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Original Article

Evaluating Efficacy of Appendicitis Inflammatory Response Score, Alvarado Score, and Raja Isteri Pengiran Anak Saleha Appendicitis Score in the Diagnosis of Acute Appendicitis

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Abstract

Background: Acute appendicitis remains one of the most common surgical emergencies. Despite advances in imaging, diagnosis remains primarily clinical. Several scoring systems, such as Alvarado, Appendicitis Inflammatory Response (AIR), and Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA), have been developed to improve diagnostic accuracy. However, their performance varies across populations.

Aim: To evaluate and compare the diagnostic accuracy of AIR, Alvarado, and RIPASA scoring systems in diagnosing acute appendicitis using histopathological examination (HPE) as the gold standard.

Materials and Methods: A cross-sectional study was conducted at the Department of General Surgery, Dhanalakshmi Srinivasan Medical College and Hospital, Tamil Nadu, from November 2023 to November 2025. A total of 101 patients aged 18–60 years presenting with right iliac fossa pain and undergoing appendectomy were included. Clinical findings and laboratory parameters were recorded, and AIR, Alvarado, and RIPASA scores were calculated preoperatively. HPE of resected specimens served as the reference standard. Sensitivity and specificity were calculated for each scoring system.

Results: Among 101 patients, 91 (90.1%) had histopathologically confirmed acute appendicitis. The mean age was 26.36±13.98 years, with male predominance (56.4%). (1) Alvarado score: Sensitivity 84.6%, specificity 20%. (2) AIR score: Sensitivity 72.5%, specificity 50%. (3) RIPASA score: Sensitivity 82.4%, specificity 20%. AIR score demonstrated higher specificity compared to the other two systems, whereas Alvarado showed the highest sensitivity.

Conclusion: All three scoring systems are useful screening tools for acute appendicitis. Alvarado and RIPASA scores showed higher sensitivity, whereas the AIR score demonstrated superior specificity, potentially reducing negative appendectomy rates. AIR score may be particularly useful in resource-limited settings to avoid unnecessary surgical intervention.

Key words: Acute appendicitis, Appendicitis Inflammatory Response score, Alvarado score, Diagnostic accuracy, Raja Isteri Pengiran Anak Saleha appendicitis score

INTRODUCTION

Acute appendicitis is one of the most frequent causes of acute abdomen requiring emergency surgery. The lifetime risk is estimated at 7–10%. Despite its prevalence, diagnosis remains challenging due to variable clinical presentation. Delayed diagnosis increases the risk of perforation, while overdiagnosis leads to unnecessary appendectomies.[1-4]

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Although imaging modalities such as ultrasonography and computed tomography improve diagnostic accuracy, they may not be readily available in all settings and increase healthcare costs.[6,7] Clinical scoring systems were therefore developed to aid decision-making. The Alvarado score, introduced in 1986, is widely used but has shown variable

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performance in Asian populations.[10,12,13] The Appendicitis Inflammatory Response (AIR) score incorporates C-reactive protein (CRP) and objective inflammatory markers.[11] The RIPASA score was specifically developed for Asian populations and includes additional demographic and clinical parameters.[8,9]

This study aimed to compare the diagnostic performance of AIR, Alvarado, and RIPASA scoring systems in a South Indian population using histopathological examination (HPE) as the gold standard.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional study was conducted in the Department of General Surgery, Dhanalakshmi Srinivasan Medical College and Hospital, Tamil Nadu, between November 2023 and November 2025.

Study Population

A total of 101 consecutive patients aged 18–60 years presenting with right lower quadrant pain suggestive of acute appendicitis and undergoing appendectomy were included.

Inclusion Criteria

- Age 18–60 years
- Clinical suspicion of acute appendicitis
- Duration of symptoms ≤72 h
- Undergoing appendectomy
- Provided informed consent.

Exclusion Criteria

- Patients unfit for surgery
- Refusal to consent
- Appendicular mass managed conservatively.

Data Collection

Detailed history, physical examination findings, and laboratory parameters, including total leukocyte count and CRP, were recorded. AIR, Alvarado, and RIPASA scores were calculated preoperatively.

Outcome Measure

HPE of the resected appendix was considered the gold standard for diagnosis.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences version 23. Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as frequencies and percentages. Sensitivity and specificity were calculated using 2 × 2 contingency tables.

RESULTS

Demographic Profile

- Mean age: 26.36 ± 13.98 years
- Male: 56.4%
- Female: 43.6%.

Histopathological Findings

- Acute appendicitis confirmed in 91 patients (90.1%)
- Negative appendectomy rate: 9.9%.

Scoring System Performance

Scoring system	Sensitivity (%)	Specificity (%)
Alvarado	84.6	20
AIR	72.5	50
RIPASA	82	20

AIR: Appendicitis Inflammatory Response, RIPASA: Raja Isteri Pengiran Anak Saleha appendicitis

- Alvarado score showed the highest sensitivity
- AIR score demonstrated the highest specificity
- RIPASA performed similarly to Alvarado in sensitivity but had low specificity.

DISCUSSION

Accurate diagnosis of acute appendicitis remains crucial to balance early intervention and avoidance of unnecessary surgery.[5] In this study, 90.1% of patients had histologically confirmed appendicitis.

The Alvarado score demonstrated high sensitivity but low specificity, consistent with previous literature suggesting it is better suited as a screening tool.[10-13]

The AIR score, by incorporating CRP and graded inflammatory variables, demonstrated superior specificity (50%) in our study. This may reduce negative appendectomy rates.[11]

The RIPASA score, though developed for Asian populations, did not demonstrate improved specificity in our cohort.[8,9]

Compared to similar studies, our findings showed variability in specificity values, likely influenced by sample size, regional population characteristics, and scoring cutoffs.

Overall, the AIR score appears more balanced and may be particularly useful in resource-constrained settings.

Limitations include a single-center study, a relatively small sample size, observer-dependent clinical assessment, and only surgically managed patients were included.

Multicenter studies with larger sample sizes are required for broader generalization.

CONCLUSION

AIR, Alvarado, and RIPASA scoring systems are valuable adjuncts in diagnosing acute appendicitis.

- Alvarado and RIPASA demonstrated higher sensitivity
- AIR score demonstrated higher specificity and may help reduce negative appendectomy rates.

None of the scoring systems should replace clinical judgment but may serve as effective decision-support tools, especially in resource-limited settings.

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