

Alvarado Vs Ripasa Scores in Diagnosing Acute Appendicitis in A Tertiary Care Centre

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Abstract

Background: Acute appendicitis is a common surgical emergency and early diagnosis is crucial to prevent complications such as perforation and the formation of an appendix abscess. Development of clinical scoring systems: Improves diagnostic accuracy, especially in limited resource settings. The Alvarado and RIPASA scores are extensively utilized. Evaluating their performance enhances clinical decision-making and minimizes superfluous appendectomies. The aim is to compare the diagnostic accuracy of Alvarado scoring system versus RIPASA scoring system in diagnosing acute appendicitis. **Material and Methods:** This is a prospective observational study carried out in Department of General Surgery for 12 months with a 65 patients with a clinical suspicion of acute appendicitis. Demographic and clinical data were collected after obtaining informed consent. Alvarado and RIPASA scores were used to assess each patient. Patients were categorized as 'high risk' or 'low risk' by the use of predetermined cut-off values (Alvarado ≥ 7 and RIPASA ≥ 7.5). Operative interventions were performed in all the patients as per clinical decision making. Intraoperative diagnosis and histopathology analysis of the postoperative specimen were taken as the gold standards to confirm the diagnosis of appendicitis. The sensitivity, the specificity, the positive predictive value (PPV), the negative predictive value (NPV) and the diagnostic accuracy of both scoring systems were analysed and compared. **Results:** On histopathology, the majority of the 65 included had acute appendicitis. Moderate sensitivity and specificity were seen with the Alvarado score, in that it was able to detect a significant number of actual cases, but was not able to detect some early or atypical presentations. In contrast, the RIPASA score displayed greater sensitivity and recognized more true-positive patients and showed good overall diagnostic accuracy. Both the positive predictive value (PPV) and Negative predictive value (NPV) were high for RIPASA, indicating a more reliable classification for different clinical presentations. **Conclusion:** The Alvarado score was not as sensitive, specific or accurate as the RIPASA scoring system for suspected acute appendicitis. Using RIPASA along with traditional evaluation can provide a better diagnostic accuracy and reduce the number of negative appendectomy.

Keywords: Acute appendicitis, Alvarado score, Diagnostic accuracy, RIPASA score.

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INTRODUCTION

Acute appendicitis is a common cause of acute abdominal pain requiring emergency surgical surgery. It affects all age groups, particularly young adults, and has been shown to have varying implications such as perforation, abscess formation, peritonitis and sepsis which decisively increase morbidity and hospital stay, if left undiagnosed.^[1,2]

The diagnosis of acute appendicitis is difficult because of the overlap of clinical presentation with different causes of right iliac fossa pain and the lack of uniformity of inflammatory response and variation in anatomy.^[3] As a result, physicians often rely on elements of their clinical judgment, lab tests, and imaging to make a diagnosis.^[4]

For example, in the fast-paced setting of the emergency room or a low-resource setting where access to imaging technologies such as computed tomography (CT) scans may be delayed in an emergency, the need for reliable diagnostics becomes all the more vital. To address this challenge, many clinical scoring systems have been developed to improve the accuracy of the diagnosis and aid decision making.^[5]

One of the most widely-used scores is the Alvarado score,

which was developed in 1986. The assessment relies on eight clinical and laboratory indicators categorized under the mnemonic MANTRELS: Migration of pain, Anorexia, Nausea/vomiting, Tenderness in the right iliac fossa, Rebound tenderness, Elevated temperature, Leukocytosis, and Shift to the left.^[6] The Alvarado score is straightforward, rapid, and uncomplicated to implement. A score of 7 or higher usually means that it is quite likely that you have appendicitis and that you will need an operation. Numerous studies suggest that the diagnostic value of SevenDespite may span across different ethnic groups, often with lower sensitivity in Asian settings.^[7] To bypass these limitations, a new score (the RPAS score: Raja

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IsteriPengiranAnakSaleha Appendicitis) has been developed in 2010, mostly for Asian populations. It includes additional criteria such as the duration of symptoms, guarding, Rovsing's sign and urinalysis findings making it a more comprehensive assessment tool; the RIPASA has been found to have greater sensitivity and specificity in several studies across Asian countries, with a maximum score of 17.5 on a scale of 14. The RIPASA score is better adapted to populations in South and Southeast Asia because it includes, in addition to the above, culturally and regionally relevant clinical characteristics.^[8-10]

The efficacy assessment of Alvarado and RIPASA is of great significance to improve the diagnostic approach in a tertiary care set-up. In an era when surgical services in the emergency room are becoming more available, and where rapid action is required for surgical procedures, the relevance of evaluating these scoring systems in different environments is especially important in the context of the increasing pressure on emergency surgical services and the need for an economical way of performing the necessary imaging.

Aims and Objectives: To compare the diagnostic performance of the Alvarado and RIPASA scoring systems in identifying acute appendicitis.

MATERIALS AND METHODS

This prospective observational study was carried out in the Department of General Surgery at SreeMookambika Institute of Medical Sciences, over a period of 12 months from June 2024 to May 2025. A total of 65 patients who presented to the emergency department with symptoms suggestive of acute appendicitis were included after screening for eligibility.

Inclusion Criteria

- Patients aged above 12 years presenting with right iliac fossa pain suspected to be acute appendicitis.
- Patients willing to provide informed consent.
- Patients undergoing surgical exploration for suspected appendicitis.

Exclusion Criteria

- Patients with previous abdominal surgeries.
- Patients with appendicular mass or abscess detected clinically or radiologically.
- Pregnant women.
- Patients unfit for surgery or who refused operative management.
- Patients with alternative diagnosed causes of right iliac fossa pain.

A comprehensive clinical assessment was performed when patients were admitted to all cases. History was detailed including onset, duration of pain, migration of pain, gastrointestinal symptoms and history of similar events. All patients underwent a thorough physical examination for right iliac fossa pain, rebound tenderness, guarding, and special physical examination for Rovsing. Baseline investigations involved hemoglobin, total leukocyte count, differential count and urinalysis.

Both Alvarado and RIPASA scoring was used for each patient. Careful recording of the parameters was done for each scoring system. Alvarado score calculated 8 clinical and laboratory values; RIPASA score included additional clinical and laboratory variables, which are urinalysis results, guarding, Rovsing's sign, gender, and duration of symptoms, age. An Alvarado score ≥ 7 and a RIPASA score ≥ 7.5 were used for the analysis as predictive factors of acute appendicitis. Scoring was performed independently, and not used to determine the surgery performed by the treating surgeon.

Standard hospital treatment was used on all patients. Appendectomy was performed based on surgeon's clinical judgement. Any intraoperative observations were recorded, such as the appearance of the appendix, its degree of inflammation, presence of edema, hyperemia, exudates, perforation, gangrene, or peri-appendiceal pus. Pathological examination of the appendix was used as the gold standard to obtain the definitive diagnosis of acute appendicitis after removal, from each patient. Histopathology reports were divided according to the severity of appendicitis into four following categories: acute appendicitis, suppurative appendicitis, gangrenous appendicitis, perforated appendicitis, and normal appendix.

Data were collected and analysed statistically using appropriate statistical tools. Where applicable, the categorical variables were compared by the chi-squared test or Fisher's exact test. Results of continuous variables were presented as mean and SD. A p value < 0.05 was considered statistically significant. The diagnostic powers of Alvarado score and RIPASA score were compared to see which score was more accurate in diagnosing acute appendicitis on the study population.

RESULTS

A total of 65 patients who presented with symptoms suggestive of acute appendicitis were included in the study. Among them, most patients (36.9%) were in the 21–30 years age group, reflecting the typical age pattern of acute appendicitis. Males were predominantly affected, forming 63.1% of the study population.

Table 1: Demographic characteristics

	Number of Patients	Percentage (%)
Age Group (years)		
13–20	18	27.7
21–30	24	36.9
31–40	13	20.0
>40	10	15.4
Gender		
Male	41	63.1

Female	24	36.9
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The majority of cases showed inflammatory pathology. Only 3 patients (4.6%) had a normal appendix, indicating a

low negative appendectomy rate. [Table 2]

Table 2: Histopathological Findings

HPE Diagnosis	Number	Percentage (%)
Acute appendicitis	36	55.4
Suppurative appendicitis	14	21.5
Gangrenous appendicitis	8	12.3
Perforated appendicitis	4	6.2
Normal appendix	3	4.6

Alvarado score identified the majority of positive cases but missed 14 cases that were confirmed by HPE. There was a

moderate positive correlation between the Alvarado score and histopathological findings. [Table 3]

Table 3: Alvarado Score vs Histopathology

Alvarado Score	HPE Positive	HPE Negative	Total	p value
≥7 (Positive)	38 (73.1%)	4 (30.8%)	42 (64.6%)	0.001
<7 (Negative)	14 (26.9%)	9 (69.2%)	23 (35.4%)	
Total	52 (100%)	13 (100%)	65 (100%)	

RIPASA score identified a larger proportion of true-positive cases with fewer false negative cases. The RIPASA score

demonstrated a stronger correlation with histopathology. [Table 4]

Table 4: RIPASA Score vs Histopathology

RIPASA Score	HPE Positive	HPE Negative	Total	p value
≥7.5 (Positive)	47 (90.4%)	2 (15.4%)	49 (75.4%)	<0.001
<7.5 (Negative)	5 (9.6%)	11 (84.6%)	16 (24.6%)	
Total	52 (100%)	13 (100%)	65 (100%)	

RIPASA showed higher sensitivity, specificity, and superior diagnostic accuracy when compared to Alvarado score. RIPASA score clearly outperformed the Alvarado score across all diagnostic parameters. [Table 5] The comparison

of scoring performance between Alvarado and RIPASA showed a chi-square value of 9.87, with a p-value of 0.002, indicating a statistically significant difference.

Table 5: Diagnostic Performance of Alvarado vs RIPASA Scores

Parameter	Alvarado (%)	RIPASA (%)
Sensitivity	73.1	90.4
Specificity	69.2	84.6
Positive Predictive Value	90.4	95.9
Negative Predictive Value	39.1	68.7
Diagnostic Accuracy	72.3	89.2

DISCUSSION

The present study examined 65 patients with suspected acute appendicitis and showed the distribution characteristics consistent with known epidemiological trends. The predominant age group affected was males at 41 patients (63.1%) and also younger, mostly 21–30 years age (36.9%). The results corroborated with findings of Karki OB et al,^[12] who reported a mean age of 26.44 ± 15.52 years with majority (34.8%) patients in 10-20 years age group followed by 20-30 years age group (24%). A similar finding was made by Memon SN et al,^[13] who found that 60.4% of their cohort were within the 18-30 age group, of which the males accounted for 57.4% of the research population.

The clinical presentation in this study was consistent with the classic signs and symptoms of acute appendicitis while both the Alvarado scoring and RIPASA scoring were used

for diagnosis. Histopathological findings confirmed the presence of appendicitis in 52 patients (80%), and only 3 patients (4.6%) had normal appendix, the rate of which remained low in the negative appendectomy. Of the 943 cases examined by additional studies, Memon SN et al,^[13] found histopathology confirmation in 94.3% while Majid M et al,^[14] found 29 histologically normal appendixes in 270 cases.

Symptomatology in equivalent cohorts confirms the value of the classical features for diagnosis. Mehbub H et al,^[15] highlighted that guarding (62%), leukocytosis (93.3%), fever (92%) and migrating pain (60.7%) were in high percentage, justifying the use of clinical scoring methods for early diagnosis.

The present study shows that the Alvarado score of ≥7 had a moderate diagnostic utility with 38 patients being correctly identified as having a true-positive score and missing 14 patients with histologically proven peritonitis. In contrast, a cut-off of ≥7.5 on the RIPASA score showed an improvement in

detection with 47 true positives and five false negatives. The high true-negative detection of RIPASA added substantially to the specificity. Therefore, RIPASA showed high sensitivity (90.4% vs. 73.1%), specificity (84.6% vs. 69.2%), negative predictive value (68.7% vs. 39.1%) and overall diagnostic accuracy (89.2% vs. 72.3%) compared to the Alvarado score.

Studies have repeatedly demonstrated a greater diagnostic utility of the RIPASA score system than the Alvarado score. This was further confirmed by Karki OB et al,^[12] who found an outstanding sensitivity of 97.39 % and overall diagnostic performance of 95.58 % with RIPASA as compared to Alvarado score, which had a far lesser specificity of 33.33 % with a poor negative predictive value of 16.66 % implying that there was a high risk that cases of appendicitis would be missed. Mohamad H et al,^[16] suggested that the Alvarado score was not as sensitive (84.6%) nor specific (57.7%) as RIPASA, which demonstrates that the Alvarado score has a lower ability to detect true-positive and true negative cases.

In the same way, the RIPASA score had consistently high diagnostic parameters compared to large groups of patients reported by Mehbub H et al,^[15] Ali F et al,^[17] and Gogoi C et al.^[18] Din SS et al,^[19] specifically found that RIPASA had a diagnosis accuracy of 95.12% whereas Alvarado score had a diagnosis accuracy of 71.46% – compared to the high achievement of RIPASA in practical clinical settings. These findings are supported by further research provided by the work of Karmakar PK et al,^[20] and Kumar PH et al,^[21] where the authors have shown that RIPASA outperforms Alvarado when it comes to the critical criteria of specificity, positive predictive value and overall diagnostic accuracy. All these studies show that RIPASA reduces the number of false negs and increases the reliability in early disease detection.

Parmeshwar T et al,^[22] and Hameed A et al,^[23] have found statistically significant differences in favor of the RIPASA scoring method when compared with other methods. Their results demonstrated that the difference in diagnostic accuracy between RIPASA and Alvarado (in some cases more than 25%) is clinically meaningful and statistically meaningful.

These results were confirmed by the correlation analysis. There was a moderate relationship between the Alvarado score and histopathology ($r = 0.421$, $p = 0.001$); the RIPASA score showed a stronger association with real status of the disease ($r = 0.683$, $p < 0.001$) indicating better predictive congruence with the disease status. The substantial p-values derived from comparative and correlation analyses validated the statistical reliability of the observed disparity between the two rating systems. The findings concurred with those of Kumar PH et al,^[21] who observed a substantial correlation between RIPASA scores and histopathology, while observing no significant correlation between the Alvarado score and confirmed histological results.

CONCLUSION

The RIPASA scoring system shown superior diagnostic accuracy compared to the Alvarado score for the identification of acute appendicitis. It demonstrated enhanced sensitivity, specificity, and predictive values, exhibiting a stronger correlation with histological findings. The RIPASA score enhances reliability in clinical assessment by reliably identifying a greater number of true-positive and true-negative instances. The broader spectrum of clinical indicators improves diagnostic certainty and facilitates prompt decision-making. The RIPASA scoring system is indicated as an effective and reliable instrument for assessing suspected acute appendicitis, aiding in the reduction of unnecessary procedures and enhancing patient outcomes in a tertiary care environment.

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Conflicts of interest

There are no conflicts of interest.

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