



## CLINICAL STUDY ON CONSERVATIVE MANAGEMENT OF UNCOMPLICATED ACUTE APPENDICITIS IN A TERTIARY CARE HOSPITAL

### General Surgery

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### ABSTRACT

**Background:** The use of antibiotic therapy alone as a treatment for acute appendicitis, avoiding surgical intervention, is currently being extensively investigated. While conservative management has become an accepted treatment modality for uncomplicated acute diverticulitis and salpingitis, its application in acute appendicitis remains a topic of debate. Nevertheless, accumulating evidence from recent studies suggests that selected patients with uncomplicated acute appendicitis may be managed safely and effectively using an antibiotics-first strategy, thereby potentially reducing the need for immediate surgery. **Methods:** A prospective longitudinal study was conducted over a period of 12 months at a tertiary care center. Patients presenting within 48 hours of the onset of abdominal pain, with clinical and radiological evidence suggestive of acute appendicitis and a Modified Alvarado Score of  $\geq 5$ , were included in the study. Demographic characteristics, clinical features, laboratory parameters, and radiological findings were collected and analyzed to assess their association with disease presentation and outcomes. **Results:** A total of 40 patients were included in the study, with a mean age of  $30.45 \pm 9.71$  years. Right iliac fossa tenderness was the most frequently observed clinical finding, followed by fever and rebound tenderness. Leukocytosis was present in 80% of the patients. A Modified Alvarado Score of 5–6 was observed in 17.5% of patients, while 82.5% had scores ranging from 7 to 9. Initial non-operative management with antibiotics was successful in 85% of patients, whereas treatment failure occurred in 15%. Among those who responded successfully to conservative management during the initial admission, a recurrence of appendicitis was observed in 10% during follow-up. **Conclusions:** Most patients presenting with a first episode of uncomplicated acute appendicitis can be managed successfully with conservative treatment using antibiotics. However, careful monitoring and regular clinical reassessment are essential to promptly identify cases in which conservative management fails and surgical intervention becomes necessary. The rates of treatment failure during the initial hospital admission and short-term recurrence following successful conservative therapy are relatively low and considered clinically acceptable. Furthermore, the success of conservative management appears to be independent of the Modified Alvarado Score, indicating that this scoring system may not reliably predict treatment outcomes in patients undergoing non-operative management.

### KEYWORDS

Acute appendicitis, Antibiotics, Conservative treatment, Modified Alvarado score, Uncomplicated acute appendicitis

### INTRODUCTION

More than 130 years have passed since Reginald Heber Fitz introduced the term *appendicitis* to describe inflammation of the vermiform appendix.(1) Recognition of the risk that appendiceal perforation could progress to generalized peritonitis, often resulting in death, led Charles McBurney to recommend early surgical removal of the appendix. In the era before the availability of antibiotics, prompt appendectomy was considered essential in all cases of acute appendicitis to prevent potentially fatal complications.(2) Acute appendicitis remains one of the most common surgical emergencies, with an estimated lifetime risk of approximately 7–8%. The condition occurs most frequently during the second and third decades of life, with peak incidence observed among adolescents and young adults.(3) In recent years, increasing evidence has suggested that antibiotic therapy alone may serve as an effective treatment option for selected patients with acute appendicitis. Although appendectomy remains the standard treatment, it is associated with postoperative complications, occurring in approximately 10–19% of patients with non-perforated appendicitis and up to 30% of those with perforated disease.(4-6) Furthermore, the widespread adoption of laparoscopic surgery has not

eliminated the issue of negative appendectomy, which may expose patients to unnecessary surgical procedures and their associated morbidity. While conservative management with antibiotics has become an established treatment approach for conditions such as uncomplicated acute diverticulitis and salpingitis, the role of non-operative management in acute appendicitis continues to be debated.(7) Despite encouraging results from recent studies, concerns regarding treatment failure, recurrence, and appropriate patient selection have prevented universal acceptance of this approach. Growing evidence suggests that an antibiotics-first strategy can be a safe and effective treatment option for patients with acute uncomplicated appendicitis. Several systematic reviews, meta-analyses, and a Cochrane review have reported that a substantial proportion of patients with uncomplicated appendicitis can be successfully managed without immediate surgical intervention.(7-9) Advances in antimicrobial therapy have also improved the efficacy of non-operative treatment for intra-abdominal infections, further supporting the feasibility of conservative management.(9)

Successful antibiotic treatment may spare patients from surgery-

related discomfort, reduce time away from work and daily activities, and avoid potential postoperative complications. These advantages have contributed to increasing interest in non-operative management as an alternative to appendectomy. However, for conservative treatment to be considered a practical substitute for surgery, it must demonstrate comparable effectiveness in resolving acute appendicitis while maintaining acceptable rates of recurrence and treatment failure. Consequently, ongoing research continues to evaluate the long-term outcomes and safety of an antibiotics-first approach in carefully selected patients with uncomplicated acute appendicitis.

In this context, the present study aims to evaluate the effectiveness of conservative management using antibiotic therapy in patients with uncomplicated acute appendicitis. Additionally, the study seeks to assess the rate of treatment failure during the initial admission and determine the incidence of short-term recurrence following successful non-operative management.

METHODS

The present study was carried out in a tertiary care hospital in central India from September 2024 to October 2025. A total of 40 cases were recruited in this study based on inclusion and exclusion criteria.

Study design

The present study was a tertiary care hospital based longitudinal study.

Study population

Patients presenting with Acute Pain in Right Lower Quadrant

Inclusion criteria

- Age: Above 18 years
- Clinically diagnosed case of Acute Appendicitis presenting within 48 hours of initiation of Abdominal pain with Modified Alvarado Score (Clinico-pathological score) more than or equal to 5.

Ultrasonography of the abdomen and pelvis was performed to support the clinical diagnosis of acute appendicitis. It was also utilized to identify complications such as appendicular phlegmon, abscess formation, or perforation, and to exclude other potential causes of right lower quadrant pain, including ureteric calculi and gynecological pathologies such as ovarian disorders.

Exclusion Criteria

- Patients with a history of recurrent appendicitis.
- Patients presenting with complicated acute appendicitis, including appendicular abscess, phlegmon, perforation, or generalized peritonitis.
- Individuals with immunodeficiency disorders or those receiving immunosuppressive therapy.
- Patients in whom non-operative management had already been initiated at another healthcare facility.
- Pregnant women.
- Patients with a documented allergy or contraindication to the antibiotics specified in the study protocol.
- Patients who declined to provide consent or were unwilling to comply with the study protocol.

Study factors

Data were collected using a structured pre-designed proforma. Demographic characteristics, clinical presentation, laboratory findings, and radiological parameters were systematically recorded and analyzed as study variables.

Successful conservative treatment

Successful conservative treatment was defined as resolution of appendicitis symptoms resulting in discharge from the hospital without requiring surgical intervention, with no recurrence of appendicitis during the 6-month follow-up period.

Failure of Conservative Treatment

Failure of conservative management was classified into the following categories:

Treatment Failure:

Treatment failure was defined as the absence of clinical improvement or worsening of symptoms during the course of conservative management, necessitating appendectomy during the same hospital admission.

Recurrence:

Recurrence was defined as the reappearance of symptoms suggestive of acute appendicitis in a patient who had previously responded successfully to conservative treatment. The diagnosis was confirmed clinically and supported by imaging studies, requiring further medical or surgical intervention.

Patients meeting the inclusion criteria were enrolled in the study and initially managed with intravenous antibiotic therapy consisting of ceftriaxone 1 g every 12 hours and metronidazole 500 mg every 8 hours for 48 hours. During this period, patients were maintained on intravenous fluids and kept nil per oral for the first 24 hours. Continuous clinical monitoring and serial assessments were performed to evaluate treatment response.

Patients demonstrating clinical improvement were subsequently transitioned to oral antibiotic therapy with ciprofloxacin 500 mg twice daily and metronidazole 400 mg thrice daily, completing a total treatment duration of 7 days. Patients who failed to show clinical improvement or exhibited deterioration in their condition underwent appendectomy according to standard surgical practice, using either an open or laparoscopic approach. Resected appendices were sent for histopathological examination.

All patients were followed up at 10 days, 30 days, and 6 months after treatment to evaluate clinical outcomes and detect recurrence among those managed conservatively. Any recurrence of appendicitis during the follow-up period was assessed and managed according to the prevailing institutional treatment protocol.

Descriptive statistics were summarized using appropriate measures such as mean, standard deviation, frequencies, and percentages, and were presented in tabular form.

For analytical statistics, categorical variables were expressed as absolute numbers and percentages. Comparisons between categorical variables were performed using Fisher's exact test, and the corresponding p-values were calculated. A p-value of less than 0.05 was considered statistically significant.

A total of 40 patients diagnosed with uncomplicated acute appendicitis were enrolled in the study and managed conservatively with antibiotic therapy.

The mean age of the study population was 35.45 ± 9.71 years, with ages ranging from 18 to 61 years. The majority of patients belonged to the 21–30 years age group, accounting for 12 cases (40%). This was followed by the 31–40 years age group, which comprised 12 patients (30%). Thus, most cases of uncomplicated acute appendicitis occurred in young adults, with the highest incidence observed during the third decade of life.

Table 1: Age distribution of patients.

| Age in years | Frequency (n =40) | Percentage |
|--------------|-------------------|------------|
| 18-20        | 4                 | 10.00      |
| >20-30       | 16                | 40.00      |
| >30-40       | 12                | 30.00      |
| >40-50       | 6                 | 15.00      |
| >50-60       | 1                 | 2.5        |
| >60          | 1                 | 2.5        |
| Total        | 40                | 100        |

Out of 40 patients in the present study, 18 were males and 22 were female with Male: female ratio of 1:1.22.

Table 2: Clinico-pathological factors at the time of presentation.

| Symptoms and signs | Frequency | Percentage |
|--------------------|-----------|------------|
| Pain               | 40        | 100%       |
| Anorexia           | 28        | 70%        |
| Nausea/Vomiting    | 32        | 80%        |
| Fever              | 35        | 87.5%      |
| Tenderness in RIF  | 40        | 100%       |
| Rebound tenderness | 24        | 60%        |
| Leucocytosis       | 32        | 80%        |

Among the 40 patients included in the study, abdominal pain and right iliac fossa tenderness were present in all cases (100%). Nausea and/or vomiting was reported by 32 patients (80%), while anorexia was

observed in 28 patients (70%). Fever (body temperature >99.1°F) was documented in 35 patients (87.5%). Rebound tenderness was present in 24 patients (60%), and leukocytosis was also noted in 32 patients (80%). These findings indicate that abdominal pain, tenderness, fever, and leukocytosis were the predominant clinical features among patients with uncomplicated acute appendicitis (Table 2).

Among the 40 patients included in the study, 7 patients (17.50%) had a Modified Alvarado Score of 5–6, whereas 33 patients (82.5%) had a score of 7 or higher. Of the 40 patients managed conservatively, treatment was successful in 30 patients (75%), who remained free of treatment failure and recurrence during the 6-month follow-up period. Conservative management failed in 6 patients (15%). Primary treatment failure during the initial hospital admission occurred in 6 patients (15%), necessitating surgical intervention. Recurrence following successful initial conservative treatment was observed in 4 patients (10%). The median time to recurrence was 2 months (Table 3).

**Table 3: Outcome of conservative treatment.**

| Outcome of conservative treatment | Frequency (n=40) | Percentage |
|-----------------------------------|------------------|------------|
| Successful                        | 30               | 75         |
| Treatment failure                 | 6                | 15         |
| Recurrences                       | 4                | 10         |

**Table 4: Co-relation of Modified Alvarado score with outcome of conservative treatment.**

|       |     | Outcome     |             | Total     |
|-------|-----|-------------|-------------|-----------|
|       |     | Success (%) | Failure (%) |           |
| MAS   | 5-6 | 6(15%)      | 1(2.5%)     | 7 (17.5%) |
|       | 7-9 | 28          | 5           | 33        |
| Total |     | 34 (85%)    | 6 (15%)     | 40 (100%) |

Among the 10 patients who experienced treatment failure during the initial admission, all underwent appendectomy. Histopathological examination of the resected specimens confirmed acute appendicitis in every case. Of the 6 patients who developed recurrence following successful conservative management, 5 subsequently underwent appendectomy, and histopathological analysis confirmed acute appendicitis in all of these patients. The remaining patient with recurrent appendicitis was managed successfully with repeat conservative treatment using antibiotics.

## DISCUSSION

Acute appendicitis is one of the most frequent causes of acute abdominal pain and has traditionally been treated by appendectomy since the procedure was popularized by Charles McBurney in 1889. Historically, it was believed that, without surgical intervention, uncomplicated appendicitis would inevitably progress to perforation and other serious complications.(1,2) However, contemporary evidence suggests that only a minority of patients present with complicated appendicitis, while the majority have uncomplicated disease.

As a result, non-operative management using antibiotics and supportive care has emerged as a potential treatment alternative for selected patients with uncomplicated acute appendicitis. Several studies have demonstrated successful resolution of symptoms in a significant proportion of such patients, thereby avoiding the risks, morbidity, and healthcare costs associated with surgery. Given these promising outcomes, conservative treatment has become a feasible management option, warranting comparison with appendectomy in terms of efficacy, safety, recurrence rates, and overall patient outcomes.

### Potential Advantages of Conservative Management Over Surgical Treatment

- Conservative management with antibiotics offers several potential benefits when compared with appendectomy. Antibiotic therapy provides a practical treatment option in settings where surgical facilities or expertise are not readily available, such as in resource-limited regions, remote locations, and isolated environments.(10) In addition, healthcare systems increasingly emphasize cost-effective treatment strategies, and previous studies have demonstrated a substantial reduction in hospital expenditure among patients managed with antibiotics compared with those undergoing surgery.

- Another important advantage of conservative treatment is the avoidance of negative appendectomies, thereby preventing unnecessary surgical procedures and promoting more efficient utilization of healthcare resources. Furthermore, successful antibiotic therapy eliminates the immediate risks associated with anesthesia and surgery, including postoperative morbidity and mortality.

The diagnosis of acute appendicitis is further complicated by the existence of a histologically normal entity known as **neuro-immune appendicitis**. This condition is characterized by increased concentrations of neuropeptides, neuronal proliferation and sprouting, and a possible associated immunological response within the appendix despite the absence of classical histopathological features of inflammation. Neuro-immune appendicitis has been proposed as a potential explanation for symptom relief observed in some patients following appendectomy, even when the removed appendix appears histologically normal. These findings suggest that functional and neurogenic alterations within the appendix may contribute to abdominal pain and clinical features resembling acute appendicitis.

The present study was undertaken to assess the effectiveness of conservative management in patients with uncomplicated acute appendicitis. The mean age of the study population was 35.45 ± 9.71 years, with an age range of 18–61 years. These findings are comparable to those reported in previous studies, indicating a similar age distribution among patients with uncomplicated acute appendicitis.

In the present study, the largest proportion of patients (40%) belonged to the 21–30 years age group. This finding is consistent with previous studies reported in the literature, which indicate that the incidence of acute appendicitis is highest during the third decade of life.

The number of patients in the fourth decade of life was greater than that in the second decade. This observation may be attributed to the study's inclusion criterion restricting enrollment to patients older than 18 years, thereby limiting the assessment of the true incidence of acute appendicitis among adolescents. Nevertheless, the age distribution observed in the present study is comparable to that reported by Vaishnav et al., who employed a similar age-based inclusion criterion. The male-to-female ratio in the study population was approximately 1:1.22, indicating a nearly equal distribution between genders. This finding is in agreement with previous studies and suggests that uncomplicated acute appendicitis affects both sexes with comparable frequency.

Regarding clinical presentation, abdominal pain was the most common symptom and was present in all patients. It was followed by nausea and/or vomiting, which occurred in 80% of patients, and anorexia, which was reported by 70% of patients. These findings are consistent with the clinical features described in the existing literature. Right iliac fossa tenderness was present in all patients and was the most consistent clinical finding. This was followed by fever, observed in 87.5% of patients, and rebound tenderness, which was present in 60% of cases. These findings are largely in agreement with those reported in the literature. However, the proportion of patients presenting with fever was higher than that reported by Berry et al., who documented fever in only 34.3% of cases. This discrepancy may be explained by differences in the diagnostic threshold used to define fever. While Berry et al. considered a temperature of 100°F as the cutoff value, the present study used a lower threshold of 99.1°F (37.3°C), consistent with the criteria employed in the Modified Alvarado Score.

The majority of patients (82.5%) had a Modified Alvarado Score of 7 or greater. This finding is comparable to that reported by Kalan et al., who introduced the Modified Alvarado Score in 1994, supporting the utility of this scoring system in the assessment of patients with suspected acute appendicitis.

In the present study, no statistically significant association was observed between the Modified Alvarado Score and the outcome of conservative management. This finding suggests that the likelihood of success or failure of antibiotic therapy cannot be reliably predicted based on the Modified Alvarado Score at the time of presentation. Consequently, patients with higher Modified Alvarado Scores may be considered for conservative treatment, as their rates of treatment failure and recurrence appear comparable to those observed in patients with lower scores. To the best of our knowledge, similar studies

specifically evaluating the relationship between Modified Alvarado Score and the outcome of non-operative management of uncomplicated acute appendicitis are scarce in the available literature.

### LIMITATIONS OF THE STUDY

The present study was a hospital-based longitudinal study conducted on a relatively small sample size, which may limit the generalizability of the findings. The diagnosis of acute appendicitis was primarily based on clinical evaluation, supported by the Modified Alvarado Score and ultrasonographic findings. Although computed tomography (CT) has been shown to improve the diagnostic accuracy of acute appendicitis, its routine use was not feasible in this study due to financial constraints and concerns regarding patient affordability.

Another limitation was the relatively short follow-up duration of 6 months, which may not be sufficient to accurately assess the long-term recurrence rate following conservative management. A longer follow-up period would provide a more comprehensive evaluation of treatment outcomes and recurrence patterns.

Furthermore, large-scale randomized controlled trials with longer follow-up periods are required to compare conservative and surgical management of uncomplicated acute appendicitis in terms of treatment efficacy, recurrence rates, complication profiles, patient satisfaction, and cost-effectiveness. Such studies would help establish stronger evidence regarding the optimal management strategy for this common surgical condition.

### CONCLUSION

The present study evaluated the effectiveness of conservative management in patients with uncomplicated acute appendicitis and was conducted over a two-year period at a tertiary care teaching hospital. The findings suggest that a majority of patients experiencing a first episode of uncomplicated acute appendicitis can be successfully managed with antibiotic therapy, thereby avoiding appendectomy and its associated surgical risks, morbidity, and healthcare costs.

Nevertheless, conservative management requires close clinical monitoring and regular reassessment to promptly identify patients who fail to respond to treatment and may require surgical intervention. Early recognition of treatment failure is essential to prevent disease progression and associated complications. In the present study, both the rate of treatment failure during the initial admission and the short-term recurrence rate following successful conservative treatment were low and considered clinically acceptable.

Further prospective studies with larger sample sizes and longer follow-up periods are required to establish clear criteria for selecting patients who are most suitable for non-operative management. As evidence continues to evolve, appendectomy following an initial trial of conservative treatment may be regarded not as a failure of management but as a component of a stepwise treatment strategy. Such an approach has the potential to ensure that only patients who genuinely require surgery are exposed to operative risks, thereby reducing the overall morbidity and mortality associated with acute appendicitis.

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