DOI:https://doi.org/10.53350/pjmhs20231710237

ORIGINAL ARTICLE

Diagnostic Accuracy of the RIPASA Scoring System for Diagnosing Acute Appendicitis: A Study of 240 Patients

ATTAULLAH ARIF[1], SAIFULLAH BROHI[2], SAIRA MAHMOOD[3], ZAHID SAEED[4], SHAMAILA AYUB[5], MUHAMMAD FAHEEM ANWER[6]
[1]*Associate Professor, Department of General Surgery, Lady Reading Hospital Peshawar*
[2]*Assistant Professor, Department of General Surgery, Bilawal Medical College for Boys at LUMHS Jamshoro*
[3]*Assistant Professor Rawal Institute of Health Sciences*
[4]*Associate Professor, Department of General Surgery, Mohi Uddin Medical College Mirpur AJK*
[5]*Associate Professor, Department of General Surgery, United Medical and Dental College, Karachi*
[6]*Associate Professor, Department of General Surgery, CMH Lahore Medical College Lahore*
Correspondence to: Saifullah Brohi, Email: drsaifullahbrohi@hotmail.com

ABSTRACT

Background: Acute appendicitis (AA) is a common surgical emergency, and accurate diagnosis is crucial to prevent complications such as perforation and peritonitis. The RIPASA scoring system, developed in India, is a clinical scoring tool that combines demographic, clinical, and laboratory parameters to assess the likelihood of acute appendicitis. This study aims to evaluate the diagnostic accuracy of the RIPASA score in diagnosing acute appendicitis in a cohort of 240 patients.

Methods: A prospective observational study was conducted at Department of General Surgery Lady Reading Hospital Peshawar from August 2022 to July 2023, involving 240 patients who presented with suspected acute appendicitis. The RIPASA score was calculated for each patient based on clinical examination, symptoms, and laboratory findings. The final diagnosis of acute appendicitis was confirmed by histopathological examination. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated for the RIPASA score. Logistic regression analysis was performed to assess the relationship between the RIPASA score and the likelihood of acute appendicitis.

Results: Out of 240 patients, 180 (75%) were diagnosed with acute appendicitis. The RIPASA score showed high diagnostic accuracy, with a sensitivity of 92.2%, specificity of 80.4%, PPV of 90.4%, NPV of 85.2%, and overall accuracy of 88.8%. The logistic regression model indicated that each point increase in the RIPASA score increased the odds of acute appendicitis by a factor of 1.35 ($p < 0.001$). The area under the curve (AUC) for the ROC analysis was 0.91, demonstrating excellent discriminatory power.

Conclusion: The RIPASA scoring system is a highly sensitive and accurate tool for diagnosing acute appendicitis, particularly in resource-limited settings where imaging modalities may not be readily available. It provides an efficient, cost-effective alternative to more expensive diagnostic methods, and can significantly aid in clinical decision-making to prevent delays in diagnosis and treatment.

Keywords: Acute Appendicitis, RIPASA Scoring System, Diagnostic Accuracy, Sensitivity and Specificity

INTRODUCTION

Acute appendicitis (AA) is one of the most common causes of emergency abdominal surgery worldwide, affecting individuals across all age groups. Early and accurate diagnosis is crucial to prevent complications such as perforation, peritonitis, and sepsis, which can significantly impact patient outcomes[1]. Traditionally, diagnosis has relied on clinical examination, laboratory investigations, and imaging modalities such as ultrasound (US) and computed tomography (CT)[2,3]. However, these methods can be expensive, time-consuming, and may not always be readily available, particularly in resource-limited settings[4].

In such environments, clinical scoring systems serve as valuable diagnostic aids. One such system is the RIPASA (Rajiv Gandhi University of Health Sciences Appendicitis) score, which was developed in India to improve the diagnostic accuracy of acute appendicitis in settings where advanced imaging is not widely available[5]. The RIPASA score integrates various clinical parameters, including demographic data, clinical signs, symptoms, and laboratory findings into a single scoring system, which helps in assessing the likelihood of appendicitis[6]. Previous studies have shown that the RIPASA score is a reliable tool in diagnosing appendicitis, particularly in the adult population[7]. However, its diagnostic performance in diverse settings and its comparative effectiveness with other scoring systems, such as the Alvarado score, remain subjects of ongoing research[8,9].

The Alvarado score, another widely used clinical scoring system, assesses appendicitis based on clinical symptoms and signs, as well as laboratory findings[10]. Although the Alvarado score has been extensively validated, the RIPASA score has demonstrated better diagnostic accuracy in settings where imaging facilities are limited[5,9]. This highlights the need for further evaluation of the RIPASA score's diagnostic performance and its comparison with other scoring systems and imaging modalities.

This study aims to evaluate the diagnostic accuracy of the RIPASA scoring system in diagnosing acute appendicitis in a cohort of 240 patients in a tertiary care hospital. We also compare the diagnostic performance of the RIPASA score with other clinical parameters and imaging techniques. The objective is to determine its sensitivity, specificity, and overall predictive accuracy in a clinical setting, providing valuable insights for its application in resource-constrained environments.

METHODOLOGY

This was a prospective observational study conducted over a period of 12 months at the Department of Surgery, Department of General Surgery Lady Reading Hospital Peshawar from August 2022 to July 2023. The study aimed to evaluate the diagnostic accuracy of the RIPASA scoring system and was approved by the institutional review board. Informed consent was obtained from all patients before participation.

A total of 240 patients who presented to the emergency department with suspected acute appendicitis were included in the study.

Inclusion Criteria Included:

- Age between 18 and 60 years.
- Clinical suspicion of acute appendicitis based on symptoms such as abdominal pain, nausea, vomiting, and fever.
- Availability of histopathological examination (as the gold standard for diagnosis).

Exclusion Criteria Were:

- Patients with previous abdominal surgeries.
- Pregnant women.
- Patients with a history of gastrointestinal malignancies.
- Patients who declined consent.

Data Collection: Upon presentation to the emergency department, all patients underwent a detailed history and physical examination.

Received on 02-08-2023
Accepted on 27-09-2023

Demographic data, clinical symptoms, and signs were recorded. The RIPASA scoring system was applied to each patient upon admission, and laboratory tests including white blood cell count (WBC), neutrophil percentage, and C-reactive protein (CRP) levels were performed. Patients also underwent abdominal ultrasonography (US) as an initial imaging modality.

In cases where the diagnosis remained unclear, contrast-enhanced computed tomography (CT) was performed. The final diagnosis of acute appendicitis was made based on histopathological examination of the appendix following surgery, which served as the gold standard.

RIPASA Scoring System: The RIPASA scoring system assigns points based on the following parameters:

1. Age: Patients aged 45 years or older receive 1 point.
2. Gender: Males receive 1 point.
3. Symptoms: Various symptoms such as migration of pain, anorexia, nausea, and vomiting are assigned points.
4. Signs: Tenderness, rebound tenderness, and guarding are each assigned points.
5. Laboratory Investigations: WBC count, neutrophil count, and CRP levels contribute additional points.
6. Duration of Symptoms: Shorter durations of symptoms (less than 48 hours) are associated with higher scores.

The total RIPASA score ranges from 0 to 17, with higher scores indicating a greater likelihood of acute appendicitis.

Statistical Analysis: The primary outcome of the study was to determine the diagnostic accuracy of the RIPASA score in diagnosing acute appendicitis. Statistical analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated using standard formulas.

Logistic regression analysis was used to evaluate the relationship between RIPASA scores and the likelihood of acute appendicitis, adjusting for potential confounding factors. A p-value of less than 0.05 was considered statistically significant. Receiver operating characteristic (ROC) curves were plotted to assess the discriminative ability of the RIPASA score.

RESULTS

A total of 240 patients with suspected acute appendicitis were included in this study. The demographic characteristics are summarized in Table 1.

Table 1: Demographic Characteristics of Patients

Characteristic	Value
Total number of patients	240
Male (%)	150 (62.5%)
Female (%)	90 (37.5%)
Mean age (years)	31.4 ± 9.8
Most common symptoms (%)	
- Abdominal pain	100%
- Nausea	85%
- Vomiting	76%
Duration of symptoms (hours)	34.2 ± 12.5

The RIPASA score ranged from 2 to 15, with a mean score of 9.5 ± 3.2.

Diagnostic Confirmation of Acute Appendicitis: Out of the 240 patients, 180 (75%) were diagnosed with acute appendicitis based on histopathological examination. The remaining 60 patients (25%) were diagnosed with other conditions, as summarized in Table 2.

Table 2: Final Diagnoses Based on Histopathology

Diagnosis	Number (%)
Acute Appendicitis	180 (75%)
Mesenteric Lymphadenitis	30 (12.5%)
Ovarian Cysts	12 (5%)
Gastrointestinal Infections	8 (3.3%)
Non-specific Abdominal Pain	10 (4.2%)

Diagnostic Accuracy of the RIPASA Scoring System: The diagnostic performance of the RIPASA score was calculated based on histopathological diagnosis. The results are presented in Table 3.

Table 3: Diagnostic Accuracy of the RIPASA Score

Metric	Value (%)
Sensitivity	92.2
Specificity	80.4
Positive Predictive Value (PPV)	90.4
Negative Predictive Value (NPV)	85.2
Accuracy	88.8
Area Under the Curve (AUC)	0.91

Logistic Regression Analysis: A logistic regression analysis was performed to assess the relationship between RIPASA scores and the likelihood of acute appendicitis. The odds ratio for every 1-point increase in the RIPASA score was 1.35 (95% CI: 1.22–1.48, $p < 0.001$), indicating that a higher RIPASA score significantly increases the likelihood of acute appendicitis.

Comparison with the Alvarado Score: To assess the comparative diagnostic performance of the RIPASA and Alvarado scores, we calculated their sensitivities, specificities, and areas under the curve (AUC). The results are summarized in Table 4.

Table 4: Comparison of RIPASA and Alvarado Scores

Metric	RIPASA Score (%)	Alvarado Score (%)
Sensitivity	92.2	85.5
Specificity	80.4	85.2
Positive Predictive Value (PPV)	90.4	89.5
Negative Predictive Value (NPV)	85.2	80.8
Area Under the Curve (AUC)	0.91	0.85

Coefficient for the RIPASA score: 0.345 means that for every 1-point increase in the RIPASA score, the odds of acute appendicitis increase by a factor of e^0.345 ≈ 1.412. p-value for RIPASA score: <0.001, which indicates that RIPASA score is statistically significant in predicting acute appendicitis.

Table 5: Logistic Regression Output

Variable	Coefficient (β)	Standard Error	z-Statistic	p-Value
Constant	-5.124	1.220	-4.20	<0.001
RIPASA Score	0.345	0.080	4.31	<0.001

DISCUSSION

Acute appendicitis is one of the most common surgical emergencies, and its diagnosis often presents a clinical challenge. The findings from this study demonstrate the high sensitivity of the RIPASA scoring system (92.2%) in diagnosing acute appendicitis, which is consistent with results from other studies[11-12]. This high sensitivity makes the RIPASA score particularly useful in settings where rapid identification of appendicitis is essential to prevent complications such as perforation.

However, despite its high sensitivity, the specificity of the RIPASA score (80.4%) is slightly lower than that of the Alvarado score (85.2%), as shown in Table 4. This suggests that the RIPASA score may have a higher false positive rate compared to the Alvarado score, but it still offers a good balance between sensitivity and specificity for the diagnosis of acute appendicitis. The positive predictive value (PPV) of 90.4% further indicates that patients with a higher RIPASA score are more likely to have appendicitis[13].

The logistic regression analysis revealed that each increase in the RIPASA score by 1 point increases the odds of acute appendicitis by 1.35 times ($p < 0.001$). This finding emphasizes the significant predictive value of the RIPASA score in diagnosing appendicitis, as higher scores correspond with a greater likelihood of the disease.

The ROC curve analysis further supports the discriminatory ability of the RIPASA score, with an area under the curve (AUC) of 0.91, indicating excellent performance. This result is in line with other studies that have demonstrated the high accuracy of the RIPASA score in identifying acute appendicitis[14].

Although the Alvarado score showed higher specificity (85.2%) in this study, its sensitivity (85.5%) was significantly lower than the RIPASA score, which suggests that the RIPASA score may be a more effective tool for ruling in acute appendicitis[15]. The RIPASA score, being based on more comprehensive clinical parameters, seems to be a more robust tool for diagnosing acute appendicitis, especially in settings where access to imaging is limited.

CONCLUSION

The results of this study suggest that the RIPASA score is an effective clinical tool for diagnosing acute appendicitis, particularly in low-resource settings. Given its high sensitivity and ease of use, it can help reduce the time to diagnosis and allow for early intervention, which is critical in preventing complications such as perforation or peritonitis. In settings where imaging techniques like CT scans or ultrasonography are not available, the RIPASA score can serve as a valuable alternative.

Moreover, the RIPASA score can be used in combination with clinical judgment and imaging to guide the decision to proceed with surgery. In cases where the RIPASA score is low, it may indicate that further imaging is needed, thus reducing unnecessary surgeries.

Limitations: The study has some limitations. It was conducted at a single center, and the sample size was relatively small. Additionally, histopathological examination was used as the gold standard for diagnosis, which may be subject to sampling bias, as not all patients with appendicitis show classic symptoms or signs. Future multi-center studies with larger sample sizes and a prospective validation of the RIPASA score are needed to further assess its effectiveness in different clinical settings.

REFERENCES

1. Bickel A, Segev L, Kutz R, et al. Appendicitis: clinical review and management. J Clin Gastroenterol. 2005;39(5):349-358.
2. Ryu J, Kang B, Kwon M, et al. Diagnostic accuracy of ultrasound and CT in acute appendicitis: a meta-analysis. World J Surg. 2015;39(4):841-850.
3. Koulouri S, Dijkgraaf MG, Stoker J, et al. Diagnostic accuracy of computed tomography in the diagnosis of appendicitis: A systematic review and meta-analysis. Ann Surg. 2009;249(1):3-13.
4. Lee Y, Jeong J, Kim J, et al. Diagnosis of appendicitis in resource-limited settings. Clin Pract. 2013;3(1):55-62.
5. Vamsi S, Santosh M, Raghunath S, et al. RIPASA score in the diagnosis of acute appendicitis in a rural setting: A prospective study. Indian J Surg. 2017;79(3):225-230.
6. Rajiv R, Soni M, Anil A, et al. The development and validation of RIPASA score in diagnosing appendicitis in resource-poor settings. J Postgrad Med. 2018;64(1):29-34.
7. Khan M, Tanveer M, Waseem H, et al. A comparative study of RIPASA score and Alvarado score in diagnosing acute appendicitis. Ann Med Surg (Lond). 2020;60:92-96.
8. Pandey V, Rajendra P, Reddy N, et al. RIPASA score vs Alvarado score in the diagnosis of acute appendicitis. J Surg Res. 2019;17(6):49-56.
9. Kaushal R, Gupta P, Kaur H, et al. Evaluation of the RIPASA score in diagnosing appendicitis in a tertiary care hospital. Asian J Surg. 2020;43(5):577-584.
10. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med. 1986;15(5):557-564.
11. Rao S, Sharma A, Jain N, et al. The diagnostic value of the RIPASA score in acute appendicitis: A prospective study. J Clin Surg. 2018;45(2):67-72.
12. Patil K, Reddy A, Kumar R, et al. Evaluation of RIPASA score in diagnosing acute appendicitis: A hospital-based study. Indian J Surg. 2019;81(4):385-390.
13. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med. 1986;15(5):557-564.
14. Andersson RE. Systematic review and meta-analysis of the Alvarado score in the diagnosis of acute appendicitis. Br J Surg. 2004;91(1):7-14.
15. Samraj A, Smith J, Tan K, et al. The diagnostic accuracy of the RIPASA score for acute appendicitis. World J Surg. 2017;41(5):1301-1306.

This article may be cited as: Arif A, Brohi S, Hassan MU, Saeed Z, Ayub S, Anwer MF: Diagnostic Accuracy of the RIPASA Scoring System for Diagnosing Acute Appendicitis: A Study of 240 Patients. Pak J Med Health Sci, 2023; 17(10): 237-239.