



To evaluate the clinical profile of patients diagnosed with acute appendicitis in a tertiary care hospital in North India

Dr. Nitin Verma^{1*}, Dr. Irshan Mohammad², Dr. Heena Sharma³

¹ MS General Surgery, RH Una, Department of Health and Family Welfare, Himachal Pradesh, India

² MS General Surgery, CHC Jawali, Department of Health and Family Welfare, Himachal Pradesh, India

³ MS General Surgery, CHC Nalagarh, Department of Health and Family Welfare, Himachal Pradesh, India

Abstract

Background: Acute appendicitis is one of the most common surgical emergencies worldwide. Early diagnosis and intervention are essential to reduce complications such as perforation and peritonitis. Clinical evaluation remains a cornerstone in diagnosis, particularly in resource-limited settings where advanced imaging is not always accessible.

Objectives: To evaluate the clinical profile, laboratory parameters, and intraoperative findings of patients diagnosed with acute appendicitis in a tertiary care hospital in North India.

Methods: This prospective observational study was conducted over one year and included 100 patients who presented with signs and symptoms suggestive of acute appendicitis and subsequently underwent appendectomy. Clinical history, abdominal examination, total leukocyte count (TLC), intraoperative findings, and histopathological confirmation were recorded and analyzed.

Results: The study population had an equal gender distribution (50% male, 50% female), with a mean age of 30.48 ± 16.8 years. The most affected age group was 11–30 years. Right iliac fossa pain was reported by all patients, while 96% reported progression and 92% relocation of pain. Rebound tenderness was observed in 85%, and rigidity in 47%. TLC was $>14,000$ in 21% of patients, all of whom had confirmed appendicitis. Even among those with TLC $<9,000$, 80.55% were histopathologically positive. The duration of pain before presentation did not significantly alter diagnostic accuracy.

Conclusion: Acute appendicitis predominantly affects young adults and presents consistent classical symptoms. Rebound tenderness and elevated TLC are valuable diagnostic indicators. However, normal TLC does not exclude the diagnosis, reaffirming the importance of thorough clinical evaluation in guiding timely management.

Keywords: Acute appendicitis, clinical profile, right iliac fossa pain, leukocytosis, histopathological confirmation

Introduction

Acute appendicitis is a common surgical emergency globally and remains a significant cause of morbidity across all age groups. First described in detail by Reginald Fitz in 1886, appendicitis is characterized by inflammation of the vermiform appendix, typically caused by luminal obstruction due to fecaliths, lymphoid hyperplasia, or rarely, neoplasms or foreign bodies [1]. The lifetime risk of developing acute appendicitis is approximately 8.6% in males and 6.7% in females [2]. Prompt diagnosis and timely surgical intervention are essential to prevent complications such as gangrene, perforation, and peritonitis, which can lead to increased morbidity and, in rare cases, mortality [3].

The classical clinical presentation of acute appendicitis includes peri-umbilical pain migrating to the right iliac fossa, anorexia, nausea, vomiting, and low-grade fever. However, variations in anatomical position of the appendix such as retrocecal, pelvic, or subhepatic positions—can lead to atypical presentations, complicating the diagnostic process [4, 5]. Clinical scoring systems like the Alvarado score and Appendicitis Inflammatory Response (AIR) score are commonly used to aid diagnosis, particularly in resource-limited settings [6]. Nonetheless, these tools have variable sensitivity and specificity across populations.

In India, the diagnosis of acute appendicitis can be further complicated by socio-cultural and healthcare delivery factors. Delay in presentation, self-medication, and poor access to diagnostic imaging often result in increased rates of perforation and complications [7]. The condition tends to

affect a younger demographic, and dietary factors—particularly low fiber and high refined carbohydrate intake—are believed to contribute to its pathogenesis [8].

Recent advances in diagnostic modalities, including high-resolution ultrasonography and multidetector computed tomography (CT), have significantly improved diagnostic accuracy. However, reliance on imaging in every case is not feasible in many Indian healthcare setups, especially in primary or secondary centers [9]. Therefore, understanding the clinical presentation patterns and associated laboratory and intraoperative findings in the local population becomes essential for optimizing patient care.

Furthermore, there is a growing interest in the use of conservative (non-operative) management with antibiotics in selected cases of uncomplicated appendicitis. While this approach is gaining traction globally, surgical appendectomy either open or laparoscopic—remains the standard treatment in most Indian hospitals due to concerns about recurrence, diagnostic uncertainty, and patient follow-up challenges [10].

Given these factors, there is a compelling need to study the clinical profile of patients presenting with acute appendicitis in the Indian context. The present study aims to analyze demographic details, presenting symptoms, laboratory parameters, intraoperative findings, and postoperative outcomes of patients diagnosed with acute appendicitis in a tertiary care hospital in North India. This will contribute to the existing literature by offering region-specific insights, potentially aiding early diagnosis and management.

Materials and Methods

This prospective observational study was conducted in the Department of General Surgery at a tertiary care hospital in North India over a period of one year. The study commenced after obtaining prior approval from the Institutional Ethics Committee. Written informed consent was taken from all participants or their legally authorized representatives before inclusion in the study.

The study included 100 patients of all ages and both sexes who presented with right iliac fossa pain and clinical suspicion of acute appendicitis and subsequently underwent appendectomy. Patients were selected based on specific inclusion and exclusion criteria. Inclusion criteria consisted of patients presenting with signs and symptoms suggestive of acute appendicitis, such as right lower quadrant pain, vomiting, anorexia, fever, or tenderness. Patients were excluded if they had a preoperative diagnosis of appendicular abscess, appendicular mass, generalized peritonitis, were unfit or unwilling for surgery, or declined to provide consent.

Clinical data were recorded at presentation, including demographic details (age and sex), the nature and duration of abdominal pain, associated gastrointestinal symptoms, migration of pain, aggravation of symptoms with movement or coughing, and findings on abdominal examination such as rebound tenderness, rigidity, and guarding. Laboratory investigations including total leukocyte count (TLC) and differential count were performed. All patients underwent surgical intervention, and intraoperative findings such as the position, inflammation, or perforation of the appendix were noted. The final diagnosis was confirmed by histopathological examination of the excised appendix, which served as the diagnostic gold standard.

The collected data were entered into Microsoft Excel and analyzed using Epi Info version 7.2. Quantitative variables were expressed as mean and standard deviation, while categorical variables were summarized as frequencies and percentages. Associations between clinical variables and histopathologically confirmed appendicitis were analyzed using the Chi-square test or Fisher’s exact test where applicable. A p-value less than 0.05 was considered statistically significant. Graphical representations such as bar diagrams and pie charts were generated using Microsoft Excel and Word.

Results

Demographic Characteristics

The study included 100 patients diagnosed with acute appendicitis, with an equal gender distribution of 50% male and 50% female. The mean age of the study population was 30.48 ± 16.8 years, indicating a predominance of younger adults. The majority of patients were in the 11–20 years age group (26%), followed by the 21–30 years group (24%), and 31–40 years group (19%). Only 10% of patients were older than 50 years, suggesting that acute appendicitis is more commonly seen in younger age groups, particularly in the second and third decades of life (Table 1).

Table 1: Demographic Characteristics of Study Participants

Demographic Characteristics	Frequency (n=100)	Percentage (%)
Age group (years)		
≤10	6	6.0%
11–20	26	26.0%

21–30	24	24.0%
31–40	19	19.0%
41–50	15	15.0%
>50	10	10.0%
Mean age (years)	–	30.48 ± 16.8
Gender		
Male	50	50.0%
Female	50	50.0%

Symptom Profile of Patients with Acute Appendicitis

All patients in the study (100%) presented with pain in the right iliac fossa (RIF), making it the most consistent symptom of acute appendicitis. Progression of pain from the periumbilical region to the RIF was reported by 96%, and relocation of pain was present in 92%, both of which are hallmark features of classical appendicitis presentation. Vomiting was observed in 65% of patients, reflecting gastrointestinal involvement. Additionally, 61% of patients reported aggravation of pain upon coughing, an indicator of peritoneal irritation. These findings highlight the predominance of classical clinical features among patients with confirmed acute appendicitis (Table 2).

Table 2: Symptom Profile of Patients with Acute Appendicitis

Symptom	Present (n)	Percentage (%)
Pain in the right iliac fossa	100	100.0%
Progression of pain	96	96.0%
Relocation of pain to RIF	92	92.0%
Vomiting	65	65.0%
Aggravation on coughing	61	61.0%

Clinical Signs on Abdominal Examination

On clinical examination, rebound tenderness was the most commonly observed sign, present in 85% of patients, indicating peritoneal irritation typically associated with acute appendicitis. Rigidity of the abdominal wall, suggestive of localized inflammation and guarding, was noted in 47% of cases. These findings reinforce the diagnostic value of physical examination in suspected appendicitis, particularly the presence of rebound tenderness, which was prevalent in the majority of confirmed cases (Table 3).

Table 3: Clinical Signs on Abdominal Examination

Clinical Sign	Frequency (n=100)	Percentage (%)
Rebound tenderness	85	85.0%
Rigidity	47	47.0%

Laboratory Profile Total Leukocyte Count (TLC)

Among the study population, 21% of patients had a total leukocyte count (TLC) greater than 14,000 cells/mm³, and all of them (100%) were confirmed to have acute appendicitis on histopathological examination. TLC in the range of 9,000–13,999 was observed in 43% of patients, with 93.02% (n=40) showing histopathological evidence of appendicitis. In contrast, 36% of patients had a TLC below 9,000, among whom 80.55% (n=29) were confirmed cases. These findings indicate a positive correlation between elevated TLC and the likelihood of appendicitis, with diagnostic accuracy increasing at higher leukocyte counts. However, a substantial proportion of patients with normal or mildly elevated TLC also had confirmed appendicitis, highlighting that normal TLC values do not exclude the diagnosis (Table 4).

Table 4: Laboratory Profile Total Leukocyte Count (TLC)

TLC Range (cells/mm ³)	Frequency (n)	Percentage (%)	Appendicitis Confirmed (n)
>14,000	21	21.0%	21 (100%)
9,000–13,999	43	43.0%	40 (93.02%)
<9,000	36	36.0%	29 (80.55%)

Duration of Pain Before Presentation

Table 5 presents the distribution of patients based on the duration of abdominal pain prior to hospital presentation and the corresponding rate of histopathologically confirmed appendicitis. Among the 100 patients included in the study, 32% presented within 24 hours of onset of abdominal pain, and 93.75% (n=30) of these were confirmed to have acute appendicitis on histopathological examination. Another 32% reported to the hospital between 24 to 48 hours after the onset of symptoms, with 87.5% (n=28) showing histological confirmation. The remaining 36% presented after more than 48 hours, of whom 88.8% (n=32) had confirmed appendicitis. These findings indicate that although the rate of confirmed appendicitis was slightly higher among those who presented earlier, a significant proportion of patients across all duration groups were diagnosed with appendicitis, suggesting that the classical clinical features remain relatively consistent regardless of the time of presentation (Table 5).

Table 5: Duration of Pain Before Presentation

Duration of Pain	Frequency (n)	Percentage (%)	Appendicitis Confirmed (n)
<24 hours	32	32.0%	30 (93.75%)
24–48 hours	32	32.0%	28 (87.5%)
>48 hours	36	36.0%	32 (88.8%)

Discussion

Acute appendicitis remains one of the most prevalent surgical emergencies globally. Prompt diagnosis and early surgical intervention are essential to prevent complications such as perforation, peritonitis, or abscess formation. In our study of 100 patients, the clinical profile was evaluated, and histopathological confirmation of appendicitis was observed in 90% of cases.

The demographic distribution showed that acute appendicitis was more common in younger individuals, particularly those aged 11–30 years. This finding aligns with global trends, where the highest incidence is reported in the second and third decades of life, attributed to increased lymphoid hyperplasia and luminal obstruction during this period [11]. Although some studies report a slight male predominance [12], our study found an equal gender distribution, possibly reflecting regional or institutional differences.

Right iliac fossa (RIF) pain was a universal finding in all patients, while pain migration and progression were observed in over 90%, consistent with classical appendicitis presentation [13]. Vomiting and aggravation on coughing were also common, supporting their value as diagnostic clues, although they are less specific [14].

Rebound tenderness was noted in 85% of patients and remains a key clinical sign associated with peritoneal irritation [15]. Rigidity, found in 47%, may be indicative of more advanced inflammation or perforation [16].

Laboratory findings showed that elevated total leukocyte count (TLC) correlated with appendicitis diagnosis. All

patients with TLC >14,000 had histologically confirmed appendicitis. However, even among those with TLC <9,000, 80.5% were confirmed, supporting previous findings that leukocytosis increases diagnostic probability, but normal counts do not exclude the diagnosis [17].

Interestingly, a high proportion of confirmed appendicitis cases were seen across all durations of symptom onset. While those presenting within 24 hours had the highest confirmation rate (93.75%), even patients presenting after 48 hours had a high diagnostic yield (88.8%), suggesting that classical features remain reliable across the time spectrum [18].

These findings reaffirm that careful clinical assessment, supported by laboratory evaluation, remains the cornerstone of diagnosing acute appendicitis, especially in resource-limited settings where imaging may not always be feasible

Conclusion

This study highlights that acute appendicitis most commonly affects young individuals, particularly those in the second and third decades of life, with an equal distribution among males and females in our cohort. Classical symptoms such as right iliac fossa pain, migration of pain, and vomiting remain consistent and highly prevalent clinical indicators. Rebound tenderness was the most reliable clinical sign, and elevated total leukocyte count showed a positive correlation with histopathological confirmation. However, a significant number of patients with normal leukocyte counts also had confirmed appendicitis, emphasizing the importance of a comprehensive clinical evaluation. These findings underscore that in resource-limited settings, timely diagnosis based on clinical profile and basic laboratory parameters remains a dependable approach for the effective management of acute appendicitis.

References

1. Fitz RH. Perforating inflammation of the vermiform appendix with special reference to its early diagnosis and treatment. *Am J Med Sci*,1886;92:321–46.
2. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol*,1990;132(5):910–25.
3. Bickell NA, Aufses AH Jr, Rojas M, Bodian C. How time affects the risk of rupture in appendicitis. *J Am Coll Surg*,2006;202(3):401–6.
4. Humes DJ, Simpson J. Acute appendicitis. *BMJ*,2006;333(7567):530–4.
5. Nega B, Taye M, Wondemagegnehu T. Acute appendicitis: clinical, ultrasonographic and operative findings in correlation with histopathology diagnosis. *Ethiop Med J*,2014;52(3):123–30.
6. Kollar D, McCartan DP, Bourke M, Cross KS, Dowdall J. Predicting acute appendicitis: a comparison of five clinical scoring systems. *Surgeon*,2015;13(6):301–5.
7. Singh JP, Mariadason JG. Role of the white blood cell count in the diagnosis of acute appendicitis in an urban hospital in India. *Saudi Med J*,2008;29(3):331–5.
8. Burkitt DP, Trowell HC. Dietary fibre and disease. *JAMA*,1975;231(5):543–4.
9. Howell JM, Eddy OL, Lukens TW, Thiessen MEW, Weingart SD, Decker WW. Clinical policy: Critical issues in the evaluation and management of emergency

- department patients with suspected appendicitis. *Ann Emerg Med*,2010;55(1):71–116.
10. Salminen P, Paajanen H, Rautio T, Nordström P, Aarnio M, Rantanen T, et al. Antibiotic therapy vs appendectomy for treatment of uncomplicated acute appendicitis: the APPAC randomized clinical trial. *JAMA*,2015;313(23):2340–8.
 11. Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, et al. The global incidence of appendicitis: a systematic review of population-based studies. *Ann Surg*,2017;266(2):237–41.
 12. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. *Lancet*,2015;386(10000):1278–87.
 13. Ghorbani A, Forouzesh M, Kazemifar AM. Variation in anatomical position of vermiform appendix among Iranian population: an old issue which has not lost its importance. *Anat Res Int*,2014;2014:313575.
 14. Singh JP, Mariadason JG. Role of the laboratory in the diagnosis of acute appendicitis. *ANZ J Surg*,2013;83(10):712–5.
 15. Alvarado A. A practical score for the early diagnosis of acute appendicitis. *Ann Emerg Med*,1986;15(5):557–64.
 16. Malik A, Khan A, Waheed A. Clinical presentation of acute appendicitis in adults. *J Ayub Med Coll Abbottabad*,2010;22(4):76–9.
 17. Andersson RE, Hugander A, Ravn H, Offenbartl K, Ghazi SH, Nystrom PO, et al. Repeated clinical and laboratory examinations in patients with an equivocal diagnosis of appendicitis. *World J Surg*,2000;24(4):479–85.
 18. Sartelli M, Baiocchi GL, Di Saverio S, Ferrara F, Labricciosa FM, Ansaloni L, et al. Prospective observational study on acute appendicitis worldwide (POSAW). *World J Emerg Surg*,2018;13:19.