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Diagnostic Accuracy of ALVARADO Score VS RIPASA Score in the diagnosis of acute appendicitis

Tayyaba Manzoor ^a, Jamil Salamat Ullah ^b, Saima Jamal ^c, Shah Zaman ^d, Inam Ul Haq ^e

^a Resident Surgeon, Department of Surgery, CMH, Malir.

^b Assistant Professor, Department of Surgery, KIMS, CMH, Malir

^c Senior Registrar, Department of Surgery, CMH, Khuzdar.

^d House Officer, Combined Military Hospital, Malir.

^e Medical Officer, Combined Military Hospital, Malir.

Correspondence: * Manzoor.tayyaba@gmail.com

ABSTRACT

BACKGROUND & OBJECTIVE: In places like Pakistan, which have limited resources, scoring systems are essential. For clinical diagnosis, prompt transfer from primary care institutions, and surgical decision-making when radiography is ambiguous or unavailable, several grading systems can be useful. Therefore, this study will compare RIPASA and Alvarado scores to identify which tool offers better diagnostic reliability in our clinical practice, thereby reducing the risk of complications and negative appendectomies.

METHODOLOGY: A Cross-sectional (validation) study was Conducted at the Department of Surgery, Combined Military Hospital, Malir, Karachi. A total of 186 patients who had suspected acute appendicitis, underwent appendectomy, and were aged 11 to 69 years of either gender were included. This study excluded patients who had a h/o discomfort lasting longer than five days, were pregnant, had a right iliac fossa mass, experienced persistent recurring pain in the right iliac fossa, or had a h/o pelvic inflammatory disease. After a comprehensive history, examination, and basic laboratory testing, the RIPASA score was established. Suspected cases of acute appendicitis were clinically diagnosed using the Alvarado Score. The histopathological report was compared with the results.

RESULTS: To identify acute appendicitis, the following criteria were used: 89.84% PPV, 86.21% NPV, 79.37% specificity, 93.50% RIPASA score sensitivity, and 88.71% diagnostic accuracy. The diagnostic accuracy for acute appendicitis was 83.87%, with 73.02% specificity, 86.61% PPV, 77.97% NPV, and Alvarado score sensitivity.

CONCLUSION: In contrast to the Alvarado scoring system, this study found that the RIPASA scoring system is a simple, easy, highly sensitive, and accurate method of diagnosing acute appendicitis.

KEYWORDS: Appendicitis, Diagnosis, Sensitivity and Specificity, Appendectomy, Clinical Decision Rules.

INTRODUCTION

Acute appendicitis (AA), an inflammation of the appendix, is caused by bacterial translocation as a result of appendiceal luminal obstruction and elevated intraluminal pressure of the appendiceal lumen ^[1]. It is among the world's most common surgical emergencies ^[2]. 7–12% of the overall population is affected over the course of their lives ^[3]. The incidence is therefore between 1.5 and 1.9 per 1000 ^[4].

Acute appendicitis symptoms might mimic those of other illnesses if it is not identified promptly, which makes problems like perforation more challenging. On the other hand, the negative appendectomy rate is roughly 10–15% ^[5]. The use of diagnostic auxiliary tools, including signs and symptoms, clinical, laboratory, and radiographic exams, can

help avoid the aforementioned outcomes ^[6]. The sensitivity and specificity of computed tomography (CT) for acute appendicitis are 94% and 95%, respectively ^[7]. But the price is steep. Clinical grading methods, including Tzanakis, RIPASA, Alvarado, and AIR score, have thus lately shown their value ^[8]. The Alvarado score uses eight clinical criteria to improve the diagnosis of acute appendicitis. C-reactive protein (CRP) and anorexia or nausea are two of the seven factors that are considered in the appendicitis inflammatory response (AIR) score ^[8].

In places like Pakistan, where resources are scarce, scoring systems are essential. The clinical diagnosis, prompt transfer from primary care institutions, and surgical decision-making in cases when radiography is uncertain or unavailable can all benefit from these grading systems. Therefore, this study

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will compare RIPASA and Alvarado scores to identify which tool offers better diagnostic reliability in our clinical practice, thereby reducing the risk of complications and negative appendectomies.

METHODOLOGY

From October 2, 2025, to January 1, 2026, this cross-sectional study was conducted in the Department of Surgery at the Combined Military Hospital, Malir, Karachi, Pakistan. The project was approved ethically before it began (140/2024/Trg/ERC). A non-probability consecutive sampling technique was used to enroll eligible patients who fulfilled the inclusion criteria during the study period. According to the Dr Lin Naing's sample size calculator, the total sample size was 186 (169 plus 10%, or 17), with an extra 10% for possible dropouts.

The sensitivity and specificity of the Alvarado scoring system were calculated to be 68.32% and 87.91%, respectively. A 50% prevalence of AA and a 10% margin of error were assumed. Patients with lower abdominal discomfort for fewer than five days who were suspected of having acute appendicitis, underwent appendectomy as the primary procedure, and were aged 11 to 69 years of either gender were included. This pain may or may not have been followed by additional signs and symptoms as specified in the Alvarado/RIPASA scoring systems. This study excluded patients who had a history of discomfort lasting longer than five days, were pregnant, had a right iliac fossa mass, experienced persistent recurring pain in the right iliac fossa, or had a history of pelvic inflammatory disease.

Demographics, signs, symptoms, and laboratory tests utilized by the Alvarado and RIPASA scoring systems will all be included in the questionnaire (Annex B).

A maximum of 10 points are awarded using the Alvarado scoring system (Annex C). Each of the following symptoms is given one point: rebound tenderness, elevated temperature, Blumberg sign, urge to vomit and emesis, loss of appetite, and pain migrating to the right iliac fossa. On the other hand, leukocytosis and soreness in the right iliac fossa are given two points. A possible diagnosis of acute appendicitis is suggested by an Alvarado score of 5–6, a high chance is indicated by a score of 7–8, and the diagnosis is strongly supported by a score of 9–10.

A maximum of 16 points are awarded using the RIPASA scoring method (Annex D). A maximum of three points are awarded for each of the three demographic variables: one point for foreign nationals, 0.5 points for females, one point for age under 39.9 years, and 0.5 points for those over 40. Right iliac fossa pain, pain that migrates to the right iliac fossa, and symptoms lasting longer than 48 hours are all worth 0.5 points. Loss of appetite, nausea, and vomiting that lasts shorter than 48 hours are worth one point. One point for leukocytosis, elevated temperature, Blumberg sign, right iliac fossa discomfort, and negative urinalysis. The Rovsing sign and right iliac fossa guarding receive two points. An appendicitis diagnosis is deemed positive if the RIPASA score is greater than 7.5.

Before giving analgesics and obtaining consent, an ER/OPD resident completed a questionnaire for every patient who arrived at the hospital with a suspected case of AA. For comparison with histology as the gold standard, the scores were then manually computed to tentatively classify the patient into either the appendicitis or non-appendicitis category. However, the consulting surgeon decided to conduct an appendectomy on the patient. Histopathological findings were acquired from the lab and documented following the appendectomy. To reduce biases and confounders, the data were collected using stringent, clearly stated inclusion and exclusion criteria, and any lingering issues were addressed throughout the analysis.

TP stands for true positive. Patients will be categorised as true positives (TP) if their RIPASA score is greater than 7.5 and their Alvarado score is greater than 6, both of which are confirmed by histology to be AA.

TN stands for true negative. Patients with a RIPASA score of 7.5, an Alvarado score of < 6, and histology confirming they do not have acute appendicitis will be categorised as true negatives (TN).

FP, or false positive. False-positive (FP) patients are those with an Alvarado score greater than 6 and a RIPASA score greater than 7.5, but whose histology does not confirm AA.

Negative False (FN). Patients who are confirmed as AA on histology and have an Alvarado score of ≤ 6 and a RIPASA score of ≤ 7.5 will be labelled as false negatives (FN).

The ability of a test to detect a disease when it is present is measured by its sensitivity. It is stated as follows: Specificity. is a diagnostic test's ability to identify individuals who are not afflicted accurately.

A positive predictive value is the proportion of people who genuinely have the condition, or the probability that a positive test will correctly indicate its presence. The negative predictive value is the likelihood that a negative test correctly indicates that there is no disease, or the proportion of individuals who receive a negative test result and are in fact disease-free.

To enter the data collected from the suggested questionnaire, SPSS (Statistical Package for the Social Sciences) version 22 was utilized. Continuous and categorical variables were compared using the Chi-Square test. To evaluate the diagnostic accuracy of the Alvarado and RIPASA scoring systems, 2×2 contingency tables were created and compared with the gold-standard diagnosis. Next, negative predictive value, positive predictive value, sensitivity, and specificity were calculated.

RESULTS

Participants in the study were between the ages of 11 and 69, with a mean age of 39.76 ± 7.12 years. 109 (58.60%) of the patients were between the ages of 11 and 40 years, according to Table-I. Of these 186 individuals, 91 (48.92%) were male, and 95 (51.08%) were female, resulting in a male-to-female ratio of 1.1:1. Mean BMI was 27.04 ± 3.38 kg/m². I presents the distribution of patients by factor.

Acute appendicitis: ALVARADO score VS RIPASA score

Thirteen patients (False Positive) had no acute appendicitis based on histopathology, while 115 patients (True Positive) had acute appendicitis among those who tested positive for RIPASA score. 50 (True Negative) and 08 (False Negative) of the 58 patients with a negative RIPASA score exhibited acute appendicitis on histopathology, respectively ($p=0.0001$), as indicated in Table-II. 93.50% RIPASA score sensitivity, 79.37% specificity, 89.84% PPV, 86.21% NPV, and 88.71% diagnostic accuracy were used to diagnose acute appendicitis. Table-III

17 patients (False Positive) had no acute appendicitis based on histopathology, while 110 patients (True Positive) had acute appendicitis among those who tested positive for the Alvarado score. 46 (True Negative) and 13 (False Negative) of the 59 patients with a negative Alvarado score exhibited acute appendicitis on histopathology, respectively ($p\leq 0.001$), as indicated in Table-IV. 89.43% Alvarado score sensitivity, 73.02% specificity, 86.61% PPV, 77.97% NPV, and 83.87% diagnostic accuracy were used to diagnose acute appendicitis. Table-V

Table -I: Distribution of patients with variables (n=186).

Variables	Categories	n (%)
Age (years)	11-40	109(58.60)
	41-69	77(41.40)
Gender	Male	91(48.92)
	Female	95(51.08)
BMI (kg/m ²)	≤ 30	140(75.27)
	>30	46(24.73)

Table-II: Diagnostic accuracy of RIPASA score.

Variables	Histopathology (+ve)	Histopathology (-ve)	P-value
RIPASA score (+ve)	115 (True positive)	13 (False Positive)	≤ 0.001
RIPASA score (-ve)	08 (False negative)	50 (True Negative)	

Table-III: Diagnostic parameters of RIPASA score.

Diagnostic parameters	Values
Sensitivity	93.50%
Specificity	79.37%
Positive Predictive Value (PPV)	89.84%
Negative Predictive Value (PPV)	86.21%
Diagnostic Accuracy	88.71%

Table-IV: Diagnostic accuracy of Alvarado score.

Variables	Histopathology (+ve)	Histopathology (-ve)	P-value
Alvarado score (+ve)	110 (True positive)	17 (False Positive)	≤ 0.001
Alvarado score (-ve)	13 (False negative)	46 (True Negative)	

Table-V: Diagnostic accuracy of Alvarado score.

Diagnostic parameters	Values
Sensitivity	89.43%
Specificity	73.02%
Positive Predictive Value (PPV)	86.61%
Negative Predictive Value (PPV)	77.97%
Diagnostic Accuracy	83.87%

DISCUSSION

Acute appendicitis is a common surgical emergency. Diagnosis largely depends on clinical assessment in the emergency department, supported, when necessary, by laboratory tests and imaging, such as abdominal ultrasonography. In resource-limited settings, validated clinical scoring systems may help standardize assessment and guide timely surgical decision-making^[9].

In line with the results of this investigation, Majid et al. found that the RIPASA score was 89% accurate for identifying acute appendicitis, whereas the Alvarado score was 72%. For diagnosing acute appendicitis, the RIPASA scoring's diagnostic accuracy, sensitivity, specificity, PPV, and NPV were 92.1%, 62.1%, 95.2%, 48.6%, and 88.9%, respectively, whereas the Alvarado scoring's were 72.6%, 68.9%, 95.1%, 23.2%, and 72.2%, respectively^[10].

Other Pakistani studies conducted in various local settings have similarly reported favourable RIPASA performance in diagnosing acute appendicitis^[11,12].

Regional studies have also shown comparable findings, with RIPASA generally performing better than Alvarado in overall diagnostic accuracy and sensitivity. However, reported estimates vary across populations and clinical settings^[13,14].

Recent evidence is not entirely uniform. Some prospective and comparative analyses have found both RIPASA and Alvarado useful, with Alvarado occasionally showing slightly higher sensitivity and RIPASA often showing better specificity^[15,16].

A 2024 national prospective audit from Turkey reported that risk scores such as RIPASA and the Adult Appendicitis Score performed better than the Alvarado score and the AIR in adults presenting with right iliac fossa pain^[17].

A recent systematic review and meta-analysis also reported higher pooled diagnostic performance for RIPASA than for Alvarado^[18]. Another recent Pakistani study reported greater diagnostic accuracy with RIPASA than with Alvarado, consistent with our findings^[19].

Overall, the present findings suggest that RIPASA may be a more dependable clinical scoring system for diagnosing acute appendicitis in our setting. Nevertheless, larger multicenter studies are required before these results can be generalized widely^[20]. A previous meta-analysis of 12 trials including 2161 patients reported high pooled sensitivity for RIPASA, supporting its role as a useful rule-in/rule-out clinical tool^[21].

A local study by Butt et al. also found that RIPASA had high sensitivity, specificity, PPV, and NPV at a cut-off value of 7.5. At the same time, the Alvarado score showed lower sensitivity^[22]. Sanjive and Ramaiah similarly reported higher diagnostic accuracy for RIPASA than for Alvarado, further supporting the findings of the present study^[23].

In the present study, RIPASA produced more reliable results than Alvarado. Its use may therefore improve clinical decision-making for suspected acute appendicitis, particularly where advanced imaging is not readily available.

LIMITATIONS:

The main limitations of this study were the relatively small sample size, single-centre design, and use of non-probability consecutive sampling. Therefore, the findings should be interpreted with caution and validated in larger multicenter studies.

CONCLUSION

In this study, the RIPASA score showed higher sensitivity and diagnostic accuracy than the Alvarado score of diagnosing acute appendicitis. These findings support the use of RIPASA as a practical clinical scoring tool in similar resource-limited surgical settings.

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Authors Contributions:

Tayyaba Manzoor: Substantial contributions to the conception and design of the work.

Jamil Salamat Ullah: The acquisition of data for the work.

Saima Jamal: Analysis and interpretation of data for the work.

Shah Zaman: Drafting the work.

Inam Ul Haq: Reviewing it critically for important intellectual content.