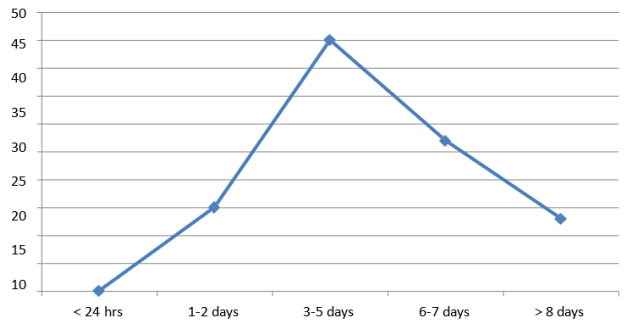

Fig. 3: Delay between the onset of pain and the time of surgery (n=100)

Table-III: Operative procedures (n=100)

Type of procedure	Frequency	Percentage
Appendicectomy	98	98
Peritoneal lavage with normal saline		
Local	92	92
Generalized	8	8
Laparotomy procedure		
Lower right incisiom paramedian incision	89	89
Midline incision	11	11
Drain used	92	92

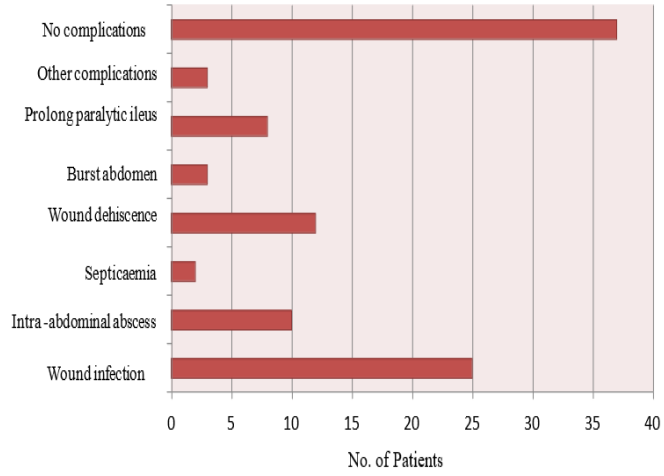

Fig. 4: Postoperative complications (n=100)

Table-IV: ICU admission and duration of hospital stay (n=100)

Variables	Frequency	Percentage
ICU Admission	3	3
Duration of hospital stay		
6-8 days	40	40
8-10 days	45	45
>10 days	15	15

Discussion

Our study provides important insights into the management and outcomes of perforated appendicitis in a tertiary care hospital in Bangladesh, with findings that both corroborate and contrast with existing literature. The 13.2% perforation rate we observed is notably higher than the 5-10% reported in developed nations.[14] However, it was consistent with rates from similar low-resource settings.[15] This disparity likely reflects multiple factors, including delayed presentation, which was evident in our study where 85% of perforated cases presented more than 72 hours after symptom onset, compared to just 30-40% in high-income countries.[16] The particularly high perforation rates among children <15 years (39%) and low-income groups (32%) highlight vulnerable populations that face significant barriers to timely healthcare access.[17] The demographic patterns in our study reveal important epidemiological trends. The male predominance (56%) aligns with global patterns of appendicitis,[18] though our observed male-to-female ratio of 1.5:1 is slightly lower than the 1.7:1 ratio reported in recent meta-analyses.[19] This variation may reflect regional differences in healthcare-seeking behavior or possibly biological factors warranting further investigation. The clinical presentation in our cohort largely matched classical descriptions, with 74% showing migratory pain and all cases demonstrating right iliac fossa tenderness.[20] The 67%

incidence of fever corresponds with other series of perforated appendicitis,[21] though notably 33% of our patients were afebrile at presentation, emphasizing that absence of fever cannot reliably exclude perforation.[22] Our diagnostic findings have important implications for clinical practice in resource-limited settings. The 82% rate of leukocytosis aligns well with the reported 75-85% sensitivity of this marker for perforated cases.[23] However, the limited sensitivity of ultrasonography (only identifying direct signs of perforation in 18% of cases) confirms its well-documented operator-dependent nature.[24] These results strongly support the continued reliance on clinical judgment alongside available investigations, particularly in settings where advanced imaging modalities like CT scans are not routinely available.[25] The management approach in our study reflects current best practices for perforated appendicitis while adapting to resource constraints. Our antibiotic regimen of metronidazole (95% of cases) and ceftriaxone (75%) aligns with guidelines recommending coverage for both anaerobic and gram-negative organisms.[26] The 98% rate of surgical intervention with appendectomy is consistent with global standards, though the predominance of open procedures (89% via lower right paramedian incision) reflects the limited laparoscopic capabilities in many resource-constrained settings.[27] The frequent use of peritoneal lavage (92%) and surgical drains (92%) represents a more cautious approach than some Western centers advocate, but may be justified given the delayed presentations and higher contamination risks in our population.[28] The postoperative complication profile in our series warrants careful analysis. The 25% wound infection rate is higher than the 10-15% reported in high-income settings,[29] but comparable to other studies from similar environments.[30] This likely reflects multiple factors, including delayed presentation, nutritional status, and environmental conditions in the hospital. The 10% rate of intra-abdominal abscess is similarly elevated compared to high-resource settings (typically 3-5%), but consistent with other reports from developing countries.[31,32] The 8% incidence of prolonged paralytic ileus may relate to both the severity of peritoneal contamination and postoperative pain management strategies.[33]

This study has several limitations. Purposive sampling may introduce selection bias; the cross-sectional design limits causal inference. Our sample size may be inadequate and 6-month duration prevents long-term assessment. Being a single-centere study, results may not reflect nationwide patterns. These constraints warrant cautious interpretation of findings.

Conclusion

Our study highlights that delayed presentation remains the primary risk factor for perforated appendicitis in Bangladesh, particularly affecting pediatric and low-income populations. Despite resource constraints, prompt surgical intervention and appropriate antibiotic therapy achieved favorable outcomes, though complication rates remained significant. These findings underscore the need for public health initiatives to improve early diagnosis and access to emergency surgical care in resource-limited settings to reduce perforation-related morbidity. Standardized management protocols could further optimize outcomes. To reduce perforation rates, public awareness campaigns should emphasize early symptom recognition. Hospitals should implement standardized appendicitis management protocols and improve emergency surgical capacity. Future multicenter studies with larger samples are needed to

validate these findings. Training on ultrasound diagnostics should be enhanced to improve preoperative accuracy.

References

1. *Pepper VK, Stanfill AB, Pearl RH. Diagnosis and management of pediatric appendicitis, intussusception, and Meckel diverticulum. Surg Clin North Am. 2012;92(3):505-26.*
2. *Buckius MT, McGrath B, Monk J, Grim R, Bell T, Ahuja V. Changing epidemiology of acute appendicitis in the United States: study period 1993-2008. J Surg Res. 2012;175(2):185-90.*
3. *kon K, Rai M. Microbiology for Surgical Infections: Diagnosis, Prognosis and Treatment. London: Academic Press; 2014.*
4. *Sikder SS, Labrique AB, Shamim AA, Ali H, Mehra S, Wu L, et al. Risk factors for reported obstetric complications and near misses in rural northwest Bangladesh: analysis from a prospective cohort study. BMC Pregnancy Childbirth. 2014;14:347.*
5. *Omari AH, Khammash MR, Qasaimeh GR, Shammari AK, Yaseen MK, Hammori SK. Acute appendicitis in the elderly: risk factors for perforation. World J Emerg Surg. 2014;9(1):6.*
6. *Bachar I, Perry ZH, Dukhno L, Mizrahi S, Kirshtein B. Diagnostic value of laparoscopy, abdominal computed tomography, and ultrasonography in acute appendicitis. J Laparoendosc Adv Surg Tech A. 2013;23(12):982-9.*
7. *de Castro SM, Ünlü C, Steller EP, van Wagensveld BA, Vrouenraets BC. Evaluation of the appendicitis inflammatory response score for patients with acute appendicitis. World J Surg. 2012L;36(7):1540-5.*
8. *Bhullar JS, Chaudhary S, Cozacov Y, Lopez P, Mittal VK. Acute appendicitis in the elderly: diagnosis and management still a challenge. Am Surg. 2014;80(11):E295-7.*
9. *Drake FT, Flum DR. Improvement in the diagnosis of appendicitis. Adv Surg. 2013;47:299-328.*
10. *Goulart RN, Silvério Gde S, Moreira MB, Franzon O. Main findings in laboratory tests diagnosis of acute appendicitis: a prospective evaluation. Arq Bras Cir Dig. 2012;25(2):88-90.*
11. *Mittal MK, Dayan PS, Macias CG, Bachur RG, Bennett J, Dudley NC, et al. Performance of ultrasound in the diagnosis of appendicitis in children in a multicenter cohort. Acad Emerg Med. 2013;20(7):697-702.*
12. *Sartelli M, Viale P, Catena F, Ansaloni L, Moore E, Malangoni M, et al. 2013 WSES guidelines for management of intra-abdominal infections. World J Emerg Surg. 2013;8(1):3.*
13. *Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, et al. Laparoscopic versus conventional appendectomy – a meta-analysis of randomized controlled trials. BMC Gastroenterol. 2010;10:129.*
14. *Cheong LH, Emil S. Determinants of appendicitis outcomes in Canadian children. J Pediatr Surg. 2014;49(5):777-81.*
15. *Livingston EH, Fomby TB, Woodward WA, Haley RW. Epidemiological similarities between appendicitis and diverticulitis suggesting a common underlying pathogenesis. Arch Surg. 2011;146(3):308-14.*
16. *Daskalakis K, Juhlin C, Påhlman L. The use of pre- or postoperative antibiotics in surgery for appendicitis: a systematic review. Scand J Surg. 2014;103(1):14-20.*
17. *Segev L, Keidar A, Schrier I, Rayman S, Wasserberg N, Sadot E. Acute appendicitis in the elderly in the twenty-first century. J Gastrointest Surg. 2015;19(4):730-5.*
18. *Wei PL, Chen CS, Keller JJ, Lin HC. Monthly variation in acute appendicitis incidence: a 10-year nationwide population-based study. J Surg Res. 2012;178(2):670-6.*
19. *Sammalkorpi HE, Mentula P, Leppäniemi A. A new adult appendicitis score improves diagnostic accuracy of acute appendicitis--a prospective study. BMC Gastroenterol. 2014;14:114.*
20. *Andersson RE. The natural history and traditional management of appendicitis revisited: spontaneous resolution and predominance of prehospital perforations imply that a correct*

diagnosis is more important than an early diagnosis. World J Surg. 2007;31(1):86-92.

21. *Andersson M, Rubér M, Ekerfelt C, Hallgren HB, Olaison G, Andersson RE. Can new inflammatory markers improve the diagnosis of acute appendicitis? World J Surg. 2014;38(11):2777-83.*
22. *Kulik DM, Uleryk EM, Maguire JL. Does this child have appendicitis? A systematic review of clinical prediction rules for children with acute abdominal pain. J Clin Epidemiol. 2013;66(1):95-104.*
23. *Benabbas R, Hanna M, Shah J, Sinert R. Diagnostic Accuracy of History, Physical Examination, Laboratory Tests, and Point-of-care Ultrasound for Pediatric Acute Appendicitis in the Emergency Department: A Systematic Review and Meta-analysis. Acad Emerg Med. 2017;24(5):523-51.*
24. *Groselj-Grenc M, Repse S, Vidmar D, Derganc M. Clinical and laboratory methods in diagnosis of acute appendicitis in children. Croat Med J. 2007;48(3):353-61.*
25. *Leeuwenburgh MM, Wiarda BM, Bipat S, Nio CY, Bollen TL, Kardux JJ, et al. Acute appendicitis on abdominal MR images: training readers to improve diagnostic accuracy. Radiology. 2012;264(2):455-63.*
26. *Svensson JF, Hall NJ, Eaton S, Pierro A, Wester T. A review of conservative treatment of acute appendicitis. Eur J Pediatr Surg. 2012;22(3):185-94.*
27. *Ohtani H, Tamamori Y, Arimoto Y, Nishiguchi Y, Maeda K, Hirakawa K. Meta-analysis of the results of randomized controlled trials that compared laparoscopic and open surgery for acute appendicitis. J Gastrointest Surg. 2012;16(10):1929-39.*
28. *Andersson RE, Petzold MG. Nonsurgical treatment of appendiceal abscess or phlegmon: a systematic review and meta-analysis. Ann Surg. 2007;246(5):741-8.*
29. *St Peter SD, Sharp SW, Holcomb GW 3rd, Ostlie DJ. An evidence-based definition for perforated appendicitis derived from a prospective randomized trial. J Pediatr Surg. 2008;43(12):2242-5.*
30. *Blakely ML, Williams R, Dassinger MS, Eubanks JW 3rd, Fischer P, Huang EY, et al. Early vs interval appendectomy for children with perforated appendicitis. Arch Surg. 2011;146(6):660-5.*
31. *Henry MC, Walker A, Silverman BL, Gollin G, Islam S, Sylvester K, et al. Risk factors for the development of abdominal abscess following operation for perforated appendicitis in children: a multicenter case-control study. Arch Surg. 2007;142(3):236-41.*
32. *Ngim CF, Quek KF, Dhanoa A, Khoo JJ, Vellusamy M, Ng CS. Pediatric appendicitis in a developing country: what are the clinical predictors and outcome of perforation? J Trop Pediatr. 2014;60(6):409-14.*
33. *Fraser JD, Aguayo P, Leys CM, Keckler SJ, Newland JG, Sharp SW, et al. A complete course of intravenous antibiotics vs a combination of intravenous and oral antibiotics for perforated appendicitis in children: a prospective, randomized trial. J Pediatr Surg. 2010;45(6):1198-202.*