

Clinical Characteristics and Surgical Outcomes of Patients with Acute Appendicitis at a Tertiary Care Center

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Abstract:

Background: Acute appendicitis is one of the most common surgical emergencies and predominantly affects young adults. Clinical presentation may vary, and disease severity can influence postoperative outcomes. Laparoscopic appendectomy has increasingly become an important approach in the surgical management of acute appendicitis.

Objectives: To evaluate the clinical characteristics, laboratory and imaging findings, operative management and postoperative outcomes of patients with acute appendicitis at a tertiary care center.

Materials and Methods: A hospital-based observational study was conducted among 200 patients diagnosed with acute appendicitis and managed surgically. Demographic characteristics, clinical presentation, laboratory and imaging findings, operative findings, type of appendectomy and postoperative outcomes were recorded. Patients undergoing laparoscopic and open appendectomy were compared with respect to postoperative complications and duration of hospital stay. Statistical analysis was performed using appropriate tests, with $p < 0.05$ considered statistically significant.

Results: The mean age of the study population was 28.6 ± 11.4 years, and males constituted 59% of patients. Right iliac fossa pain was the most common presenting symptom (92%), followed by nausea/vomiting (68%) and anorexia (63%). Leukocytosis was present in 72% of patients. Laparoscopic appendectomy was performed in 144 (72%) patients and open appendectomy in 56 (28%). Complicated appendicitis was observed in 36 (18%) patients. Postoperative complications occurred in 20 (10%) patients. Wound infection was significantly lower following laparoscopic compared with open appendectomy (2.1% vs. 8.9%, $p = 0.047$). The mean hospital stay was also significantly shorter following laparoscopic surgery (3.2 ± 1.4 vs. 5.3 ± 2.6 days, $p < 0.001$). Postoperative complications were significantly more frequent in complicated appendicitis than uncomplicated appendicitis (27.8% vs. 6.1%, $p < 0.001$).

Conclusion: Acute appendicitis predominantly affected young adults with a slight male predominance. Laparoscopic appendectomy was associated with lower wound infection rates and shorter hospital stay, while complicated appendicitis was associated with increased postoperative morbidity. Early diagnosis and appropriate assessment of disease severity are important for improving surgical outcomes.

Keywords: Acute appendicitis; laparoscopic appendectomy; open appendectomy; postoperative complications; surgical outcomes infection.

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Introduction

Acute appendicitis is one of the most common surgical emergencies and remains a major cause of acute abdominal pain

requiring hospital admission and operative treatment. It can occur at any age but is particularly common among adolescents

and young adults. The incidence varies with age, sex and geographical region, with the highest incidence generally observed among younger individuals.¹

The diagnosis of acute appendicitis is primarily clinical and may be challenging because of variations in presentation. Classical symptoms include abdominal pain that initially may be periumbilical and subsequently localizes to the right iliac fossa, associated with anorexia, nausea, vomiting and fever. Clinical examination, laboratory investigations and imaging are commonly combined to improve diagnostic accuracy. Clinical scoring systems such as the Alvarado score can also assist in risk stratification and decision-making.²

Ultrasonography and computed tomography are important imaging modalities in patients in whom the diagnosis is uncertain. The World Society of Emergency Surgery (WSES) guidelines recommend the use of clinical scores and imaging according to the clinical setting and patient characteristics. Complicated appendicitis, including gangrene, perforation and periappendicular abscess, is associated with increased postoperative morbidity and requires appropriate individualized management.^{2,3}

Appendectomy remains an established treatment for acute appendicitis. With advances in minimally invasive surgery, laparoscopic appendectomy has become widely used. Compared with open appendectomy, laparoscopic surgery has been associated with less postoperative pain, fewer postoperative complications, shorter hospital stay and earlier return to normal activities, although operative time may be longer.^{4,5}

The clinical course and postoperative outcome may vary according to the patient's age, duration of symptoms, severity of inflammation, presence of perforation or gangrene and surgical approach. Early diagnosis and timely surgical intervention are therefore important to prevent

progression to complicated disease and reduce postoperative morbidity.

Despite the established role of appendectomy, differences in clinical presentation, disease severity, choice of surgical approach and postoperative outcomes may exist between healthcare settings. Evaluation of these characteristics at the institutional level can provide useful information regarding patient profiles and surgical outcomes. Therefore, the present study was undertaken to assess the **clinical characteristics and surgical outcomes of patients with acute appendicitis at a tertiary care center**, with emphasis on demographic profile, clinical presentation, laboratory and radiological findings, operative management and postoperative complications.

Materials and Methods:

Study Design and Setting

A hospital-based observational study was conducted in the Department of General Surgery at a tertiary care center after getting approval from the Institutional ethics committee. The study included patients diagnosed with acute appendicitis who underwent surgical management during the study period.

Study Population and Sample Size

A total of **200 consecutive patients** with acute appendicitis were included in the study. Patients undergoing either laparoscopic or open appendectomy were evaluated with respect to their clinical characteristics, operative findings and postoperative outcomes.

Inclusion Criteria

Patients were included if they:

- Were diagnosed with acute appendicitis based on clinical, laboratory and/or imaging findings.
- Underwent laparoscopic or open appendectomy.
- Had adequate clinical and postoperative records available for analysis.

Exclusion Criteria

Patients were excluded if they:

- Were managed conservatively without appendectomy.
- Had incomplete clinical or operative records.
- Underwent appendectomy for indications other than acute appendicitis.

Data Collection

Data were collected using a structured proforma. Demographic variables included **age and sex**. Clinical parameters included duration and site of abdominal pain, migration of pain, anorexia, nausea/vomiting, fever, guarding and rebound tenderness. Laboratory findings such as leukocytosis and inflammatory markers were recorded. Imaging findings from **ultrasonography and computed tomography**, when performed, were documented.

Operative details included the **type of appendectomy, operative findings, presence of gangrenous or perforated appendix, abscess/pus formation and other intraoperative findings**. Postoperative complications, duration of hospital stay and mortality were also recorded.

Assessment of Disease Severity

Patients were categorized according to operative findings into uncomplicated and complicated appendicitis. **Gangrenous appendicitis, perforation and abscess/pus formation** were considered features of complicated disease.

Assessment of Postoperative Outcomes

Patients were monitored during the postoperative period for complications including **surgical site infection, postoperative ileus and intra-abdominal collection**. Duration of hospital stay and postoperative mortality were also recorded. Outcomes were compared between laparoscopic and open appendectomy groups.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as **mean $\pm$ standard deviation**, while categorical variables were presented as **frequency and percentage**. The **Chi-square test** was used to assess associations between categorical variables, while continuous variables were compared using the **independent-samples t-test**. A **p-value <0.05** was considered statistically significant.

Results:

A total of **200 patients** with acute appendicitis were included in the study. The mean age of the patients was **28.6 $\pm$ 11.4 years**, with a male predominance (59%). Most patients belonged to the 18–30-year age group.

Among the 200 patients, 118 (59%) were males and 82 (41%) were females. The majority of patients (59%) were aged 18–30 years. The overall mean age was 28.6 $\pm$ 11.4 years

.Table 1. Demographic characteristics of the study population

Age group / Sex	Number (n)	Percentage (%)
18–30 years	118	59
31–40 years	42	21
41–50 years	24	12
>50 years	16	8
Male	118	59
Female	82	41
Total	200	100

Right iliac fossa pain was the predominant presenting symptom (92%), followed by nausea/vomiting (68%) and anorexia (63%). Rebound tenderness and guarding were present in 44% and 38% of patients, respectively. (Table 2)

Table 2. Clinical presentation of patients

Clinical feature	Number (n)	Percentage (%)
Right iliac fossa pain	184	92
Nausea/vomiting	136	68
Anorexia	126	63
Fever	108	54
Migration of pain	102	51
Rebound tenderness	88	44
Guarding	76	38

Leukocytosis was present in 72% of patients and elevated inflammatory markers in 66%. Ultrasonography was performed in 88% of patients, while CT was performed in 24%. Imaging was suggestive of acute appendicitis in 82% of patients.

Table 3. Laboratory and imaging findings

Finding	Number (n)	Percentage (%)
Leukocytosis	144	72
Elevated inflammatory markers	132	66
Ultrasonography performed	176	88
CT performed	48	24
Imaging suggestive of appendicitis	164	82

Laparoscopic appendectomy was the predominant surgical approach (72%). An inflamed appendix was found in 82% of patients, while gangrenous and perforated appendicitis accounted for 11% and 7%, respectively. Overall, 36 (18%) patients had complicated appendicitis.

Table 4. Operative findings and surgical management

Operative parameter	Number (n)	Percentage (%)
Laparoscopic appendectomy	144	72
Open appendectomy	56	28
Inflamed appendix	164	82
Gangrenous appendix	22	11
Perforated appendix	14	7
Abscess/pus formation	12	6
Complicated appendicitis	36	18

Most patients (90%) had no postoperative complications. Surgical site infection occurred in 4%, postoperative ileus in 2.5% and intra-abdominal collection in 2% of patients. One postoperative death (0.5%) was recorded.

Table 5. Postoperative outcomes

Postoperative outcome	Number (n)	Percentage (%)
No complication	180	90
Surgical site infection	8	4
Postoperative ileus	5	2.5
Intra-abdominal collection	4	2
Other complications	3	1.5
Mortality	1	0.5

Mean hospital stay	3.8 ± 2.1 days	—
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Surgical site infection was observed in 2.1% of patients undergoing laparoscopic appendectomy compared with 8.9% after open appendectomy ($p=0.047$). The mean duration of hospital stay was significantly lower in the laparoscopic group (3.2 ± 1.4 vs. 5.3 ± 2.6 days, $p<0.001$).

Table 6. Comparison of postoperative outcomes between laparoscopic and open appendectomy

Outcome	Laparoscopic (n=144)	Open (n=56)	p-value
Wound infection	3 (2.1%)	5 (8.9%)	0.047*
Ileus	3 (2.1%)	2 (3.6%)	0.632
Intra-abdominal collection	3 (2.1%)	1 (1.8%)	0.912
Mean hospital stay (days)	3.2 ± 1.4	5.3 ± 2.6	$<0.001^*$

Postoperative complications were more frequently observed among patients with complicated appendicitis (27.8%) than among those with uncomplicated disease (6.1%), with the difference being statistically significant ($p<0.001$).

Table 7. Postoperative complications according to disease severity

Disease severity	Complications present	No complications	p value
Complicated appendicitis	10 (27.8%)	26 (72.2%)	$<0.001^*$
Uncomplicated appendicitis	10 (6.1%)	154 (93.9%)	

Discussion:

Acute appendicitis remains one of the most common surgical emergencies and continues to represent an important workload for tertiary care surgical units. In the present study, the mean age of the patients was 28.6 ± 11.4 years, and males constituted 59% of the study population. This predominance of younger patients and males is consistent with previously reported epidemiological patterns of acute appendicitis. [6]

In the present study, **right iliac fossa pain was the most common presenting symptom (92%)**, followed by nausea/vomiting (68%), anorexia (63%) and fever (54%). Guarding and rebound tenderness were present in 38% and 44% of patients, respectively. These findings are consistent with the recognized clinical presentation of acute appendicitis, although considerable variation may occur between patients. Clinical assessment remains central to diagnosis, with laboratory investigations and imaging providing additional diagnostic support when required. [7]

Leukocytosis was observed in 72% of patients and elevated inflammatory markers in 66%. Ultrasonography was performed in 88% of patients, while CT was used in 24%. Imaging was suggestive of appendicitis in 82% of cases. The use of clinical assessment together with laboratory investigations and selective imaging is consistent with established approaches to the diagnosis of acute appendicitis. [7]

Laparoscopic appendectomy was performed in 72% of patients, whereas 28% underwent open appendectomy. This reflects the increasing use of minimally invasive surgery in the management of acute appendicitis. Large clinical series have reported increasing utilization of laparoscopic appendectomy and demonstrated its role in contemporary surgical management. [8]

The present study found **18% complicated appendicitis**, including gangrenous, perforated and abscess-forming disease. Postoperative complications were significantly more frequent among patients with complicated appendicitis than among those with uncomplicated disease (27.8%

vs. 6.1%, $p < 0.001$). Previous studies have also demonstrated that complicated appendicitis is associated with increased postoperative morbidity and prolonged hospitalization. [7,8]

Postoperative complications occurred in 10% of the study population. Surgical site infection was observed in 4%, postoperative ileus in 2.5% and intra-abdominal collection in 2%. The overall postoperative mortality was 0.5%. The relatively low complication rate in the present study may be related to the predominance of younger patients and the relatively high proportion of uncomplicated appendicitis.

Comparison of surgical approaches showed that wound infection was significantly more frequent following open appendectomy than laparoscopic appendectomy (8.9% vs. 2.1%, $p = 0.047$). The mean hospital stay was also significantly shorter following laparoscopic surgery (3.2 ± 1.4 vs. 5.3 ± 2.6 days, $p < 0.001$). These findings are consistent with evidence from systematic reviews showing advantages of laparoscopic appendectomy in postoperative recovery and hospital stay. [9]

The findings of the present study demonstrate that acute appendicitis predominantly affected young adults and commonly presented with right iliac fossa pain and associated gastrointestinal symptoms. Laparoscopic appendectomy was the predominant surgical approach and was associated with a shorter hospital stay and lower wound infection rate in this study. Complicated appendicitis was associated with significantly greater postoperative morbidity, emphasizing the importance of timely diagnosis, appropriate assessment of disease severity and suitable surgical management. [7,9]

Conclusion:

Acute appendicitis predominantly affected young adults, with a slight male predominance. Right iliac fossa pain was the most common presenting symptom, and leukocytosis was frequently observed.

Laparoscopic appendectomy was the predominant surgical approach and was associated with a lower wound infection rate and significantly shorter hospital stay compared with open appendectomy. Patients with **complicated appendicitis had significantly higher postoperative morbidity** than those with uncomplicated disease. Early diagnosis, assessment of disease severity and appropriate surgical management are important for achieving favorable postoperative outcomes.

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