

## Original Research Article

# ROLE OF APPENDICECTOMY IN CASES OF MESENTERIC ADENITIS

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**ABSTRACT**

**Background:** Mesenteric adenitis is an important differential diagnosis of acute appendicitis in children and adolescents due to similar clinical presentations, often leading to unnecessary appendicectomies. The present study aimed to evaluate the role of appendicectomy in mesenteric adenitis and its clinical relevance in improving patient outcomes.

**Materials and Methods:** This prospective hospital-based observational study included 60 patients aged  $\geq 5$  years with clinically suspected mesenteric adenitis confirmed on ultrasonography who subsequently underwent appendicectomy. Detailed clinical evaluation, laboratory investigations, ultrasonography, and selective contrast-enhanced CT were performed. Intraoperative findings, histopathological examination, postoperative outcomes, and follow-up at 1 week, 1 month, and 3 months were assessed.

**Results:** Most patients belonged to the 11–15 years age group (46.7%) with male predominance (56.7%). All patients (100%) presented with right lower quadrant pain, while nausea (80%), fever (75%), vomiting (60%), and anorexia (65%) were common associated symptoms. Ultrasonography demonstrated enlarged mesenteric lymph nodes in all cases, while CT findings showed overlapping appendiceal changes. Clinical suspicion of appendicitis (70%) and persistent symptoms (60%) were the major indications for surgery. Intraoperatively, 55% of appendices appeared normal, and histopathology confirmed normal appendices in 50% of cases, with reactive lymphoid hyperplasia in 30%. Postoperative outcomes were favorable, with minimal complications, mean hospital stay of  $2.1 \pm 0.8$  days, and significant reduction in pain scores. At 3 months follow-up, 95% of patients were symptom-free and overall satisfaction was 98.3%.

**Conclusion:** Mesenteric adenitis frequently mimics acute appendicitis, leading to a high rate of negative appendectomies. Although appendicectomy provided symptomatic relief with low morbidity, improved diagnostic strategies and careful patient selection are necessary to reduce unnecessary surgeries.

**Keywords:** Mesenteric adenitis, Appendicectomy, Acute appendicitis, Ultrasonography, Lymph nodes.

**INTRODUCTION**

Appendicectomy, the surgical removal of the vermiform appendix, is one of the most commonly performed emergency abdominal surgeries

worldwide and is primarily indicated for the treatment of acute appendicitis. Acute appendicitis typically presents with right lower quadrant abdominal pain, nausea, vomiting, anorexia, and fever, and early diagnosis is essential to prevent complications such as perforation, abscess

formation, peritonitis, and sepsis. Although clinical examination, laboratory investigations, and imaging modalities like ultrasonography and computed tomography aid in diagnosis, differentiating appendicitis from other causes of acute abdominal pain remains challenging. One important differential diagnosis is mesenteric adenitis, an inflammatory condition of the mesenteric lymph nodes that closely mimics acute appendicitis, particularly in children and adolescents. Both conditions share similar clinical features, including abdominal pain, fever, and leukocytosis, often leading to diagnostic uncertainty and unnecessary appendectomies.<sup>[1,2]</sup>

In pediatric patients, differentiating mesenteric adenitis from acute appendicitis is particularly challenging due to atypical symptoms, difficulty in clinical examination, and limitations in radiological assessment. Current guidelines recommend careful clinical observation, serial abdominal examinations, and repeat imaging in doubtful cases to reduce unnecessary surgeries.<sup>[3]</sup> Although several biomarkers and scoring systems that can help distinguish mesenteric adenitis from acute appendicitis preoperatively. Parameters like C-reactive protein (CRP), procalcitonin levels, neutrophil-to-lymphocyte ratio (NLR), and imaging-based lymph node-to-appendix size ratios have been explored. However, none of these have demonstrated sufficient diagnostic accuracy to be adopted widely in clinical practice, leaving the surgeon with a persistent dilemma in borderline cases.<sup>[4]</sup>

Interestingly, some studies suggest that appendectomy in mesenteric adenitis may reduce hospital stay and improve recovery, while others discourage unnecessary surgery because of associated risks and morbidity.<sup>[4,5]</sup> With advances in minimally invasive surgery and diagnostic techniques, the decision for operative intervention requires careful evaluation. Therefore, the present study was undertaken to assess the indications, intraoperative findings, histopathological outcomes, and postoperative course of patients undergoing appendectomy who were later diagnosed with mesenteric adenitis.

## **MATERIALS AND METHODS**

After obtaining approval from the Institutional Ethical Committee and written informed consent from all participants, this prospective hospital-based observational study was conducted in the Department of General Surgery at a tertiary care centre over a period of 18 months, from 1st May 2024 to 30th April 2026. A total of 60 patients of either sex, aged 5 years and above, presenting with acute right lower quadrant abdominal pain and clinically suspected mesenteric adenitis confirmed by ultrasonography, who subsequently underwent appendectomy, were included in the study. Patients below 5 years of age, those with a

confirmed diagnosis of appendicitis without mesenteric adenitis, patients with contraindications to surgery, and pregnant women were excluded from the study.

A detailed clinical history was obtained, including the duration, severity, and nature of abdominal pain, associated symptoms such as fever, nausea, vomiting, diarrhea or constipation, and any prior episodes of similar pain. Relevant past medical, surgical, and personal history was also recorded. A thorough clinical examination was performed, focusing on abdominal findings such as tenderness, rebound tenderness, guarding, and palpable masses, with particular attention to the right iliac fossa. Baseline demographic data, including age, sex, and residence, were documented in a predesigned proforma. All patients underwent abdominal and pelvic ultrasonography (USG) to evaluate for mesenteric adenitis and appendiceal pathology. Findings such as the size and number of mesenteric lymph nodes, appendiceal diameter, wall thickness, and the presence of free fluid were documented. In selected cases with inconclusive USG findings or diagnostic uncertainty, contrast-enhanced computed tomography (CECT) of the abdomen and pelvis was performed. CT findings including enlarged mesenteric lymph nodes, peri-appendiceal fat stranding, and signs of appendiceal inflammation were recorded. Mesenteric adenitis was diagnosed based on the presence of clustered, enlarged, hypoechoic mesenteric lymph nodes (>5 mm) with a normal or minimally inflamed appendix on imaging. Patients, who met the diagnostic criteria for mesenteric adenitis, were planned for appendectomy. Indications for surgery were documented by the attending surgeon, including persistent pain, diagnostic uncertainty, or failure of conservative management. All surgeries were performed under standard aseptic precautions. Intraoperative findings such as the macroscopic appearance of the appendix, mesenteric lymph nodes, and any other intra-abdominal pathology were carefully noted. Resected appendices were sent for histopathological examination to correlate intraoperative findings with final pathology and to exclude subclinical appendicitis. Lymph node biopsies were obtained when indicated.

**Postoperative Management and Follow-Up:** Postoperative monitoring included assessment of pain, vital parameters, wound status, and early complications. Analgesia and antibiotics were given as per institutional protocol. Postoperative outcomes recorded were complication rates, including surgical site infections, intra-abdominal abscesses, and bowel obstruction. The outcomes assessed included length of hospital stay (in days), postoperative pain scores using the standard Visual Analogue Scale (VAS), and the time taken to return to normal diet and daily activities.

Patients were followed up at 1 week, 1 month, and 3 months post-surgery to assess recovery, late complications, and recurrence of abdominal pain.

Compliance with follow-up was ensured via outpatient visits and telephonic reminders.

### Statistical Analysis

Data collected throughout the study were entered into Microsoft Excel and analyzed using IBMSPSS software version 22.0. Continuous variables were expressed as mean  $\pm$  standard deviation, while categorical variables were represented as frequencies and percentages. Comparative analysis between groups was performed using the Chi-square test or Fisher's exact test for categorical variables and Student's t-test for continuous variables, as

appropriate. A p-value  $<0.05$  was considered statistically significant.

## RESULTS

Among the 60 participants, the majority belonged to the 11–15 years age group (46.7%), followed by 5–10 years (36.7%) with the mean age of  $12.8 \pm 4.2$  years. Males constituted 56.7% and females 43.3% of the study population, showing a slight male predominance with a male-to-female ratio of 1.3:1. [Table 1]

**Table 1: Demographic Profile of Patients**

Demographic data		No. of patients	Percentage
Age Groups(years)	5-10	22	36.7
	11-15	28	46.7
	>15	10	16.6
Gender	Male	34	56.7
	Female	26	43.3

The most common symptoms were right lower quadrant pain (100.0%), nausea (80.0%), fever (75.0%), migration of pain (70.0%), anorexia (65.0%), and vomiting (60.0%), while the most common signs were right iliac fossa tenderness (100.0%), rebound tenderness (75.0%), guarding (60.0%), and Rovsing's sign (50.0%), [Table 2]

The mean total WBC count was  $12,400 \pm 3,200$  cells/ $\mu$ L, with elevated counts in 70% of patients.

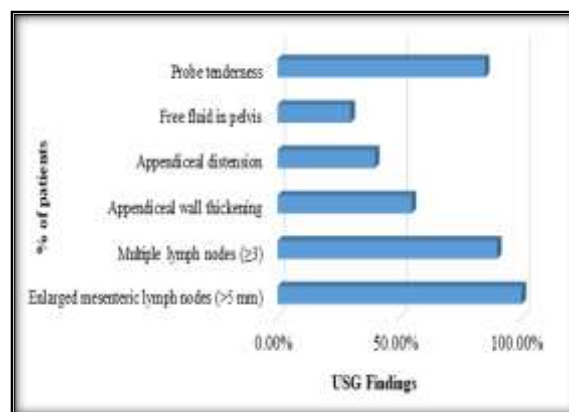
Neutrophilia was observed in 80% with a mean neutrophil percentage of  $78.5 \pm 8.4$ , while lymphocyte percentage was reduced in 75% of patients (mean  $18.2 \pm 6.1$ ). Elevated NLR was seen in 85% with a mean of  $4.8 \pm 1.6$ . CRP levels were raised in 90% of patients with mean of  $45.6 \pm 28.3$  mg/L, and ESR was elevated in 60% with a mean of  $28.4 \pm 15.2$  mm/hr.

**Table 2: Clinical Presentation, Symptoms, and Physical Signs among Study Participants**

Symptoms, and physical signs		No. of patients	Percentage (%)
Clinical Features	Right lower quadrant pain	60	100.0
	Migration of pain	42	70.0
	Nausea	48	80.0
	Vomiting	36	60.0
	Fever	45	75.0
	Anorexia	39	65.0
	Diarrhea	15	25.0
Physical Signs	Right iliac fossa tenderness	60	100.0
	Rebound tenderness	45	75.0
	Guarding	36	60.0
	Rovsing's sign	30	50.0
	Psoas sign	18	30.0
	Obturator sign	12	20.0

Enlarged mesenteric lymph nodes ( $>5$  mm) were observed in all patients (100%), with multiple lymph nodes present in 90% of cases. Appendiceal wall thickening and appendiceal distension were noted in 55% and 40% of patients, respectively. Free pelvic fluid was seen in 30% of cases, while probe tenderness was present in 85% of patients as shown in. [Figure 1]

The mean number of enlarged lymph nodes was  $4.2 \pm 1.8$ , with mean short-axis and long-axis diameters of  $8.4 \pm 2.1$  mm and  $12.6 \pm 3.4$  mm, respectively. Most lymph nodes were located in the right lower quadrant (90%), followed by the periumbilical region (60%) and left lower quadrant (30%).



**Figure 1: Ultrasonography findings (n=60)**

Mesenteric lymphadenopathy was identified in all 45 patients (100%). Appendiceal wall enhancement

was present in 30 patients (66.7%) and peri-appendiceal fat stranding in 27 (60%). Appendicolith was seen in 2 patients (4.4%), free fluid in 15 (33.3%), and bowel wall thickening in 12 (26.7%). [Figure 2]

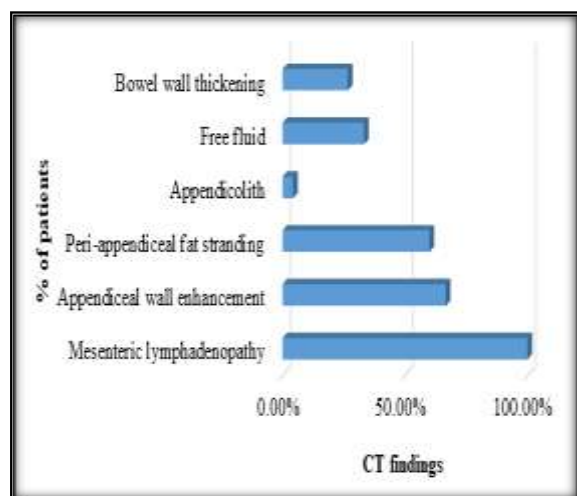


Figure 2: CT scan findings (n=45)

Clinical suspicion of appendicitis was the indication in 42 patients (70%), while 36 (60%) underwent surgery for persistent or worsening symptoms. Inconclusive imaging findings led to surgery in 24 cases (40%), and 4 (6.7%) were operated on due to patient/family request. 30 (50%) underwent surgery after failed conservative management. [Figure 3]

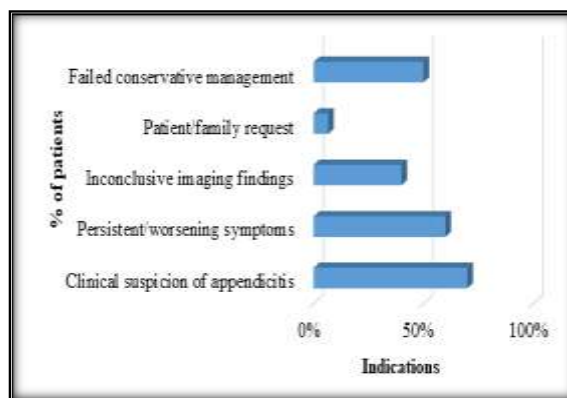


Figure 3: Indications for Appendectomy (n=60)

Laparoscopic appendectomy was performed in 70% of patients, while 30% underwent open surgery. The mean operative time was 38.5±15.2 minutes, with most surgeries completed within 30–60 minutes (60%). Intraoperatively, a normal appendix was observed in 55% of patients, mildly inflamed appendix in 35%, and moderately inflamed appendix in 10%. Enlarged mesenteric lymph nodes were present in all patients (100%), while free fluid and adhesions were noted in 25% and 15% of cases, respectively.

Histopathology revealed a normal appendix in 50% of cases, reactive lymphoid hyperplasia in 30%, mild acute appendicitis in 15%, and chronic appendicitis in 5%. Hyperplastic lymphoid tissue was observed in 30% of patients, while 70% had normal lymphoid tissue. [Table 3]

Table 3: Histopathological Examination of Appendix (n = 60)

Histopathology	Number	Percentage (%)
Normal appendix	30	50.0
Reactive lymphoid hyperplasia	18	30.0
Mild acute appendicitis	9	15.0
Chronic appendicitis	3	5.0
Lymphoid Tissue Status	Number	Percentage (%)
Normal lymphoid tissue	42	70.0
Hyperplastic lymphoid tissue	18	30.0

Immediate postoperative complications were reported in 51 patients (85%). Surgical site infection occurred in 6 (10%), wound dehiscence in 2 (3.3%), and nausea/vomiting in 9 (15%). Urinary retention was noted in 3 patients (5%), and both pneumonia and bleeding in 1 patient each (1.7%).

Patients resumed oral intake after a mean of 8.4 ± 3.2 hours and ambulation after 12.6 ± 4.8 hours. The

mean hospital stay was 2.1 ± 0.8 days, while return to normal activities and complete pain resolution occurred at a mean of 7.8 ± 2.4 days and 5.2 ± 1.9 days, respectively. Pain scores showed gradual improvement from a preoperative mean VAS score of 7.8 ± 1.4 to 4.2 ± 1.8 at 24 hours, 2.6 ± 1.2 at 48 hours, 1.1 ± 0.8 at 1 week, and 0.2 ± 0.4 at 1 month postoperatively. [Table 4]

Table 4: Postoperative Recovery Parameters and Pain Assessment Scores (Visual Analog Scale 0–10)

Parameters		Mean ± SD	Range
Postoperative Recovery Parameters	Time to oral intake (hours)	8.4 ± 3.2	4–18
	Time to ambulation (hours)	12.6 ± 4.8	6–24
	Hospital stay (days)	2.1 ± 0.8	1–4
	Return to normal activities (days)	7.8 ± 2.4	5–14
	Complete pain resolution (days)	5.2 ± 1.9	2–10
Pain Assessment Scores	Preoperative	7.8 ± 1.4	5–10
	24 hours postop	4.2 ± 1.8	1–8
	48 hours postop	2.6 ± 1.2	0–5
	1 week postop	1.1 ± 0.8	0–3
	1 month postop	0.2 ± 0.4	0–2

At 1-week follow-up, complete pain resolution was achieved in 75% of patients, while 20% had partial relief and 5% showed no improvement. Normal wound healing was observed in 90% of cases, with wound complications in 10%, and 60% had returned to school or work. Patient satisfaction with surgery was reported by 95% of patients. At 1 month, 90% of patients were symptom-free, all wounds were

completely healed, 96.7% were satisfied with surgery, and 86.7% were willing to recommend the procedure. By 3 months, complete symptom resolution was seen in 95% of patients, quality of life improved in 91.7%, and recurrent abdominal pain was noted in only 3.3% of cases, with overall satisfaction reaching 98.3%. [Table 5]

**Table 5: Follow-up at 1 Week, Table 17: Follow-up at 1 Month, Follow-up at 3 Months**

Parameters		Number	Percentage (%)
Follow-up at 1 Week	Complete pain resolution	45	75.0
	Partial pain relief	12	20.0
	No improvement	03	5.0
	Wound healing – Normal	54	90.0
	Wound complications	06	10.0
	Return to school/work	36	60.0
Follow-up at 1 Month	Satisfied with surgery	57	95.0
	Symptom-free	54	90.0
	Mild residual discomfort	06	10.0
	Wound completely healed	60	100.0
	Patient satisfaction	58	96.7
Follow-up at 3 Months	Would recommend surgery	52	86.7
	Complete symptom resolution	57	95.0
	Occasional mild discomfort	03	5.0
	Quality of life improved	55	91.7
	Recurrent abdominal pain	2	3.3
	Overall satisfaction	59	98.3

There was a significant reduction in all symptoms by 3 months postoperatively. Abdominal pain dropped from 100% preoperatively to 5% postoperatively ( $p < 0.001$ ). Nausea, vomiting, fever,

anorexia, showed statistically significant reductions ( $p < 0.001$ ), demonstrating marked postoperative improvement. [Table 6]

**Table 6: Comparison of Pre- and Post-operative Symptoms**

Symptom	Preoperative n (%)	3 Months Postop n (%)	P-value
Abdominal pain	60 (100.0)	03 (5.0)	<0.001
Nausea	48 (80.0)	01 (1.7)	<0.001
Vomiting	36 (60.0)	00 (0.0)	<0.001
Fever	45 (75.0)	00 (0.0)	<0.001
Anorexia	39 (65.0)	02 (3.3)	<0.001

## DISCUSSION

In the present study, the mean age of patients was  $12.8 \pm 4.2$  years, with most patients belonging to the 11–15 years age group (46.7%), which is comparable to the common age distribution of pediatric acute abdominal conditions, although Sabal et al.<sup>[6]</sup> reported a younger age predominance of 5–8 years. A slight male predominance (56.7%; male-to-female ratio 1.3:1) was also observed, similar to patterns seen in acute appendicitis. Clinically, all patients presented with right lower quadrant pain, while nausea, fever, vomiting, and anorexia were more frequent compared to the findings of Maheswari et al.<sup>[7]</sup> Physical examination findings such as right iliac fossa tenderness, rebound tenderness, guarding, Rovsing's sign, psoas sign, and obturator sign closely mimicked acute appendicitis, making diagnosis difficult. Laboratory investigations revealed raised inflammatory markers with elevated WBC counts in 70%, neutrophilia in 80%, increased NLR in 85%, and elevated CRP in 90% of patients, indicating significant inflammatory

activity that often influenced the decision for surgical intervention.

Ultrasonography showed enlarged mesenteric lymph nodes ( $>5$  mm) in all patients, with multiple lymph nodes present in 90% of cases. The mean number of lymph nodes was  $4.2 \pm 1.8$ , and the mean short-axis diameter was  $8.4 \pm 2.1$  mm, comparable to the findings of Valecha et al.<sup>[8]</sup> Appendiceal wall thickening and appendiceal distension were observed in 55% and 40% of patients, respectively, suggesting possible reactive or concurrent appendiceal inflammation. CT findings further supported mesenteric adenitis, with appendiceal wall enhancement in 66.7%, peri-appendiceal fat stranding in 60%, and appendicolith in 20% of patients, which may have influenced surgical intervention.

The indications for appendectomy in the present study reflected the diagnostic difficulty in differentiating mesenteric adenitis from acute appendicitis. Clinical suspicion of appendicitis was the main indication in 70% of cases, similar to the findings of Wijetunga et al.<sup>[9]</sup> Persistent or

worsening symptoms despite conservative management were observed in 60% of patients, suggesting that some cases may benefit from surgical intervention, as also reported by Huang et al.<sup>[10]</sup> Inconclusive imaging findings led to surgery in 40% of cases, supporting the observations of Shindoh et al.<sup>[11]</sup> regarding the limitations of preoperative diagnosis. Surgeon's clinical judgment influenced decision-making in 80% of cases, while failed conservative management and patient preference contributed to surgery in 50% and 30% of cases, respectively.

Intraoperative findings showed a normal appendix in 55% of patients, while 35% had mild inflammation and 10% had moderate inflammation, indicating varying degrees of appendiceal involvement in mesenteric adenitis. These findings are comparable to Huang et al.<sup>[10]</sup> Enlarged mesenteric lymph nodes were present in all patients, confirming the diagnosis of mesenteric adenitis, while free fluid (25%) and adhesions (15%) suggested extension of the inflammatory process to surrounding peritoneal structures.

Histopathology showed a normal appendix in 50% of cases, indicating that many patients with mesenteric adenitis underwent unnecessary appendectomy. However, reactive lymphoid hyperplasia was observed in 30% and mild acute appendicitis in 15% of cases, suggesting possible appendiceal involvement in the inflammatory process. Hyperplastic lymphoid tissue was present in 30% of patients, while 70% had normal lymphoid tissue, indicating variable appendiceal lymphoid response in mesenteric adenitis.

Postoperative outcomes were favorable, with 85% of patients experiencing no immediate complications which is comparable with the study done by Shindoh et al.<sup>[11]</sup> Surgical site infection was observed in 10% of cases, while wound dehiscence occurred in 3.3%. Minor complications included nausea/vomiting (15%) and urinary retention (5%). The rare occurrence of serious complications such as pneumonia and bleeding (1.7% each) supports the safety profile of the procedure when performed for appropriate indications. Recovery was rapid, with mean time to oral intake of 8.4±3.2 hours, ambulation within 12.6±4.8 hours, and hospital stay of 2.1±0.8 days. Patients returned to normal activities within 7.8±2.4 days. Pain scores improved significantly from a preoperative mean VAS score of 7.8±1.4 to 0.2±0.4 at one month, indicating effective symptom relief following surgery.

Follow-up outcomes showed favorable long-term results after appendectomy in patients with mesenteric adenitis. At 1 week, 75% of patients achieved complete pain relief and 20% had partial improvement. By 1 month, 90% were symptom-free and 96.7% were satisfied with surgery. At 3 months, complete symptom resolution was observed in 95% of patients, improved quality of life in 91.7%, and recurrent abdominal pain in only 3.3%, with overall satisfaction reaching 98.3%. Compared to the

conservative management outcomes reported by Sabal et al.<sup>[6]</sup> and Valecha et al.<sup>[8]</sup> our study demonstrated better symptom resolution following surgery. Significant reductions in abdominal pain, nausea, vomiting, fever, anorexia, and functional limitation ( $p<0.001$ ) support the effectiveness of surgical intervention in selected cases where conservative treatment fails or diagnostic uncertainty persists. These findings are comparable with the studies conducted by Wijetunga et al.<sup>[9]</sup> Huang et al.<sup>[10]</sup> and Shindoh et al.<sup>[11]</sup> The low complication rates, high patient satisfaction, and widespread use of laparoscopic surgery (70%) further support appendectomy as a safe and beneficial option in carefully selected patients with mesenteric adenitis.

The strengths of the present study include its prospective design with detailed clinical, laboratory, imaging, intraoperative, and histopathological evaluation, along with the use of multiple diagnostic parameters such as WBC, CRP, ESR, ultrasonography, and CT scan for comprehensive assessment. Follow-up at 1 week, 1 month, and 3 months enabled evaluation of postoperative recovery, symptom resolution, and quality of life. However, the study was limited by its single-center design and relatively small sample size, which may restrict the generalizability of the findings.

## CONCLUSION

The study demonstrated that mesenteric adenitis often mimics acute appendicitis, leading to a significant proportion of negative appendectomies. Although appendectomy provided symptomatic relief and had a low complication rate, half of the cases had histologically normal appendices, suggesting that many surgeries could have been avoided with improved diagnostic precision. The findings reinforce the need for cautious evaluation, the use of imaging modalities such as ultrasonography and CT, and consideration of conservative management in stable patients. A protocol combining clinical scoring systems, serial examinations, and repeat imaging could help reduce unnecessary operative interventions.

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