Section: General Surgery

Original Research Article

A COMPARATIVE STUDY BETWEEN THE EFFICACY OF THE ALVARADO SCORING SYSTEM AND THE RIPASA SCORING SYSTEM IN ACUTE APPENDICITIS

N.Deivanathan[1], R.Arjun[2], Asha Priyatharsini[3]

[1]Associate Professor, Department of General Surgery, Government Thoothukudi medical college, Tamilnadu, India
[2]Assistant Professor, Department of General Surgery, Government Thoothukudi medical college, Tamilnadu, India
[3]Senior Resident, Department of Paediatric Surgery, Government medical college, Kozhikode, Kerala, India

Received : 03/01/2026
Received in revised form : 10/02/2026
Accepted : 27/02/2026

Keywords:
Appendicitis; Diagnosis; Decision Making; Scoring Systems; Histology; Alvarado Score; RIPASA Score.

Corresponding Author:
Dr. Asha Priyatharsini,
Email: drashapriya96@gmail.com

DOI: 10.47009/jamp.2026.8.2.24

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (2); 124-127

ABSTRACT

Background: Acute appendicitis remains a common surgical emergency with varied clinical presentations, often leading to diagnostic uncertainty. Clinical scoring systems help standardise assessments and reduce unnecessary imaging and negative appendicectomy. The Alvarado and RIPASA scores are widely used; however, their performance differs across populations. This study aimed to compare the diagnostic efficacies of the Alvarado and RIPASA scoring systems in patients with suspected acute appendicitis. **Materials and Methods:** This comparative observational study was conducted from March 2023 to August 2024 at the Department of General Surgery, Government Thoothukudi Medical College and Hospital, Tamil Nadu. Patients with suspected acute appendicitis were evaluated using both scores and correlated with histopathological findings. **Result:** Most patients were under 30 years of age, with a male predominance. Early presentation was common, and nausea and vomiting were the most frequent symptoms observed. Right iliac fossa pain was present in all cases, with tenderness in almost all patients. Using the cutoff values, RIPASA ≥7.5 identified 51% of patients as having a high probability of appendicitis, compared with 35% identified by Alvarado ≥7. Histopathological examination confirmed acute appendicitis in all operated cases. RIPASA classified more patients above the cutoff than Alvarado. **Conclusion:** RIPASA classified more patients as having high-probability appendicitis than Alvarado did in our study population. Broader clinical parameters may improve risk stratification in suspected cases. RIPASA may support early diagnosis and clinical decision-making, particularly in resource-limited settings such as ours.

INTRODUCTION

Acute appendicitis is the most common cause of acute abdominal pain requiring emergency surgery, with a lifetime incidence of 7%.[1] Even with advances in medical practice, acute appendicitis is still a condition where diagnosis depends mainly on clinical evaluation.[2] Laboratory tests and radiological investigations help support the diagnosis, but none of them alone can confirm the condition. Therefore, surgeons still depend heavily on clinical judgement in day-to-day practice.[3] When appendicitis is identified early and treated at the appropriate time, appendicectomy is usually a simple and safe procedure with minimal complications. If the condition is missed or treatment is delayed, it may progress to perforation, peritonitis, sepsis, and can even increase the risk of mortality.[4]

Acute appendicitis is a common surgical emergency, and its accurate diagnosis is often difficult. Only approximately 40% of patients present with typical symptoms, such as periumbilical pain shifting to the right iliac fossa, nausea, vomiting, anorexia, and fever.[5] Many patients present with atypical features, especially children, elderly patients, and women of reproductive age. This wide variation in presentation makes diagnosis confusing and increases the chance of unnecessary surgery.[6] In developing countries and rural areas, where access to imaging, such as CT scans, is limited, clinicians rely more on clinical assessment, making accurate diagnosis even more challenging.

Several clinical scoring systems have been developed to improve diagnostic accuracy and reduce negative appendicectomy rates.[7] Among them, the Alvarado and the RIPASA scoring systems are the most

ISSN (O): 2687-5365; ISSN (P): 2753-6556

commonly used. The Alvarado score, introduced in 1986, is based on eight parameters: right iliac fossa tenderness, migratory pain, fever, nausea or vomiting, anorexia, rebound tenderness, leukocytosis, and left shift of neutrophils. Scores of 4–5, 7–8, and 9–10 suggested possible, probable, and strong appendicitis diagnoses, respectively. Even though it is simple and easy to apply, the Alvarado score does not include factors such as age, sex, and duration of symptoms, which affect its accuracy in different patient groups.[8]

The RIPASA scoring system was introduced in 2008 to improve diagnostic accuracy, particularly in Asian populations.[9] In addition to clinical symptoms and signs, it includes demographic factors such as age, sex, and duration of symptoms. A RIPASA score of > 7.5 is considered diagnostic of acute appendicitis.[10] By including these additional parameters, RIPASA attempts to address the limitations of earlier scoring systems. However, despite the widespread use of both the Alvarado and RIPASA scores, there is no clear consensus on which scoring system is superior in routine clinical practice. Therefore, this study was conducted to compare the diagnostic accuracy of the Alvarado and RIPASA scoring systems using histopathological examination as the reference standard to determine which scoring system is more reliable for diagnosing acute appendicitis in our clinical setting.

This study aimed to compare the Alvarado and RIPASA scoring systems for suspected acute appendicitis.

MATERIALS AND METHODS

This prospective observational comparative study included 80 patients with a clinical suspicion of acute appendicitis who underwent emergency appendicectomy at the Department of General Surgery, Thoothukudi Government Medical College and Hospital, from March 2023 to August 2024 (18 months). Ethical committee approval was obtained, and written informed consent was obtained from all participants or guardians.

Inclusion Criteria

Patients aged 12–75 years of both sexes with suspected acute appendicitis based on history and clinical examination were included.

Exclusion Criteria

Patients aged <12 and >75 years, pregnant patients, patients with alternate diagnoses during surgery with or without inflamed appendix, appendicular abscess, appendicular mass, generalised peritonitis, and those who did not consent to participate in the study were excluded.

Sample size calculation: The sample size was calculated to assess the diagnostic accuracy. Sensitivity or specificity was taken as P, depending on the parameter being evaluated, and Q was calculated as 100 minus P. A 95% confidence level was considered, with the Z value taken as 1.96, and C representing the allowable absolute error. Sample size formula: $n = Z^2 (P \times Q) / C^2$. Eighty patients were included in the final analysis.

Methods: A detailed clinical history was obtained from all patients at the time of admission. Routine blood investigations, including total and differential leukocyte counts and urine analysis, were performed. The Alvarado and RIPASA scores were calculated for each patient upon admission. The cut-offs used were Alvarado ≥7 and RIPASA ≥7.5. Based on clinical judgement, patients underwent emergency appendectomy, including a few cases with low score values. Appendectomy was performed using either the open or laparoscopic method. The final diagnosis was confirmed only after histopathological examination of the resected appendix. The pathologist was blinded to the results.

Data were analysed using SPSS software v29. Data are presented as frequencies and percentages. The proportions of patients above the Alvarado and RIPASA cut-offs were compared.

RESULTS

The majority of patients were <30 years of age, with 52 cases (65%), and males constituted a higher proportion, with 52 patients (65%) [Table 1].

Table 1: Demographic characteristics

Variable	Category	N (%)
Age (years)	< 20	27 (33.8%)
	21–30	25 (31.3%)
	31–40	12 (15%)
	41–50	9 (11.3%)
	> 51	7 (8.8%)
Sex	Male	52 (65%)
	Female	28 (35%)

Most patients presented within five days of symptom onset, accounting for 72 cases (90%), and nausea or vomiting was the most frequent associated symptom, observed in 44 patients (55%) [Table 2].

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 2: Clinical presentation at admission

Clinical Variable	Category	N (%)
Duration of symptoms	< 5 days	72 (90%)
	> 5 days	8 (10%)
Migration of pain	Present	13 (16.3%)
	Absent	67 (83.8%)
Anorexia	Present	23 (28.8%)
	Absent	57 (71.3%)
Nausea / Vomiting	Present	44 (55%)
	Absent	36 (45%)
Fever	Present	24 (30%)
	Absent	56 (70%)

On clinical examination, right iliac fossa pain was present in all patients (80/80, 100%), with right iliac fossa tenderness in 79 patients (98.8%); rebound tenderness and guarding were observed in 27 (33.8%) and 29 (36.3%) patients, while Rovsing sign was positive in 2 patients (2.5%) [Table 3].

Table 3: Distribution of clinical signs on examination

Clinical sign	Category	N (%)
Right iliac fossa tenderness	Present	79 (98.8%)
	Absent	1 (1.3%)
Rebound tenderness	Present	27 (33.8%)
	Absent	53 (66.3%)
Right iliac fossa pain	Present	80 (100%)
Right iliac fossa guarding	Present	29 (36.3%)
	Absent	51 (63.8%)
Rovsing sign	Present	2 (2.5%)
	Absent	78 (97.5%)

Leukocytosis was observed in 44 patients (55%) and a left shift of neutrophils in 47 patients (58.8%); urine analysis was negative in all cases (80/80, 100%), and histopathology confirmed acute appendicitis in all operated patients (80/80, 100%) [Table 4].

Table 4: Laboratory and histopathological findings

Investigation	Category	N (%)
Leucocytosis	Present	44 (55%)
	Absent	36 (45%)
Left shift	Present	47 (58.8%)
	Absent	33 (41.3%)
Urine analysis	Negative	80 (100%)
NRI	Absent	80 (100%)
Histopathological examination (HPE) report	Acute appendicitis	80 (100%)

A RIPASA score ≥ 7.5 identified more patients with acute appendicitis (n = 32, 51%) than an Alvarado score ≥ 7 (n = 22, 35%) [Table 5].

Table 5: Distribution of Alvarado and RIPASA scores by cut-off

Scoring system	Score category	Acute appendicitis
Alvarado score	< 7	41 (65%)
	≥ 7	22 (35%)
RIPASA score	< 7.5	31 (49%)
	≥ 7.5	32 (51%)

DISCUSSION

The study found that acute appendicitis was common among young males. Most patients presented early with typical symptoms of the disease. Right iliac fossa pain and tenderness were consistent findings in all patients. RIPASA classified more patients above the diagnostic cutoff than Alvarado. This may be due to the inclusion of age, sex, and symptom duration in the RIPASA.

In our study, the study population was predominantly young, with most patients under 30 years of age, and a clear male predominance was observed. Similarly, Nanjundaiah et al. reported male predominance (61.6%, 127/206) with a mean age of 27.8 ± 9.26 years, indicating a younger population. Histopathology confirmed appendicitis in 89.3% of the patients, with a negative appendectomy rate of 10.6%.[11] Shaker et al. reported that appendicitis occurred more frequently in males (56%) than in females. Most patients belonged to the younger age group, with the highest number of cases seen between 10 and 25 years, indicating that appendicitis predominantly affected young individuals in their cohort.[12] These studies support our findings by showing a similar age distribution and male

ISSN (O): 2687-5365; ISSN (P): 2753-6556

predominance, suggesting consistent demographic patterns of acute appendicitis across different populations.

Our study showed that most patients presented early, with nausea or vomiting being common, right iliac fossa pain and tenderness predominating, and guarding and rebound tenderness being less frequent. Similarly, Nshuti et al. found that most patients presented early, with a mean symptom duration of 4.5 days. Gastrointestinal symptoms were common, with vomiting reported in 73% of patients and nausea in 80%, making these the most frequent presenting complaints.[13] Chong et al., in a study, showed that patients with confirmed appendicitis had high RIPASA scores (mean 10.2 ± 1.8), reflecting consistent right iliac fossa pain and tenderness, while guarding and rebound tenderness were seen in fewer cases.[14] These studies support our findings by showing similar early presentation patterns and predominance of gastrointestinal symptoms and right iliac fossa signs in acute appendicitis.

In this study, RIPASA scoring classified more patients as having a high probability of acute appendicitis than the Alvarado scoring system. Similarly, Shams et al. found that the RIPASA score classified more patients as having a high probability of acute appendicitis, with 345 of 389 patients (88.7%) scoring ≥7.5, compared with 261 patients (67.1%) identified using an Alvarado score ≥7.[15] Senthan Amudhan et al. found that the RIPASA score identified more patients with a high probability of acute appendicitis, with 251 of 285 patients (88%) scoring ≥7.5, compared with 194 patients (68%) who had an Alvarado score ≥7.[16] These studies support our findings by consistently demonstrating that the RIPASA score identifies a higher proportion of high-probability appendicitis cases than the Alvarado score in different populations. Both scores were applied prospectively using standard cutoffs.

Limitations: This was a single-centre study with a limited sample size. Clinical scoring depended on the examiner's judgment. Imaging is not routinely used, and the age-specific performance of the scoring systems has not been separately assessed.

Clinical implication: The RIPASA score may help clinicians make earlier decisions and reduce the need for unnecessary investigations. Future multicentre studies and validation in different age groups are thus recommended.

CONCLUSION

The RIPASA scoring system outperformed the Alvarado score in identifying patients with acute appendicitis. RIPASA classified more patients above the diagnostic cut-off than the Alvarado score. Both scores were useful, but RIPASA was more reliable in the study population. The use of this tool may improve clinical decision-making.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556