University of Basrah - Basrah Journal of Surgery
Print ISSN: 1683-3589 , **Online ISSN:** 2409-501X
https://bjsrg.uobasrah.edu.iq

Original Article
Bas J Surg, 2024; 30(2) : 75-79

MODIFIED ALVARADO AND RIPASA SCORE SYSTEMS IN ACUTE APPENDICITIS: A DIAGNOSTIC COMPARATIVE ACCURACY STUDY

Document Type : Original Article

Authors
Manjush E. [1], Keerthana Duraisamy [2]
[1] **Professor, Department of General Surgery, Government Medical College, Kozhikode.**
[2] **Junior Resident, Department of General Surgery, Government Medical College, Kozhikode.**

https://doi.org/10.33762/bsurg.2024.153199.1089

Corresponding Author: Manjush E
Email: drmanjushe@gmail.com

Receive Date: 29 August 2024
Revise Date: 29 September 2024
Accept Date: 30 November 2024
Publish Date: 11 December 2024

Abstract:

Background: One of the most common surgical emergencies include acute appendicitis which has a lifetime prevalence of one in seven with mortality rates ranging from 1-5% and morbidity rates of 10%. The diagnosis of acute appendicitis is challenging as it mimics many other acute medical and surgical conditions. This study aims to compare the diagnostic accuracy of both scoring systems to avoid potentially serious outcomes by analysing clinical and laboratory parameters.

Aim: This study aimed to compare the usefulness of the RIPASA score and Alvarado scores for diagnosing patients with abdominal pain and suspected acute appendicitis to increase diagnostic accuracy.

Patients and Methods: This is a retrospective observational study conducted in the Department of General Surgery for one year duration in. 500 patients with Acute Appendicitis.

Results: The sensitivity of the RIPASA and Alvarado score was 41.1% and 17.8% respectively. Specificity of the RIPASA score and Alvarado score was 93.4% and 98.9% respectively. The diagnostic accuracy of the RIPASA score is 50.6% compared to 32.6% for Alvarado score. Five patients (2%) with acute appendicitis were misdiagnosed using the Alvarado score compared to the RIPASA score.

Conclusion: RIPASA scoring system provides more accuracy in the diagnosis of acute appendicitis with detailed clinical and laboratory details especially in the South Indian population compared to the Alvarado scoring system.

KEYWORDS: Acute appendicitis, Alvarado score, RIPASA score, Appendicectomy.

Introduction

One of the most common surgical emergencies include acute appendicitis which has a lifetime prevalence of one in seven, with mortality rates ranging from 1-5% and morbidity rates of 10%. The diagnosis of acute appendicitis remains a challenge due to the overlapping of symptoms with other acute medical and surgical conditions resulting in diagnostic and treatment delays. To overcome this diagnostic difficulty many scoring systems like the RIPASA score and Alvarado score were developed based on the clinical history,

physical examination and laboratory tests. These aid in decision-making and help to provide timely surgical intervention reducing the likelihood of negative appendicectomies. Negative appendicectomy is when a Patient undergoes surgery for suspected acute appendicitis but the histopathology report shows no evidence of inflammation or any pathological changes.[1-4]

In 1986, Alvarado introduced a scoring system to diagnose acute appendicitis based on 8 parameters, which comprised 6 clinical indicators and 2 laboratory indicators.[3,4,5,6]

Table 1 outlines these parameters alongside their corresponding scores and their interpretation.

A new scoring system is the Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score, which incorporates additional clinical and laboratory parameters to improve diagnostic accuracy. It has a special focus on the Asian population as nationality is included as one of the parameters.

Table 2 shows the RIPASA score with its components and their interpretation.[3,4,5,7]

Materials And Methods:

Study design: This is a retrospective observational study conducted on 500 patients with a history and clinical features suggestive of acute appendicitis from August 2020 to August 2021 in the Department of General Surgery, Government Medical College, Kozhikode.

Ethics statement: The ethics committee of the Government Medical College, Kozhikode has approved this study (Ref No: GMCKKD/RP 2022/IEC/21).

Inclusion criteria: All the patients above the ge of 18 years with a history and clinical features suggestive of acute appendicitis

Exclusion criteria: Patients not willing to take part in the study, patients with co-existing pathologies, foreign & Non-resident Indians, pregnant women, patients with abdominal distension and with previous history of pelvic inflammatory disease.

Sample size calculation:

$n = \{Z_a \sqrt{(2p(1-p)} + Z_Q \sqrt{(p1(1-p1) + p2(1-p2)\}^2/(p1-p2)^2$

250 in each arm,

So, n = 500 where, p1=96.2%, p2=58.9%, α=5%, β=5%, Z_α=1.96, Z_β=1.645.

Data collection: Detailed history, clinical examination, laboratory investigations which include routine haematological investigations, urine routine and USG abdomen and pelvis and contrast-enhanced computer topography (if needed) were done in all the patients

Statistical analysis: The statistical package for social services software version 20.0 was used for data analysis (SPSS Inc. Chicago, IL, USA). Scores were tabulated and compared by applying the Chi-square test. Sensitivity, specificity, positive predictive value, and negative predictive value were computed to find the diagnostic properties of the RIPASA score and Alvarado score, correlating to

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histopathological reports. P value less than 0.05 was considered as statistically significant.

RESULTS

In the present study, the mean age group was 27.9 years with a 12.9 standard deviation. Most of the patients were in the age group of 10-25 years which is around 57.6% followed by the age group of 26-40 years which is approximately 26.8%. 70% of the participants were male (350 in number) and 30% were female (150 in number). Positive histopathological results were noted in 81.8% of cases (409 patients) and negative results in 18.2% (91 patients). Table I displays the demographic breakdown of the patients.

Table I. Demographic breakdown of the patients

Gender	**Number of patients**
Male	350 (70%)
Female	150 (30%)
Histopathology report	
Positive for acute appendicitis	409 (81.8%)
Negative for acute appendicitis	91 (18.2%)

The sensitivity and specificity of the RIPASA scoring system were 41.1% and 93.4% respectively with the optimal cut-off threshold of >7.5. The positive and negative predictive values were 96.6% and 26.1%. Similarly, the sensitivity and specificity of the Alvarado scoring system were 17.8%, and 98.9% respectively with the optimal cut-off threshold of >7. The positive and negative predictive values were 98.6% and 21.1%.

ROC analysis showed the AUC (area under the curve) for the RIPASA scoring system as 0.83 and for the Alvarado scoring system as 0.81. The difference in the AUC of 2.0% is significant between the two scoring systems ($p<0.001$), which equates to 5 patients with acute appendicitis who were misdiagnosed using the Alvarado score compared to the RIPASA score. Table II and Table III show the distribution of the respective scores among the study participants.

Table II. Distribution of RIPASA score among study participants

Score	**Number of patients**	**Percentage %**
<5	35	7
5-7	220	44
>7	245	49

Table III. Distribution of AVARADO scores among study participants

Score	Number of patients	Percentage %
<5	171	34.2
5-7	255	51
>7	74	14.8

Discussion

Acute appendicitis represents a common surgical emergency, affecting approximately one in seven individuals.[1] Despite its prevalence, diagnosing acute appendicitis presents challenges due to the symptom overlap with various acute conditions especially in females as it is difficult to differentiate from gynaecological conditions including life-threatening ectopic pregnancy.[2] This usually results in diagnostic and treatment delays. To address this clinical complexity, several scoring systems, such as RIPASA score and the Alvarado score, have been developed. These systems integrate clinical history, physical examination findings and laboratory test results to aid in decision-making and improve diagnostic accuracy.[3] Using the scoring systems for diagnosis has the advantage of being readily accessible and providing a simple, rapid, reliable and cost-effective method. [4]

In this study, we have included participants of all age groups with a substantial sample size. In this study, the RIPASA scoring system demonstrates a diagnostic accuracy of 50.6%, whereas the Alvarado score yields 32.6%. This discrepancy is statistically significant ($p<0.001$) suggesting that the RIPASA scoring system outperforms the Alvarado score in accurately diagnosing acute appendicitis. Similar findings were reported in a study by Nanjundaiah N et al.

RIPASA score of more than 7.5 indicates a high probability of acute appendicitis, necessitating surgical intervention, while a score below 7.5 allows for observation in ward and conservative management. This prevents treatment delays and reduces the need for unnecessary CT imaging and radiation exposure. It minimizes the occurrence of negative appendicectomies. Implementing RIPASA Scoring system for diagnosis enables efficient management of acute appendicitis while avoiding associated complications.

Conclusion

Both the RIPASA score and the Alvarado score are used for diagnosing acute appendicitis. However, the RIPASA score provides more accuracy in the diagnosis with detailed clinical and laboratory details especially in the South Indian population. The need for CECT imaging, unnecessary admission and negative appendicectomy can be avoided.

Basrah Journal of Surgery, 2024; 30(2): 75-79. doi: 10.33762/bsurg.2024.153199.1089

Acknowledgement: None
Conflict of interest : Authors declare no conflict of interest
Financial support: No Financial Support For this Work

Authors' Contributions:
1.Manjush E, 2. Keerthana Duraisamy
Work concept and design 1,2
Data collection and analysis 1,
Responsibility for statistical analysis 1
Writing the article 1,2
Critical review, 1, 2
Final approval of the article 1,2,

Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.
Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

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Cite this article:
E., M., Duraisamy, K. Modified ALVARADO and RIPASA Score Systems in Acute Appendicitis: A Diagnostic Comparative Accuracy Study. *Basrah Journal of Surgery*, 2024;30 (2):75 -79. doi: 10.33762/bsurg.2024.153199.1089