ORIGINAL RESEARCH ARTICLE

CLINICAL PROFILE, DIAGNOSTIC EVALUATION, AND MANAGEMENT OUTCOMES OF ACUTE APPENDICITIS IN A TERTIARY CARE HOSPITAL IN NORTH INDIA: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Acute appendicitis is one of the most common causes of acute abdomen requiring emergency surgical intervention. Despite advancements in diagnostic and surgical techniques, variability in clinical presentation and outcomes persists, particularly in resource-limited settings.

Objectives: To assess the clinical profile of patients with acute appendicitis and evaluate diagnostic modalities and management outcomes in a tertiary care hospital in North India.

Methods: This prospective observational study was conducted from April 2012 to January 2013 in a tertiary care hospital. A total of 150 patients diagnosed with acute appendicitis were included using consecutive sampling. Data on demographic characteristics, clinical presentation, laboratory and imaging findings, intraoperative observations, and postoperative outcomes were collected using a structured proforma. Statistical analysis was performed using SPSS version 20.0, with $p<0.05$ considered statistically significant.

Results: The majority of patients were aged 20–39 years with male predominance. Right iliac fossa pain was present in all cases, while nausea/vomiting, anorexia, and fever were common associated symptoms. Leukocytosis was observed in most patients, and ultrasonography was diagnostic in the majority. Surgical management was performed in 94.7% of patients, predominantly by open appendectomy. Intraoperative findings revealed uncomplicated appendicitis in most cases, with a notable proportion of complicated cases. Postoperative complications occurred in 19.7% of patients, with surgical site infection being the most common. A significant association was found between complications and prolonged hospital stay ($p<0.001$).

Conclusion: Acute appendicitis commonly affects young adults and presents with variable clinical features. Early diagnosis and timely surgical intervention are crucial in preventing complications. Strengthening diagnostic approaches and optimizing management strategies can improve patient outcomes.

Keywords: Acute appendicitis; Clinical profile; Appendectomy; Postoperative complications; Tertiary care hospital; India

INTRODUCTION

Acute appendicitis is one of the most common causes of acute abdominal pain requiring emergency surgical intervention worldwide. It accounts for a significant proportion of surgical admissions and is a leading indication for emergency abdominal surgery across all age groups, particularly in adolescents and young

adults [1]. The lifetime risk of developing acute appendicitis has been estimated to be approximately 7–8%, with a slightly higher prevalence among males [2]. Despite advances in diagnostic modalities and surgical techniques, appendicitis continues to pose diagnostic and therapeutic challenges due to its varied clinical presentation and potential for complications such as perforation, abscess formation, and peritonitis [3].

Globally, the clinical presentation of acute appendicitis ranges from classical symptoms—such as periumbilical pain migrating to the right lower quadrant, anorexia, nausea, and fever—to atypical manifestations, especially in children, elderly individuals, and pregnant women [4]. This variability often leads to delays in diagnosis or misdiagnosis, contributing to increased morbidity. In resource-limited settings, reliance on clinical evaluation remains paramount, although imaging techniques such as ultrasonography and computed tomography (CT) have improved diagnostic accuracy and reduced negative appendectomy rates [5].

In developing countries, including India, acute appendicitis continues to be a major public health concern due to delayed presentation, limited access to advanced diagnostic facilities, and variations in healthcare-seeking behavior [6]. Studies from Indian tertiary care centers have reported higher rates of complicated appendicitis, including perforation and gangrene, often attributed to delayed diagnosis and referral [7]. Furthermore, socio-demographic factors, nutritional patterns, and environmental influences may also play a role in disease occurrence and progression, although these associations remain incompletely understood [8].

Management of acute appendicitis has evolved significantly over time. While appendectomy—either open or laparoscopic—remains the gold standard of treatment, there is growing interest in non-operative management using antibiotics in selected cases of uncomplicated appendicitis [9]. However, surgical management continues to be the preferred approach in most tertiary care settings in India due to concerns regarding recurrence, patient compliance, and diagnostic uncertainty. The choice between open and laparoscopic appendectomy is influenced by factors such as surgeon expertise, resource availability, and patient condition, with laparoscopic approaches offering advantages such as reduced postoperative pain, shorter hospital stay, and faster recovery [10].

Despite the high burden of acute appendicitis, there is variability in clinical presentation, diagnostic approaches, and management outcomes across different healthcare settings. Most available studies are either region-specific or focus on limited aspects such as diagnostic accuracy or surgical techniques, with relatively fewer comprehensive studies evaluating the clinical profile alongside management outcomes in a unified framework, particularly in North Indian tertiary care hospitals.

Therefore, the present study was undertaken to assess the clinical profile of patients presenting with acute appendicitis and to evaluate the management outcomes in a tertiary care hospital in North India. The objectives were to describe the demographic and clinical characteristics, analyze diagnostic modalities and intraoperative findings, and assess postoperative outcomes including complications and duration of hospital stay.

METHODOLOGY

Study Design: This was a hospital-based observational descriptive study with a prospective design conducted to assess the clinical profile and management outcomes of patients diagnosed with acute appendicitis.

Study Setting: The study was carried out in the Department of General Surgery of a tertiary care hospital in North India, catering to both urban and rural populations and serving as a referral center for surrounding districts.

Study Duration: The study was conducted over a period of 10 months from April 2012 to January 2013.

Study Population: The study population comprised all patients presenting to the surgical emergency or outpatient department with a clinical diagnosis of acute appendicitis and subsequently undergoing management (operative or conservative) during the study period.

Inclusion Criteria

- Patients of all age groups diagnosed clinically as acute appendicitis
- Patients who underwent surgical management (open or laparoscopic appendectomy) or were managed conservatively
- Patients willing to provide informed consent

Exclusion Criteria

- Patients with a diagnosis of appendicular mass managed electively
- Patients with other causes of right iliac fossa pain (e.g., gynecological conditions, renal colic, mesenteric adenitis) confirmed on evaluation
- Patients with incomplete clinical or operative records
- Patients unwilling to participate in the study

Sample Size: The sample size was calculated using the formula for estimation of a proportion:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Assuming a prevalence (p) of acute appendicitis among acute abdomen cases as 10% based on prior hospital records, with a confidence level of 95% (Z = 1.96) and allowable error (d) of 5%, the minimum sample size was calculated to be approximately 138. To account for possible exclusions and incomplete data, a total sample size of 150 patients was included in the study.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible patients presenting during the study period and fulfilling the inclusion criteria were enrolled until the desired sample size of 150 was achieved.

Data Collection Tools & Procedure: Data were collected using a predesigned, pretested structured proforma. Detailed history including demographic characteristics, presenting symptoms (pain, vomiting, fever, anorexia), duration of symptoms, and past medical history were recorded. Clinical examination findings such as tenderness in the right iliac fossa, rebound tenderness, guarding, and vital parameters were documented. Laboratory investigations including complete blood count and imaging studies (ultrasonography and/or CT scan where indicated) were noted. Intraoperative findings such as position of appendix, presence of perforation, gangrene, or abscess were recorded for surgically managed cases. Postoperative outcomes including complications (wound infection, intra-abdominal abscess, ileus), duration of hospital stay, and recovery status were documented. Patients were followed up until discharge.

Study Variables: Independent variables included age, sex, duration of symptoms, clinical presentation, laboratory parameters (e.g., leukocyte count), and imaging findings. Dependent variables included type of management (operative vs conservative), intraoperative findings, postoperative complications, and duration of hospital stay. The relationship between clinical parameters and outcomes was assessed.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Descriptive statistics such as mean, standard deviation, frequencies, and percentages were used to summarize the data. Inferential statistics including Chi-square test or Fisher's exact test were applied to assess associations between categorical variables. Independent t-test was used for comparison of continuous variables where appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants or their guardians in case of minors. Confidentiality of patient information was strictly maintained throughout the study. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

A total of 150 patients with acute appendicitis were included in the study. The majority of patients were in the 20–39 years age group, with a male predominance (Table 1).

Table 1: Distribution of Study Participants by Demographic Characteristics (n = 150)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	<20	38	25.3
	20–39	72	48.0
	40–59	28	18.7
	≥60	12	8.0
Sex	Male	92	61.3
	Female	58	38.7

All patients presented with right iliac fossa pain, while other common symptoms included nausea/vomiting, anorexia, and fever. Classical migratory pain was observed in just over half of the cases (Table 2).

Table 2: Clinical Presentation of Patients with Acute Appendicitis (n = 150)

Clinical Feature	Frequency (n)	Percentage (%)
Right iliac fossa pain	150	100
Nausea/Vomiting	118	78.7
Fever	96	64.0
Anorexia	104	69.3
Migratory pain	82	54.7
Rebound tenderness	110	73.3
Guarding	88	58.7

Leukocytosis was present in approximately three-fourths of the patients. Ultrasonography was suggestive of appendicitis in 80% of cases. Among surgically managed patients, the most common intraoperative finding was an inflamed appendix, while complicated appendicitis (gangrenous or perforated) was noted in a significant proportion (Table 3).

Table 3: Diagnostic and Intraoperative Findings (n = 150)

Parameter	Category	Frequency (n)	Percentage (%)
Leukocytosis (>10,000/mm³)	Present	112	74.7
	Absent	38	25.3
Ultrasonography Findings	Suggestive of appendicitis	120	80.0
	Inconclusive	30	20.0
Intraoperative Findings* (n=142)	Inflamed appendix	96	67.6
	Gangrenous	22	15.5
	Perforated	18	12.7
	Normal appendix	6	4.2

*8 patients were managed conservatively.

The majority of patients underwent surgical management, predominantly open appendectomy. Postoperative complications were observed in nearly one-fifth of patients, with surgical site infection being the most common complication (Table 4).

Table 4: Management Modalities and Postoperative Complications (n = 150)

Parameter	Category	Frequency (n)	Percentage (%)
Management Type	Surgical	142	94.7
	Conservative	8	5.3
Type of Surgery (n=142)	Open appendectomy	102	71.8
	Laparoscopic appendectomy	40	28.2
Postoperative Complications	Present	28	19.7
	Absent	114	80.3
Types of Complications (n=28)	Surgical site infection	16	57.1
	Intra-abdominal abscess	6	21.4
	Prolonged ileus	6	21.4

A statistically significant association was found between duration of hospital stay and presence of complications, with patients experiencing complications having longer hospital stays ($p < 0.001$) (Table 5).

Table 5: Duration of Hospital Stay and Its Association with Complications (n = 150)

Duration of Stay (days)	Complications Present (n=28)	Complications Absent (n=122)	Total (n)
≤3 days	4	70	74
4–7 days	14	46	60
>7 days	10	6	16

Chi-square = 18.6, $p < 0.001$ (statistically significant)

DISCUSSION

The present study evaluated the clinical profile and management outcomes of patients with acute appendicitis in a tertiary care hospital setting in North India. The findings demonstrate that acute appendicitis predominantly affects young adults, presents with classical symptoms in the majority of cases, and is effectively managed surgically with acceptable complication rates. A significant association between postoperative complications and prolonged hospital stay was also observed.

In this study, the highest proportion of patients belonged to the 20–39 years age group, with a clear male predominance. These findings are consistent with previous epidemiological studies, which report a higher incidence of acute appendicitis among young adults and males [1,2]. The observed demographic pattern may be attributed to dietary factors, lifestyle differences, and hormonal influences, although the exact etiological mechanisms remain unclear.

Clinically, all patients presented with right iliac fossa pain, while associated symptoms such as nausea/vomiting, anorexia, and fever were present in a majority of cases. Classical migratory pain was observed in approximately half of the patients. Similar findings have been reported in earlier studies, highlighting that while right iliac fossa pain is a consistent feature, other classical symptoms may not always be present, contributing to diagnostic challenges [3,4]. The variability in presentation underscores the importance of a thorough clinical assessment, especially in resource-limited settings.

Leukocytosis was observed in nearly three-fourths of patients, supporting its role as a useful adjunct in the diagnosis of acute appendicitis. However, it is well recognized that leukocytosis alone lacks specificity and should be interpreted in conjunction with clinical findings [4].

Ultrasonography was suggestive of appendicitis in 80% of cases in the present study, which aligns with previous reports indicating its utility as a first-line, non-invasive, and cost-effective imaging modality, particularly in developing countries [5]. However, its operator dependency and reduced sensitivity in certain patient groups remain limitations.

The majority of patients in this study underwent surgical management, with open appendectomy being the most commonly performed procedure. Although laparoscopic appendectomy has gained popularity due to its advantages such as reduced postoperative pain and shorter hospital stay, its utilization in this study was comparatively lower, likely reflecting resource constraints and surgeon preference in the study setting. This trend is consistent with findings from similar tertiary care centers in developing regions [6,10].

Intraoperatively, uncomplicated inflamed appendix was the most common finding, although a notable proportion of patients had complicated appendicitis (gangrenous or perforated). The relatively higher incidence of complicated cases may be attributed to delayed presentation and referral, which is a common issue in developing countries [7]. Delayed diagnosis increases the risk of perforation and subsequent complications, emphasizing the need for early recognition and timely intervention.

Postoperative complications were observed in approximately one-fifth of patients, with surgical site infection being the most common. This complication rate is comparable to that reported in previous studies [6,7]. Factors such as delayed presentation, intraoperative contamination, and patient-related variables (e.g., nutritional status, comorbidities) may contribute to the occurrence of complications. Importantly, the study found a statistically significant association between postoperative complications and prolonged hospital stay, highlighting the impact of complications on healthcare resource utilization and patient recovery.

From a clinical and public health perspective, the findings of this study reinforce the importance of early diagnosis and prompt surgical intervention in reducing morbidity associated with acute appendicitis. Strengthening primary healthcare systems, improving referral mechanisms, and enhancing awareness among patients regarding early symptoms may help in reducing the burden of complicated appendicitis.

The strengths of the present study include its prospective design, adequate sample size, and comprehensive assessment of both clinical and outcome variables. However, certain limitations must be acknowledged. Being a single-center study, the findings may have limited generalizability. Additionally, long-term follow-up outcomes were not assessed, and advanced imaging modalities such as CT scan were not uniformly utilized in all patients.

CONCLUSION

Acute appendicitis remains a common surgical emergency, predominantly affecting young adults with a higher prevalence among males. The study highlights that right iliac fossa pain is the most consistent presenting symptom, while associated features such as nausea, vomiting, and fever are variably present. Leukocytosis and ultrasonography serve as useful adjuncts in diagnosis, though clinical evaluation remains paramount. Surgical management, particularly open appendectomy, continues to be the mainstay of treatment in tertiary care settings, with laparoscopic approaches being utilized selectively. The proportion of complicated appendicitis observed reflects the challenges of delayed presentation and emphasizes the need for early diagnosis and timely intervention. Postoperative complications, though within acceptable limits, significantly contribute to prolonged hospital stay and increased healthcare burden. The study underscores the importance of strengthening early diagnostic strategies, improving access to care, and promoting awareness regarding symptoms of appendicitis. Adoption of minimally invasive techniques and standardized management protocols may further improve patient outcomes. Future multicentric studies with long-term follow-up are recommended to enhance generalizability and guide evidence-based practice.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants or their guardians.

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