Original Research Paper

Volume - 15 | Issue - 08 | August - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

General Surgery

# "A COMPARATIVE STUDY OF RIPASA AND ALVARADO SCORE IN THE DIAGNOSIS OF ACUTE APPENDICITIS"

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**ABSTRACT** **Background:** The most common scoring system used worldwide for acute appendicitis is Alvarado score[1,2]. But recent studies have shown that it has less diagnostic accuracy in Asian and Middle Eastern population[3,4]. The Raja Isteri Pengirm Anak Saleha Appendicitis (RIPASA) score is more extensive than the Alvarado score with certain parameters like age, gender and duration of symptoms prior to the presentation. So, comparison of Alvarado and RIPASA scoring system[5] is carried out in a tertiary teaching hospital, to find out better scoring system in the Indian population. **Objective:** The objective of the study is comparison of Alvarado and RIPASA scoring system to find out better scoring system in Indian population. **Methods:** 144 patients presenting to surgical outpatient department and emergency department with appendicitis were included. **Results:** RIPASA score when applied on study population, 94% of patients who actually had acute appendicitis were correctly diagnosed compared to Alvarado score having correct diagnostic percentage as 86%. In low probability group patients, 66.7% patients were not having appendicitis in RIPASA score whereas only 39.3 % patients in Alvarado scoring system. **Conclusion:** Specificity of RIPASA score was 72.7 % whereas of Alvarado score was 50%, which is statistically significant. NPV of RIPASA score was 66.7%, whereas of Alvarado was 39.3% which is statistically significant. Diagnostic accuracy of RIPASA Score is 90.3% whereas of Alvarado score is 80% which has almost of 10% difference.

**KEYWORDS :** Alvarado score, RIPASA scoring system, Appendicitis.

## INTRODUCTION

Acute appendicitis is one of the common surgical emergencies. Acute appendicitis has an estimated lifetime prevalence of approximately 7% [1] and the incidence being 1.5- 1.9 per 1000 population. Men are prone for appendicitis compared to women by 1.4 times.[2]

The diagnosis of acute appendicitis remains challenging. The decision of doing an appendicectomy is mainly based on history, clinical examination and laboratory investigations. A delay in surgery increases the risk of appendicular perforation and sepsis. Diagnostic accuracy can be enhanced by the use of ultrasonography of abdomen and pelvis or Computed Tomography CT abdomen and Pelvis imaging. Study had suggested that non selective usage of CT imaging may lead to early appendicectomies which would actually be resolved spontaneously by conservative treatment with antibiotics.[3]

Many clinical scoring systems have developed over period of time. These scores make use of clinical history, physical examination and laboratory findings[10]. The most commonly used scoring system worldwide is Alvarado score but it has less diagnostic accuracy in Asian and Middle Eastern population. [4]

The Raja Isteri Pengirm Anak Saleha Appendicitis (RIPASA) score [table 1] is more extensive than the Alvarado score. Alvarado score does not contain certain parameters like age, gender, duration of symptoms prior to the presentation which are included in the RIPASA system. Above mentioned parameters have shown to affect sensitivity and specificity of Alvarado scoring system in the diagnosis of acute appendicitis. [5,10] In 2010, Chong et al came up with a newer scoring system with 14 parameters called Raja Isteri Pengiran Anak Saleha Appendicitis score (RIPASA Score) which was designed for Asian population. Studies by Pasumarthi V, Madhu CP.; Alnjadat I, Abdallah B [8,9] and data pertaining to it shows significant results in diagnosing the acute appendicitis in Asian population. [6,7]

So, comparison of Alvarado and RIPASA scoring system was carried out in this study to find out better scoring system in Indian population.

## AIMS AND OBJECTIVES

To validate the diagnostic accuracy of appendicitis through comparison of RIPASA and ALVARADO scores in patients presenting with abdominal pain, suspected of having appendicitis and comparing with the final histopathology report.

## MATERIALS AND METHODS

### Study Design And Setting:

A prospective, observational, comparative study was conducted in St. Philomena's hospital, Bangalore for a period of 18 months from August 2019 to January 2021. 144 patients with signs and symptoms of appendicitis who presented to surgical outpatient department and emergency department and were willing for study were included.

### Participants:

After discussion with statistician, the calculated sample size calculated was 144. 144 patients with signs and symptoms of appendicitis and willing for study were included in this study.

### Inclusion Criteria:

- Both male and female >10 years of age
- Patients complaining of right iliac fossa pain.
- Patients willing for study.

### Exclusion Criteria:

- Patients coming with abdominal pain other than right iliac fossa pain and abdominal distension.
- Pregnant females.
- Any mass per abdomen.
- Patients with previous history of pelvic inflammatory disease.

The baseline demographic data which includes age, sex, occupation, educational qualifications, habits (smoking/consumption of alcohol) and socioeconomic status was recorded of the patients.

Upon admission, both RIPASA (14 fixed parameters) and ALVARADO scores (standard eight parameters) were entered. Decision of management (appendicectomy vs conservative line of management) was based on clinical judgement and investigations reports. Scoring was done during every review till a decision was taken on the management.

The diagnosis of acute appendicitis was confirmed by operative findings and histopathological examination of appendicectomy specimens. Post-operative histopathology reports were correlated with the scores.

All the data obtained was recorded in score sheet. The histological confirmation of all appendicular specimens was obtained. Patients who were treated conservatively and subsequently discharged were reviewed once in surgical outpatient department after a week of discharge.

### RIPASA

**RIPASA Scoring System Table-1:**

| PATIENT'S DEMOGRAPHY | SCORE |
|---|---|
| Female | 0.5 |
| Male | 1.0 |
| Age <39.9 years | 1.0 |

| | |
|---|---|
| Age >40 years | 0.5 |
| SYMPTOMS | |
| RIF pain | 0.5 |
| Migration of pain | 0.5 |
| Anorexia | 1.0 |
| Nausea/vomiting | 1.0 |
| Duration of symptoms <48 hours | 1.0 |
| >48 hours | 0.5 |
| SIGNS | |
| RIF tenderness | 1.0 |
| Guarding | 2.0 |
| Rebound tenderness | 1.0 |
| Rovsing's sign | 2.0 |
| Fever >37 c, <39 c | 1.0 |
| INVESTIGATIONS | |
| Raised WBC counts | 1.0 |
| Negative urinalysis | 1.0 |
| TOTAL | 16.5 |

- The cut off value for RIPASA score is taken as 7.5.
- 14 parameters are considered and each one is scored accordingly as 0,0.5, 1 or 2.
- Total value of more than or equal to 7.5 is considered as positive RIPASA score having high probability of acute appendicitis.

**ALVARADO Score**

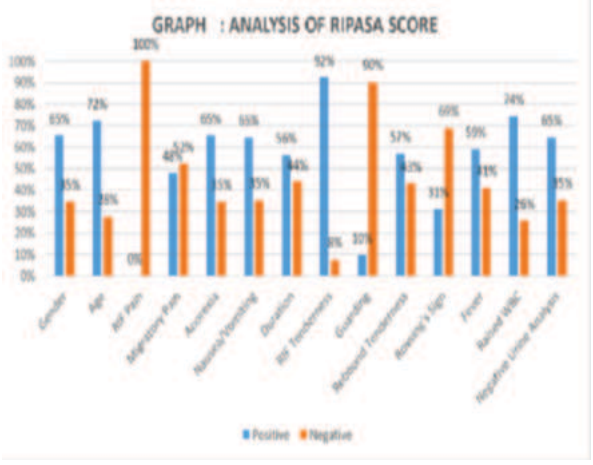
- The cut off value for Alvarado score is taken as 7.
- 8 parameters are considered and each one is scored accordingly as 0, 1 or 2.
- Total value of more than or equal to 7 is considered as positive Alvarado score having high probability of acute appendicitis.

**Statistical Analysis:**

In the study, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated and analysis was done using Chi-square test using the Statistical Package for Social Sciences (SPSS) for Windows software. Level of significance was set at 0.05.

**RESULTS:**

During 18 months of study period from August 2019 to January 2021, study was done on consecutive series of 144 patients admitted in St. Philomena's hospital, Bangalore with RIF pain.The minimum age of patient being 11 years and maximum being 57 years with maximum number of patients in 2nd and 3rd decades of life. Patients belonging to 20-30 years age group were 29.2%, and only 9% were above 50 years of age. Mean age of the study was 32.94, standard deviation being 11.82. Out of 144 patients, males were 94 and females were 50**.** Most of the patients were in younger age, which shows that there was more incidence in younger age and peak in 20-40 years age group. The patients underwent appendicectomy based on surgeon's clinical decision. Out of these,122 cases were confirmed as having acute appendicitis or complications. 22 patients who were operated had normal histology of appendix which suggested a negative appendicectomy rate of 15.3% when based on clinical decision solely.




**Graph 1:** shows positivity in different parameters such as demographics, symptoms, signs and laboratory investigations according to RIPASA scoring system.

**Analysis Of RIPASA Scoring**

72% patients belonged to age group of below 40 years, whereas 28% of them were above 40 years. 65% are males, 35% are females. RIF pain was 100% as it is an inclusion criterion. 48% of patients had migration of pain to RIF, rest didn't have that feature. 56% patients presented within first 48 hours, rest 44% presented after 48 hours of onset of pain. 60% of patients had fever, 65% of patients had negative urinalysis. 74% of patients had leucocytosis.

**Analysis Of Alvarado Scoring**

Out of 144 patients studied,116 patients got score of above or equal to 7 total score and were classified as having high probability of acute appendicitis according to Alvarado scoring system. Rest 28 patients had score less than 7 total score who were classified as having low probability of acute appendicitis.

**Table 2: Comparison Of RIPASA And Alvarado Scoring Systems With Respect To Different Variables**

| Variable | RIPASA >7.5 | Alvarado > 7 | P value |
|---|---|---|---|
| Sensitivity | 93.4% | 86.1% | |
| Specificity | 72.7% | 50.0% | <0.001 |
| Positive predictive value | 95.0% | 90.5% | |
| Negative predictive value | 66.7% | 39.3% | <0.001 |
| Diagnostic accuracy | 90.3% | 80.6% | |
| Negative appendicectomy rate | 36.4% | 77.3% | |

**Sensitivity Or True Positive Value:**

In the study, RIPASA score was accurately classified in 114(93.4%) patients with acute appendicitis which were histology positive into positive group. The score was higher when compared with that of Alvarado score findings, that is, it had classified 105 (86.1%) as positive group. RIPASA had higher sensitivity compared to Alvarado scoring system.

**Specificity Or True Negativity Value:**

In the study, RIPASA score had identified 16 patients, specificity of 72.7%, who do not have acute appendicitis, which were histology negative into negative group. Alvarado score had a specificity of 50%. RIPASA score had higher specificity than Alvarado score.

The difference in specificities was statistically significant.

When RIPASA score was applied on study population, 94% of patients who actually had acute appendicitis were correctly diagnosed compared to Alvarado score of 86%. In Alvarado score, 17 patients were falsely diagnosed whereas only 8 patients were false negative according to RIPASA scoring. Similarly, in low probability group, 66.7% patients were not having appendicitis in RIPASA score as against 39.3 % patients in Alvarado scoring system.

**DISCUSSION:**

RIPASA scoring system is better diagnostic tool when compared to Alvarado score. It has high accuracy and low false negative rates. RIPASA scoring system is simple, rapid and useful scoring system for diagnosing acute appendicitis in emergency setting. This scoring system includes patient's demographics such as age and gender, clinical history including duration of pain, migration, nausea and vomiting, clinical examination including RIF tenderness, localised guarding and rigidity, rebound tenderness, Rovsing's sign, fever and basic laboratory investigations which include WBC counts, urinalysis. The RIPASA score helps in emergency department for making a quick decision on diagnosis of condition when a patient comes with RIF pain. On scoring all patients by RIPASA scoring system, if the score >7.5, the patient can be admitted and planned for further management, while patient with score < 7.5 can be observed. It had high sensitivity (93.4%), high specificity (72.7%), PPV (95%), NPV (66.7%), in our study. Thus, RIPASA scoring system helps in reducing unnecessary expenditure on costly imaging techniques and also reducing negative appendicectomy.

**CONCLUSION:**

The study was conducted in patients who presented with RIF pain and were suspected of appendicitis. Both RIPASA and Alvarado scores were applied. Based on this study, the diagnostic accuracy of RIPASA and Alvarado scoring system were 90.3% and 80.6% respectively. Thus, the RIPASA scoring system appears to be a better scoring system compared to Alvarado scoring system in diagnosing acute appendicitis. It decreases negative appendicectomies and at the same time decreases missed appendicitis compared to Alvarado scoring system.

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