

## Management of Acute Appendicitis during COVID-19 Pandemic - Experience from a Tertiary Level Hospital of Nepal

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### ABSTRACT

#### Introduction

Appendicitis is the most common abdominal emergency and managed by appendectomy. However, during the peak COVID-19 pandemic most cases of uncomplicated acute appendicitis were managed conservatively and appendectomies were performed only after failure of conservative treatment. The objective of the study was to see the outcome of acute appendicitis treated with conservative management.

#### Methods

This was ambispective observational cohort study. All cases admitted as acute appendicitis but managed conservatively during the peak COVID period were collected from record section and patient followed up to five years or till patient got operated.

#### Results

A total of 33 cases of uncomplicated appendicitis were admitted, of which 21 cases were managed conservatively. Two cases were lost to follow-up. Of 19 cases, 11 cases (57.89 %) had recurrence and were operated. Among them, ten cases were operated on within 6 months, and 1 case after 8 months of the initial conservative treatment. Among the factors considered for treatment options, Alvarado score 8 (6.5-9) vs 9 (7-9),  $p=0.03$  and Tzanakis score 12 (10-12.5) vs 13 (10-13),  $p= <0.01$  were found to be significant indicators for the conservative and operative management groups.

#### Conclusion

Conservative management of uncomplicated appendicitis can be an alternative treatment, particularly during pandemic situations. However, patients with high Alvarado and Tzanakis scores should be closely monitored, with surgical intervention performed if there is recurrence of symptoms.

#### Keywords

Acute appendicitis; COVID-19; appendectomy

## INTRODUCTION

The COVID-19 pandemic started in China and spread worldwide. The first COVID-19 patient in Nepal was reported on January 23, 2020, and the government announced a nationwide lockdown from 24 March 2020.<sup>1,2</sup> The Nationwide lockdown had severely affected the healthcare system. Sparse transportation and fear of COVID-19 had delayed the emergency patients from reaching the health facilities.

Acute appendicitis was one of the common surgical emergencies presented to the emergency department during the COVID-19 lockdown.<sup>3</sup> Emergency appendectomy is done for acute appendicitis (AA). However, antibiotics have also been used for the treatment of uncomplicated acute appendicitis.<sup>3,4</sup> There are trials showing antibiotics are non-inferior to appendectomy based on 30-day European Quality of Life–5 Dimensions (EQ-5D) scores. However, these studies lack long-term follow-up.<sup>3</sup> In uncomplicated appendicitis, antibiotic treatment did not meet the pre specified criterion for non-inferiority compared with appendectomy in the APPAC trial.<sup>5</sup> During the peak COVID-19 outbreak, uncomplicated AA were managed mostly with antibiotics (non-operative), thus reducing exposure risk and minimizing the utilization of surgical resources.<sup>6,7</sup>

In the time of pandemic, especially COVID-19, the use of antibiotics for the treatment of acute appendicitis could be an alternative treatment

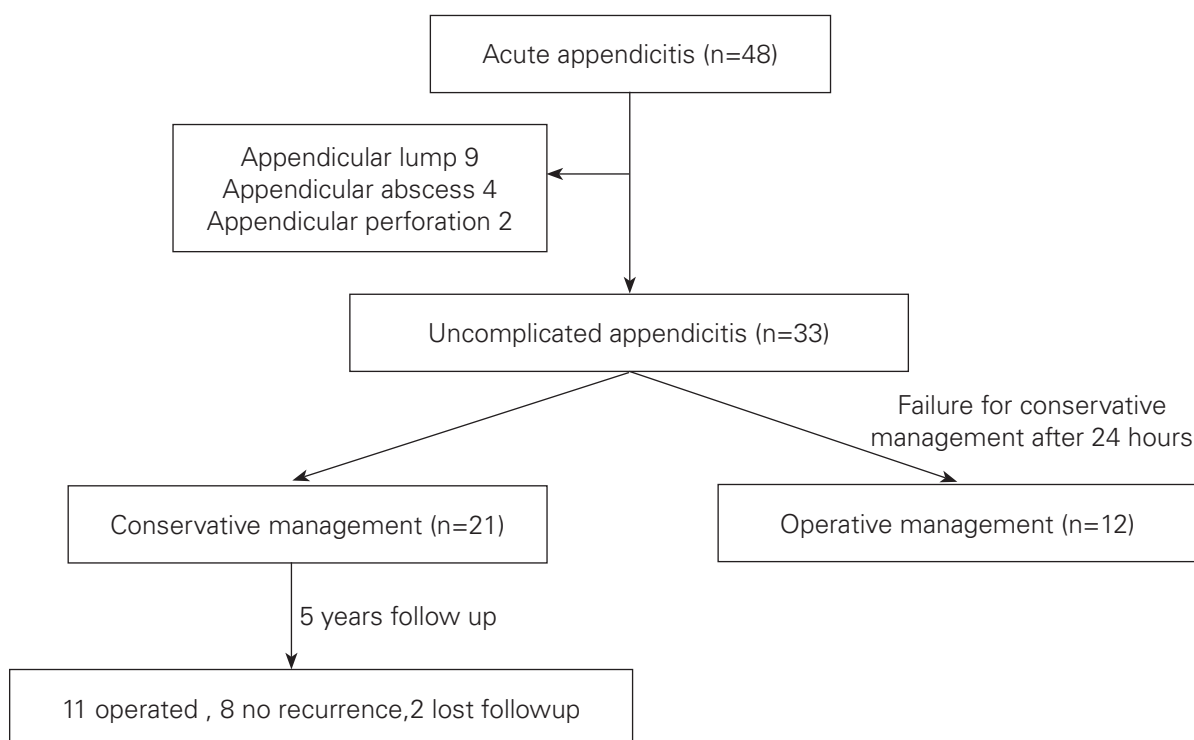
because there is less exposure to COVID-19 patients and also limitations of the resources.<sup>8</sup> In Nepal, studies have examined the management of acute appendicitis in children during the COVID-19 period; however, there is a lack of research focusing on adult patients with adequate follow-up. We conducted a study to evaluate trends in the management of acute appendicitis at a teaching hospital from 25 March to 25 May 2020, during the COVID-19 pandemic, with a five-year follow-up period or till the patient got operated.

## METHODS

This ambispective observational cohort study was conducted at Tribhuvan University Teaching Hospital. It identified patients presenting with uncomplicated acute appendicitis to the emergency department between 25 March and 25 May 2020, the peak period of the COVID-19 pandemic, retrospectively from hospital records.

During COVID, most cases of acute appendicitis were managed with antibiotics and operation reserved for patients with a diagnostic dilemma. Patients presenting with complicated acute appendicitis, like perforated acute appendicitis, peritonitis, were managed operatively and thus were excluded from the study group. Patients with appendicular lumps were managed with conservative management, and were also excluded from the study group.

Patients with uncomplicated appendicitis were managed according to protocol which included



**Figure 1.** Flowchart showing the management of appendicitis cases

admission, nil per oral, intravenous third-generation cephalosporin (ceftriaxone) and metronidazole, along with intravenous fluids and analgesics. Patients who failed to improve with conservative management within 24 hours, manifested by persistent pain or fever, underwent emergency open appendectomy. Discharge criteria included resolution of symptoms within 24 hours, tolerance of oral feeding, and mobilization. Upon discharge, patients were prescribed oral cefixime and metronidazole for a total antibiotic course of seven days, and were scheduled for outpatient follow-up.

Those patients who were managed conservatively were identified and were then followed prospectively for up to five years via phone call every 6 months to assess recurrence of appendicitis and need for surgical intervention.

Recurrence was defined as abdominal pain similar in character to acute appendicitis, with or without supportive radiological findings. The study was approved by the Institutional Review Committee of the Institute of Medicine, Tribhuvan University.

For this study, a structured proforma was developed to collect patient data, including age, gender, length of hospital stays, duration of symptoms, and comorbidities such as hypertension, diabetes mellitus, and chronic obstructive pulmonary disease. Clinical parameters recorded included the Alvarado score, total leukocyte count, Tzanakis score, and systemic inflammatory response syndrome (SIRS) criteria. Details of patient management, including conservative or surgical treatment, were documented, along with records of any readmission's and postoperative complications.

Inclusion criteria comprised patients aged over 16 years with a confirmed diagnosis of acute appendicitis who provided written informed consent. Patients with complicated acute appendicitis, such as an appendicular lump, abscess, or perforation, were excluded from the study. Data collected was entered into the Excel sheet and analyzed using SPSS version 25.

## RESULTS

A total of 48 patients with acute appendicitis were admitted through the Emergency Department of the Institute of Medicine. Among them, 33 (68.75%) had uncomplicated appendicitis, nine (18.75%) presented with appendicular lump, four (8.33%) with appendicular abscess, and two (4.17%) with appendicular perforation. Only the 33 uncomplicated cases were included in the study (Figure 1). Of these, 21 were managed conservatively, while 12 required surgery after failing conservative management within 24 hours.

The mean age group of the study population was 32.17 years  $\pm$  12.83 (SD), ranging from 17 to 65 years of age. The majority of the population was young adults. Of the population, 32 (66.67%) were male and 16 (33.33%) were female. The mean hospital stay was 3.81  $\pm$  3.33 days. The longest admission, lasting 15 days, occurred in a patient with an appendicular abscess managed with pigtail drainage. Comparison of baseline characteristics between the conservative and operative groups showed significant differences in age and Alvarado score (Table 1).

**Table 1.** Baseline characteristics compared between the conservative and operative groups

Parameters	Conservative (N=19)	Operative (N=12)	P value
Age(yrs)	25.89 $\pm$ 9.07	37.92 $\pm$ 14.35	0.008*
Admission days	2.89 $\pm$ 1.52	2.08 $\pm$ 0.79	0.10
Duration of symptoms (Days)	1.95 $\pm$ 1.58	1.33 $\pm$ 0.49	0.20
Days of IV Antibiotics	2.95 $\pm$ 1.47	2.25 $\pm$ 0.62	0.13
Days of Oral Antibiotics	5.47 $\pm$ 1.50	6.00 $\pm$ 1.04	0.29

**Table 2.** Clinical presentation of patients with acute appendicitis

Symptoms at presentation	No of patients (N=48)	Percentage
Abdominal Pain in right iliac fossa (RIF)	48	100.00
Nausea/Vomiting	37	77.08
Anorexia	23	47.92
Fever	15	31.31

**Table 3.** Comparison between the conservative and operative group

Parameters	Conservative (N=19)	Operative (N=12)	P value
Total Count(cumm)#	13385.79 ±2575.41	14341.67 ± 2878.28	0.34
Alvarado Score\$	8(6.5-9)	9 (7-9)	0.03*
Tzanakis Score\$	12 (10-12.5)	13 (10-13)	<0.01*
Ultrasound appendix Size (mm)#	8.52 ± 2.48	8.78 ± 2.06	0.76

\*Statistically significant at  $P<0.05$ ;

# Student *t* test, Values expressed as Mean ± SD

\$ Mann Whitney U test, Values expressed as Median (IQR)

The most commonly encountered presenting clinical features in all the patients were abdominal pain (100 %) in right iliac fossa (RIF) and nausea (77.1 %). Fever (31.3 %) was the least common clinical feature (Table 2). The mean duration of symptoms at presentation was 2.77 days. The mean total leukocyte count was  $13,615.20 \pm 2,978.9$ , and Median (IQR) Alvarado score was 8(7-9). Comorbidities were infrequent among the study population, with hypertension being the most common (8.33%), followed by diabetes mellitus, rheumatic heart disease, and pulmonary tuberculosis.

Among the factors considered for treatment selection, both the Alvarado score 8(6.5-9) vs 9 (7-9),  $p=0.03$  and Tzanakis score 12 (10-12.5) vs 13 (10-13),  $p= <0.01$  were significant indicators differentiating the conservative and operative management groups (Table 3). Those patients who had higher Alvarado or Tzanakis scores at the initial presentation were likely to be subjected to surgical treatment.

Within the one-year follow-up of 19 conservatively managed cases, 11 (57.89%) experienced recurrence and subsequently underwent surgery. Ten of these cases required surgery within six months, while one case presented at eight months and underwent surgery. Among those managed conservatively earlier who require surgery later, two patients developed superficial surgical site infections, which were successfully managed with dressings and antibiotics. There were no post operative complications. Other eight patients remained asymptomatic till five years follow up.

## DISCUSSION

Acute appendicitis is the most common cause of an acute abdomen requiring surgery, with a lifetime risk of about 7%.<sup>9,10</sup> Early diagnosis and treatment can reduce complications. Once the diagnosis is confirmed, an appendectomy is performed using either an open or a laparoscopic approach.<sup>11</sup> Due to the unavailability of transportation services, closure of health centers, reluctance of health centers towards the treatment of patients with unknown

COVID-19 status, and reluctance of patients towards seeking healthcare services with fear of contagion, there was a delay in the presentation of patients to the emergency.<sup>12</sup> Many countries have published protocols regarding the management of appendicitis during the COVID pandemic. During the pandemic, uncomplicated AA's were managed with antibiotics, as health resources were limited, and to minimize the risk of exposure.

A higher incidence of appendicitis was observed among young adults aged 21–30 years, particularly males (66.67%). The diagnosis of acute appendicitis remains primarily clinical. Typical presentation begins with vague peri-umbilical pain, later localizing to the right iliac fossa (RIF), often accompanied by anorexia, nausea, or vomiting.<sup>13,14</sup> Abdominal pain in the RIF was the predominant symptom in our study too.

Among the factors considered for treatment selection, both the Alvarado score 8(6.5-9) vs 9 (7-9),  $p=0.03$  and Tzanakis score 12 (10-12.5) vs 13 (10-13),  $p= <0.01$  were significant indicators of operative versus conservative management. Although total leukocyte count was higher in the operative group ( $14,341.67 \pm 2,878.28$  vs.  $13,385.79 \pm 2,575.41$ ,  $p = 0.34$ ), this difference was not statistically significant. These findings suggest that patients with higher Alvarado and Tzanakis scores should be considered for surgical management.<sup>15-17</sup>

In our study of the total 33 cases of uncomplicated appendicitis, 21 cases were managed conservatively, and 12 cases were operated. In the conservative group, two cases were lost to follow up while of the remaining 19 cases who were managed conservatively, 11 cases (57.89 %) had recurrence of symptoms of acute appendicitis and were operated. Of the 11 operated cases in the conservatively managed group, 10 cases were operated within six months, and one case after eight months. In our study, the recurrence rate following conservative management was 57.9%. This high recurrence rate may be due to preference for conservative treatment during the pandemic, driven by concerns about potential COVID-19

exposure among healthcare staff.

In the five-year follow-up of the APPAC randomized clinical trial, 530 patients were enrolled, with 257 randomized to receive antibiotic therapy. Of these, 70 patients (27.3%) initially treated with antibiotics underwent appendectomy within the first year. The cumulative incidence of appendicitis recurrence was 34.0% at 2 years, 35.2% at 3 years, 37.1% at 4 years, and 39.1% at 5 years, with an overall five-year recurrence rate of 39.1%.<sup>5,18</sup> Similarly, in the CODA trial in the antibiotics group, 29% had undergone appendectomy by 90 days.<sup>3</sup>

A limitation of our study is the small sample size however we have follow-up period of five years and the remaining eight patients remain asymptomatic so far. So, studies with larger samples are needed to establish the non-inferiority of conservative management over appendectomy in uncomplicated acute appendicitis during the pandemic.

## CONCLUSION

Conservative management of uncomplicated appendicitis can be an alternative treatment, particularly during pandemic situations. However, patients with high Alvarado and Tzanakis scores should be prioritized for operative management and those patients managed conservatively should be closely monitored, with surgical intervention performed if there is recurrence of symptoms.

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## CONFLICT OF INTEREST

None

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