

Accuracy of Raja Isteri Pengiran Anak Saleha Appendicitis Score (RIPASA) in Diagnosis of Acute Appendicitis

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Abstract

Objective: To evaluate the diagnostic precision of the RIPASA score in diagnosing acute appendicitis by using histopathology as the benchmark.

Material and Methods: A cross-sectional validation research was conducted at Ghurki trust Teaching Hospital, Lahore, Pakistan. A total of 112 patients between 16-70 years of age, either gender, presenting with suspected acute appendicitis and ready to undergo appendectomy were included. Patients having a right iliac fossa mass, past experience of abdominal trauma, pregnancy and who were already receiving therapy for urolithiasis and pelvic inflammatory disease were excluded. These patients were evaluated by the RIPASA score. Patients were labelled as either negative or positive. A single surgical team performed either open or laparoscopic appendectomies under general anaesthesia on these patients. Appendectomy specimen's histopathology reports were reviewed, and patients were verified as either positively or negatively for acute appendicitis.

Results: The RIPASA scoring system was able to diagnose acute appendicitis taking histopathology as the gold standard with a diagnostic accuracy of 88.39%, specificity of 75.0%, sensitivity of 93.75%, positive predictive value of 90.36% and negative predictive values of 82.76%.

Conclusion: This study concludes that RIPASA scoring system is an effective as well as straightforward method to diagnose acute appendicitis, demonstrating high sensitivity and accuracy.

Keywords: RIPASA score, Alvarado score

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Introduction

Acute appendicitis has a morbidity rate of approximately 10% and a mortality rate ranging from 0.24% to 4.0%.¹ It is the most common diagnosis encoun-

tered by emergency surgeons globally, accounting for about 20% of all surgical procedures.¹ This condition predominantly affects individuals between the ages of 20 and 40, and timely diagnosis can be challenging, as it largely relies on symptom assessment.² Acute appendicitis remains a challenging condition to diagnose, often requiring complex decision-making in management. Surgical exploration for this condition involves significant technical, financial, and human resources. Prompt and accurate diagnosis, followed by an early appendectomy, can help prevent complications that may arise from perforation. To minimize delays in diagnosis and reduce the potential for error, various diagnostic scoring systems have been implemented.

In a study involving 72 patients suspected of having

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acute appendicitis, it was determined that 41 cases (56.9%) were confirmed as acute appendicitis.³ The diagnosis of acute appendicitis remains complex, often requiring intricate decision-making due to the necessity for surgical exploration, which demands significant human resources, both technical and financial. Prompt and accurate identification of acute appendicitis followed by an early appendectomy can help prevent complications associated with appendicular perforation.⁴ To minimize diagnostic delays and reduce errors in identifying acute appendicitis, various assessment scales have been developed.² Currently, the Alvarado scoring system is utilized for risk stratification, which helps narrow down treatment options based on the likelihood of appendicitis. This scoring method is quick to calculate, does not necessitate imaging, and has demonstrated good validity. However, it has been found to be less accurate in women, children, and elderly patients. Consequently, a more comprehensive scoring system known as the Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score was created, which offers improved diagnostic precision, specificity and sensitivity.⁵

RIPASA score assessment allows for a precise and timely acute appendicitis' diagnosis without the requirement of computed tomography.^{6,7} The RIPASA scoring system takes into account 18 parameters as shown in Table. I and a score falls between 7.5 and 11.5 has a high risk of acute appendicitis.

According to a 2011 research, the diagnostic accuracy, PPV, NPV, specificity and sensitivity of the RIPASA score were, as order, 91.8% 85.3%, 97.4%, 81.3%, 98.0% at cut-off value of 7.5 obtained from the ROC curve.⁸ Subsequently, in a 2012 research conducted in Pakistan, the RIPASA score's sensitivity was found to be 96.7%, diagnostic accuracy as 95.1%, specificity 93.0%, PPV to be 94.8% and NPV to be 95.54%.⁹ As per another research, the sensitivity of the RIPASA score was 95.89% at a threshold value of >7.5, with a diagnostic accuracy of 90.5% and a specificity of 75.92%, observed & anticipated rates of negative appendectomy being 8.5 and 12.35%, respectively.¹⁰ Malik et al. showed that the RIPASA scoring system have a specificity of 69.86%, sensitivity of 85.39%, NPV of 72.86%, PPV of 84.06%, and diagnostic precision of 80%.¹¹ RIPASA scoring system can help to reduce time for diagnosis of acute appendicitis in suspected cases, however, conflicting results have been observed in literature regarding accuracy of RIPASA scoring system. Moreover, there are only few local studies conducted before

in this regard.⁹ RIPASA scoring system is a non-invasive diagnostic tool, more cost and time affective and can help in avoiding unnecessary appendectomies. This study was conducted to get reliable results using this scoring system which can be implemented in the local setting.

Material and Methods

A validation cross-sectional research was performed at General Surgery Department; Ghurki trust Teaching Hospital, Lahore, Pakistan., from 30th March 2022 till 29th September 2022. After the taking approval from Ethical Committee No. LMDC/42/2021 date 01-05-2021. There were 112 patients who presented in the emergency department, which were selected through non-probability consecutive sampling. All patients of 16-70 years of age, presenting with suspected acute appendicitis and ready to undergo appendectomy were included in this research after explaining in detail and taking informed consent. Patients having abdominal trauma history, mass in the right iliac fossa, pregnancy and patients following urolithiasis or pelvic inflammatory disease treatment were excluded from this research. All this information was recorded on a predesigned proforma. Demographics (name, gender, age, BMI, length of symptoms, residence, occupation, lifestyle or socioeconomic status) were recorded. The researchers then analysed the patients and reported their RIPASA score. Patients were labelled as positive or negative. Positive scores were defined as those that exceeded the RIPASA cut-off point of 7.5. These all 112 patients underwent appendectomy under general anesthesia by a single surgical team. Appendectomy specimens were followed with the histopathology reports to confirm whether the patients had acute appendicitis or not. The outcomes were linked to RIPASA ratings once histopathology data were obtained to differentiate between positive and negative appendectomies. SPSS version 21 was used to input and evaluate all gathered data. For each of the following: gender, age, length of symptoms, frequency, histology, RIPASA scores and percentages were computed. The RIPASA score's sensitivity, negative predictive value (NPV), positive predictive value (PPV), specificity and diagnostic accuracy were determined. A p-value of less than 0.05 was deemed significant.

Results

The study encompassed a 16–70-year age span, with

a mean age of 40.35 ± 7.70 years. Table II indicates that the age range of the majority of the 63 patients (56.25%) was 41–70 years. 49 (43.75%) of these 112 patients were men, and 63 (56.25%) were women, for a ratio of 1:1.3 (Figure.1). The symptoms persisted for an average of 24.0 ± 10.88 hours. RIPASA was positive in 83 individuals and negative in 29 patients. 08 patients (False Positive) were not diagnosed with acute appendicitis on histopathology, while 75 (True Positive) patients exhibited acute appendicitis. Table III reveals that among the RIPASA negative patients, 05 (False Negative) had acute appendicitis on histopathology and 24 (True Negative) did not have acute appendicitis ($p=0.0001$). Using histopathology as the standard, the total score for the specificity, diagnostic accuracy, sensitivity, negative predictive value and positive predictive value of the RIPASA scoring system were 75.0%, 88.39%, 93.75%, 82.76% 90.36%, respectively in an identification of acute appendicitis. Sensitivity: 93.75% Specificity: 75.0% Positive Predictive Value (PPV): 90.36%

Table 1: RIPASA scoring system

Parameters	Score
Female	0.5
Male	1.0
Age < 40 yrs	1.0
Age > 40 yrs	0.5
Anorexia	1.0
Migratory pain	0.5
Pain- right iliac fossa	0.5
Duration of symptoms <48 hours	1.0
Duration of symptoms >48 hours	0.5
Vomiting/ nausea	1.0
Tenderness in right iliac fossa	1.0
Elevated WBC count	1.0
Rebound tenderness	1.0
High temperature	1.0
Guarding in right iliac fossa	2.0
Non-remarkable urinalysis	1.0
Other nationality	1.0
Rovsing's sign	2.0
Overall score	17.5

Table 2: Patient distribution based on age

Age (years)	No. of patients	Percentage
16-40	49	43.75
41-70	63	56.25
Total	1121	100

Mean \pm SD = 40.35 ± 7.70 years

Table 3: Diagnostic accuracy of the RIPASA score in diagnosing acute appendicitis, using histopathology as the gold criterion.

	Positive result on Histopathology	Negative result on Histopathology	P-value
Positive on RIPASA	75 (TP)*	08 (FP)***	0.0001
Negative on RIPASA	05 (FN)**	24 (TN)****	

*-TP=True positive **-FP=False positive
 -FN=False negative *-TN=True negative



Negative Predictive Value (NPV): 82.76% Diagnostic Accuracy: 88.39%.

Figure-1: Patient distribution based on gender (n=112).

Discussion

Acute appendicitis is the most often encountered general surgical emergency and the diagnosis is primarily clinical.¹² Sometimes it is difficult to establish a diagnosis in the elderly patients, in young patients and females of childbearing age, because of other common differential diagnoses.¹² Due to reduced diagnostic accuracy, a negative appendectomy rate is around 20–40%.¹³ In order to prevent complications, like appendicular perforation, it is imperative that females in the reproductive age, the elderly, and young people with acute appendicitis receive prompt medical attention.¹² Many clinical scoring systems are in practice to assist surgeons in making accurate diagnosis and lower the negative appendectomy rates. The most often adopted score presently is the Alvarado score.¹⁷ Its negligible sensitivity as well as specificity have made a higher accuracy score obligatory; although, this score was established in Western nations with distinct dietary and environmental conditions.¹⁷ A novel scoring system, the RIPASA was created to help diagnose acute appendicitis more accurately.¹⁴ It consists of 14 clinical criteria that, when compared to Alvarado scoring, offer superior diagnostic precision, specificity and sensitivity, particularly in the Asian population.¹⁴ Chong et al. showed that the RIPASA scoring system's specificity, diagnostic accuracy, sensi-

tivity, negative and positive predictive value were 75.0%, 88.39%, 93.75%, 82.76% and 90.36% respectively, in detecting acute appendicitis using histopathology as the gold standard.¹² According to a 2011 research, the diagnostic accuracy, PPV, NPV, specificity and sensitivity of the RIPASA score were, as order, 91.8%, 85.3%, 97.4%, 81.3%, 98.0% at the ideal score of 7.5.8 Subsequently, in a 2012 research conducted in Pakistan, the RIPASA score's sensitivity was found to be 96.7%, diagnostic accuracy as 95.1%, specificity 93.0%, PPV to be 94.8% and NPV to be 95.54%.⁹ As per another research, the sensitivity of the RIPASA score was 95.89% at a cut-off value of >7.5, with a specificity of 75.92% and a diagnostic accuracy of 90.5%, observed and anticipated rates of negative appendectomy were determined to be 8.5 and 12.35%, respectively.¹⁰ RIPASA scoring system showed a specificity of 69.86%, sensitivity of 85.39%, NPV of 72.86%, PPV of 84.06%, and diagnostic precision of 80% at the score >7.5 in one study evidence.¹¹ A research found that RIPASA had a sensitivity of 82.61% (95% CI 72.02, 89.76) and a specificity of 88.89% (95% CI 67.2, 96.9). Its results included a 96.61% PPV (95% CI 88.46, 99.07), 57.14% NPV (95% CI 39.07, 73.49), and 83.91% (95% CI 74.78, 90.17) diagnostic accuracy level.¹⁵ Frountzas et al. conducted a meta-analysis including twelve studies comprising of 2161 participants and it revealed that the RIPASA score's specificity was 55% (95% CI, 51%–55%) and its sensitivity was 94% (95% CI, 92%–95%).¹⁶ Additionally, the diagnostic odds ratio was 24.66 (95% CI, 8.06 to 75.43) and the area within the Roc Curve (AUC) was 0.9431.16 Damani et al.¹¹ revealed that the RIPASA score had 91.11% sensitivity, 42.85% NPV, 95.34% PPV, 60% specificity and 88% diagnostic accuracy. Further research¹⁰ indicated that the specificity was 8.3%. Numerous centres in Pakistan have implemented and evaluated the RIPASA scoring system, with encouraging outcomes. According to Butt et al., the RIPASA Score exhibited 96.7% sensitivity, 93.0% specificity, and 95.1% diagnostic accuracy.⁹

In a comparative research reported by Din SSU et al. RIPASA was > 7.5 in 345 patients while in 261 patients, Alvarado score was >7.0.¹⁷ The RIPASA score was 65.9%, 87.9%, 95.8% and 98.9% in terms of negative predictive value (NPV), specificity, sensitivity and positive predictive value (PPV) respectively.¹⁷ An ALVARADO score, on the other hand, was 75.8% specific as well as 71.1% sensitive. Alvarado's diagnosis accuracy for acute appendicitis was only 71.46% com-

pared to RIPASA's 95.12%.¹⁷

Conclusion

This study concludes that RIPASA scoring system is an effective as well as straightforward method to diagnose acute appendicitis, demonstrating high sensitivity and accuracy. By enhancing diagnostic precision, it significantly contributes to improved patient care through timely and appropriate treatment, ultimately reducing the likelihood of unnecessary appendectomies and decreasing patient morbidity and mortality.

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Conflict of Interest: *None*

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WMC: Conceptualization of Project

MZ: Data Collection

RUA: Literature Search

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WMC: Writing of Manuscript