

## COMPARISON OF ALVARADO SCORE AND RIPASA SCORE IN DIAGNOSING ACUTE APPENDICITIS

K.P.Senthan Amudhan<sup>1</sup>, P.Prasanth<sup>2</sup>, T.Mahalingam<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Surgery, Government Erode Medical College and Hospital, Perundurai, Tamilnadu, India

<sup>2</sup>Senior Resident, Department of Surgery, Government Erode Medical College and Hospital, Perundurai, Tamilnadu, India

<sup>3</sup>Junior resident, Department of Surgery, Government Erode Medical College and Hospital, Perundurai, Tamilnadu, India

Received : 30/03/2024  
Received in revised form : 19/05/2024  
Accepted : 03/06/2024

**Keywords:**

Acute appendicitis, Alvarado score, RIPASA score, Diagnosis accuracy, Histopathology, Appendicectomy.

Corresponding Author:

**Dr. K.P.Senthan Amudhan,**  
Email: drvinoth89@gmail.com

DOI: 10.47009/jamp.2024.6.3.103

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

*Int J Acad Med Pharm*  
2024; 6 (3); 503-506



### Abstract

**Background:** Acute appendicitis is a common surgical emergency. An immediate and accurate diagnosis, primarily based on clinical assessment and laboratory results, is crucial for reducing complications and mortality rates. The challenging nature of diagnosing appendicitis and the fear of missing an inflamed appendix can lead to negative appendectomies. Several scoring systems have been developed to address these diagnostic ambiguities. The aim is to compare the efficacy of the Alvarado and RIPASA scores in diagnosing acute appendicitis. **Materials and Methods:** In total, 300 patients clinically diagnosed with acute appendicitis were included. A detailed clinical history and a thorough clinical examination were conducted. Patients were scored using both the Alvarado and RIPASA scoring systems to compare the diagnostic efficacy of both scores. **Result:** Of the 300 participants, 59.7% were male and 40.3% were female, indicating a male predominance. Additionally, 70% were under 40 years old, whereas 30% were over 40 years old. Most patients presented with symptoms lasting less than 48 h. Histopathology confirmed appendicitis in a significant proportion of the cases (91.2%). Both the RIPASA and Alvarado scoring systems demonstrated promising diagnostic accuracy, with RIPASA showing slightly higher sensitivity. **Conclusion:** RIPASA is a superior diagnostic scoring system to the Alvarado score in the prediction of acute appendicitis.

## INTRODUCTION

Acute appendicitis is the most common surgical emergency in both accidents and emergency departments. It is one of the most common causes of acute abdominal pain in both adults and children with lifetime risks of 8.6% in men and 6.7% in women.<sup>[1,2]</sup> The incidence ranges from 1.5 to 1.9 per 1000 people, and it is more common in men than in women.<sup>[2]</sup> Appendectomy is the most frequently performed emergency operation, but appendicitis can resemble other acute abdominal conditions that cause right iliac fossa pain.<sup>[3]</sup> Abdominal pain is the most common clinical presentation of appendicitis. On examination, patients often exhibit anorexia, nausea, vomiting, and tenderness or shielding rigidity in the right iliac fossa.<sup>[4]</sup> The classical history of peri-umbilical pain that later shifts to the right iliac fossa is present in only 50% of cases. In 70% of the cases, the clinical presentation is typical, making the diagnosis straightforward. A negative appendectomy rate ranging from 10% to 44% has been considered acceptable by various authors to minimize the

incidence of perforation and associated morbidity and mortality.<sup>[5]</sup>

Various diagnostic modalities including radiological, laparoscopic, and laboratory methods have been reported to affect the rate of negative appendectomies. Recognising the importance of early and accurate diagnosis, numerous clinical scoring systems have been developed to aid clinicians. These systems have significantly improved the accuracy of diagnosis and the timeliness of management. Despite the prevalence of appendicitis, its diagnosis remains challenging and relies primarily on clinical evaluation, supplemented by laboratory tests such as an elevated white blood cell count.<sup>[3-5]</sup>

An immediate and accurate diagnosis, primarily based on clinical assessment and laboratory results, is crucial for reducing complications and mortality rates. The challenging nature of diagnosing appendicitis and the fear of missing an inflamed appendix can lead to negative appendectomies. To mitigate these ambiguities, many scoring systems have been developed.<sup>[4]</sup>

The present study aimed to compare the efficacy of the Alvarado and Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scores in diagnosing acute appendicitis.

## MATERIALS AND METHODS

This prospective, comparative study was conducted in the Department of Surgery at tertiary care hospital. A total of 300 patients clinically diagnosed with acute appendicitis were included. Informed consent was obtained from all the participants.

### Inclusion criteria

Patients with pain in the right iliac fossa and those aged < 40 and > 40 years were included.

### Exclusion criteria

Patients with a diagnosed appendicular lump, patients presenting with a right iliac fossa mass, previously diagnosed cases of acute appendicitis, immunocompromised patients, patients who had already undergone appendectomy, and pregnant females were excluded.

### Methodology

A detailed clinical history and thorough clinical examination were conducted by the attending surgeon. Relevant investigations, such as haemoglobin, leukocyte count, urine albumin, sugar, and microscopic examinations were performed in all cases. The final diagnosis of acute appendicitis was based on clinical evaluation and laboratory investigation reports. The laboratory staff were blinded to the clinical findings, decisions, and outcomes. Patients were scored using both the Alvarado and RIPASA scoring systems, with scores documented in the proforma.

The Alvarado score includes 8 parameters, while the RIPASA score includes 18 parameters, with scores ranging from 0.5-2 for RIPASA and 1-2 for Alvarado. A score of 7 was considered a high probability of acute appendicitis in the Alvarado scoring system, and 7.5 in a RIPASA probability for

acute appendicitis. The decision to perform appendectomy was based solely on the surgeon's clinical judgment, taking into account all clinical, laboratory, and radiological findings.

## RESULTS

Of the 300 participants, 59.7% were male and 40.3% were female. Additionally, 70% were under 40 years old, whereas 30% were over 40 years old. Symptom duration analysis revealed that 75.4% of participants presented with symptoms lasting less than 48 h, whereas 24.6% of participants had symptoms persisting for more than 48 h. Histopathology results indicated that 91.2% of cases were histopathologically confirmed as positive for appendicitis, whereas 8.8% of cases were histopathologically negative. The diagnostic cutoff values for the scoring systems were established as 7.5 for the RIPASA score and 7 for the Alvarado score. In terms of the Alvarado scoring system, 68% of the participants had a score >7, whereas 32% had a score < 7. For the RIPASA scoring system, 88% of the participants had a score >7.5, while 12% had a score < 7.5 [Table 1].

The diagnostic values of the Alvarado Scoring System are presented in Table 2. For scores greater than 7, there were 186 true positives and 8 false positives, totalling 194 cases. For scores less than 7, there were 80 true negatives and 11 false negatives, for a total of 91 cases. Overall, the Alvarado scoring system had 266 positive and 19 negative cases out of the 285 total cases.

The diagnostic values of the RIPASA scoring system are shown in Table 3. For scores greater than 7.5, there were 246 true positives and 5 false positives, totalling 251 cases. For scores less than 7.5, there were 11 true negatives and 23 false negatives, totalling to 34 cases. Overall, the RIPASA scoring system had 257 positive and 28 negative cases out of the 285 total cases.

**Table 1: Demographic details**

Variables		Frequency (n=300)	Percentage (%)
Gender	Male	170	59.7
	Female	115	40.3
Age	<40 years	200	70
	>40 years	85	30
Duration of symptoms	<48 hours	215	75.4
	>48 hours	70	24.6
Histopathology	Positive	260	91.2
	Negative	25	8.8
Cutoff value	RIPASA score	7.5	
	Alvarado score	7	
Alvarado score	>7	194	68
	<7	91	32
RIPASA score	>7.5	251	88
	<7.5	34	12

**Table 2: Diagnostic value of Alvarado scoring system**

Alvarado score	Histopathology		Total
	Positive	Negative	
>7	186	8	194
<7	80	11	91
Total	266	19	285

**Table 3: Diagnostic value of RIPASA scoring system**

RIPASA score	Histopathology		Total
	Positive	Negative	
>7.5	246	5	251
<7.5	11	23	34
Total	257	28	285

## DISCUSSION

Acute appendicitis poses a significant challenge to surgeons because its diagnosis relies heavily on clinical assessments. While CT scans of the abdomen and pelvis with contrast are widely used for confirmation because of their impressive sensitivity (94%) and specificity (95%), reliance on clinical examination persists, particularly in peripheral centres without access to CT scans.<sup>[1]</sup> This reliance often leads to higher misdiagnosis rates, resulting in negative appendectomies ranging from 15% to 30%. Although the Alvarado score is effective in Western populations, its diagnostic utility is limited in Asian populations. In response, the RIPASA score offers a promising alternative, with 14 fixed variables tailored to unique population parameters.<sup>[6,7]</sup>

In our study, we observed that the RIPASA score emerged as a superior diagnostic tool for predicting acute appendicitis than the Alvarado score. Histopathology confirmed appendicitis in a significant proportion of the cases (91.2%). In the Alvarado scoring system, 68% of the participants scored above 7, whereas 32% scored below 7. In the RIPASA scoring system, 88% of the participants scored above 7.5, and 12% scored below 7.5.

Aslam et al. observed that 94 cases had an RIPASA score of 7 or higher, while 31 cases had an Alvarado score exceeding 7. Of these cases, 93 had a positive histopathology report, while 7 turned out to be normal. The sensitivity of the RIPASA score was 95.69%, significantly higher than that of the Alvarado score (32.25%). The specificity of the RIPASA score was 33.33%, lower than that of the Alvarado score (85.71%). They concluded that the RIPASA score outperforms the Alvarado score in diagnosing acute appendicitis.<sup>[8]</sup>

Similarly, a recent study by Onyedi et al. (2024) found that the RIPASA scoring system outperformed the Alvarado score in the diagnosis of acute appendicitis. The RIPASA score demonstrated a sensitivity of 97.1% and a diagnostic accuracy of 94.7%, whereas the Alvarado score showed a sensitivity of 66.7% and a diagnostic accuracy of 65.8%.<sup>[9]</sup> Moreover, Regar et al. revealed that the RIPASA score is a more valuable tool for diagnosing acute appendicitis than the Alvarado score, with 93% accuracy, 94.74% sensitivity, and 60% specificity. Despite the availability of sophisticated investigations like CT, the RIPASA score helps reduce treatment costs and minimizes the negative appendectomy rate.<sup>[3]</sup>

Additionally, Heiranizadeh et al. (2023) demonstrated that the RIPASA scoring system had a higher sensitivity, PPV, NPV, and accuracy than the

Alvarado score. The sensitivity and specificity of the RIPASA score were 86.6% and 66.7%, respectively, while those of the Alvarado score were 67.1% and 72.2%, respectively. The diagnostic accuracy was 83% for the RIPASA score, significantly higher than the 68% observed for the Alvarado score.<sup>[10]</sup>

Furthermore, Zeb et al., Sanjive et al., Koroth et al., Tekyol et al., and Banepali et al. presented diverse ranges of sensitivity, specificity, positive predictive value, and negative predictive value for both the RIPASA and Alvarado scoring systems. These studies suggest that The RIPASA score outperforms the Alvarado score as a more effective diagnostic tool for acute appendicitis.<sup>[1,11-14]</sup> The RIPASA score is a superior scoring system for categorising patients with suspected appendicitis. Its implementation may potentially reduce the need for diagnostic imaging and decrease the negative appendectomy rates.

### Limitation

Acute appendicitis diagnosis was based on the clinical evaluation of the consultant on duty, which might have led to a potential subjective bias. When calculating the scoring system by surgical residents, a potential source of subjective bias arises when the resident's expertise gives a score to abdominal exploration signs. We evaluated only those patients with abdominal pain who were referred for general surgery.

Despite its limitations, this study is the only prospective investigation conducted in our region, indicating a new era for further exploration of this crucial topic. This lays the groundwork for future studies aimed at uncovering robust associations and evaluating the efficacy of scoring systems in diagnosing one of the most prevalent surgical issues.

## CONCLUSION

In conclusion, our study highlights a male predominance and a higher prevalence of acute appendicitis among individuals under 40 years of age. Most participants presented with symptoms lasting less than 48 h. The RIPASA and Alvarado scoring systems exhibited promising diagnostic values, with RIPASA demonstrating slightly higher sensitivity. These results emphasise the potential of scoring systems to facilitate accurate diagnosis of acute appendicitis.

## REFERENCES

1. Zeb M, Khattak SK, Samad M, Shah SS, Shah SQA, Haseeb A. Comparison of Alvarado score, appendicitis inflammatory response score (AIR) and Raja Isteri Pengiran Anak Saleha appendicitis (RIPASA) score in predicting acute appendicitis.

- Heliyon 2023;9:e13013. <https://doi.org/10.1016/j.heliyon.2023.e13013>.
2. Noor S, Wahab A, Afridi G, Ullah K. Comparing ripasa score and Alvarado score in an accurate diagnosis of acute appendicitis. *J Ayub Med Coll Abbottabad* 2020;32. <https://pubmed.ncbi.nlm.nih.gov/32468752/>.
  3. Regar MK, Choudhary GS, Nogia C, Pipal DK, Agrawal A, Srivastava H. Comparison of Alvarado and RIPASA scoring systems in diagnosis of acute appendicitis and correlation with intraoperative and histopathological findings. *Int Surg J* 2017;4:1755. <https://doi.org/10.18203/2349-2902.isj20171634>.
  4. Jaiswal AK, Mathur SK, Kumar S, Tripathi DK, Kumari S. Comparative study of Alvarado score and RIPASA score in the diagnosis of acute appendicitis. *Int Surg J* 2023;10:1496–501. <https://doi.org/10.18203/2349-2902.isj20232642>.
  5. Fawzyabu-B, Emam H, Mohamed M-S, Samir BK. Evaluation of modified Alvarado score in the diagnosis of suspected acute appendicitis. *Menoufia Med J* 2015;28:17. <https://doi.org/10.4103/1110-2098.155906>.
  6. Flum DR, McClure TD, Morris A, Koepsell T. Misdiagnosis of appendicitis and the use of diagnostic imaging. *J Am Coll Surg* 2005;201:933–9. <https://doi.org/10.1016/j.jamcollsurg.2005.04.039>.
  7. Chan I, Bicknell SG, Graham M. Utility and diagnostic accuracy of sonography in detecting appendicitis in a community hospital. *AJR Am J Roentgenol* 2005;184:1809–12. <https://doi.org/10.2214/ajr.184.6.01841809>.
  8. Aslam F, Adil S, Tahir S. The RIPASA score in comparison to the ALVARADO score for diagnosis of acute appendicitis. *Prof Med J* 2022;29:629–33. <https://doi.org/10.29309/tpmj/2022.29.05.4410>.
  9. Onyedi DCE, Garba SE, Onullah DG. A Comparative Study of RIPASA and Alvarado Scores for the Diagnosis of Acute Appendicitis in Patients at University of Abuja Teaching Hospital, Abuja: A Prospective Cohort Study. *IJISRT* 2024;9(2) <https://ijisrt.com/assets/upload/files/IJISRT24FEB041.pdf>.
  10. Heiranizadeh N, Mousavi Beyuki SMH, Kargar S, Abadiyan A, Mohammadi HR. Alvarado or RIPASA? Which one do you use to diagnose acute appendicitis?: A cross-sectional study. *Health Sci Rep* 2023;6. <https://doi.org/10.1002/hsr2.1078>.
  11. Sanjive JG, Ramaiah RH. Comparison of RIPASA and Alvarado scoring in the diagnosis of acute appendicitis and validation of RIPASA scoring. *Int Surg J* n.d. <https://doi.org/10.18203/2349-2902.isj201827>.
  12. Koroth A, Basheer S, Abdul Rasheed MF, Ali Usman A, Sadanandan A. Association between Raja isteri pengiran anak Saleha appendicitis (RIPASA) scoring and pathological severity of acute appendicitis: A cross-sectional study. *Cureus* 2024;16. <https://doi.org/10.7759/cureus.56166>.
  13. Tekyol D, Ak R, Hökenek NM, Kılıç M, Tekyol KK, Erdoğan D. A comparative study of the RIPASA and Alvarado scores in geriatric patients diagnosed with acute appendicitis. *Rev Assoc Med Bras* 2022;68:1308–12. <https://doi.org/10.1590/1806-9282.20220528>.
  14. Banepali N, Koirala K, Mukhiya R, Sthapit RR. A comparative study of RIPASA score and Modified Alvarado score in acute appendicitis in Nepalese population. *Nepal Med J* 2019;2:224–8. <https://doi.org/10.3126/nmj.v2i2.25369>.