



E-ISSN: 2616-3470

P-ISSN: 2616-3462

© Surgery Science

<https://www.surgeryscience.com>

2024; 8(2): 26-32

Received: 09-03-2024

Accepted: 12-04-2024

**Dr. Sabbella Sai Siva Priya Reddy**  
Post-Graduate Resident,  
Department of General Surgery,  
Mamata Medical College,  
Khammam, Telangana, India

**Dr. Yeramaneni Venkat Prashanth**  
Assistant Professor, Department of  
General Surgery, Mamata Medical  
College, Khammam, Telangana,  
India

**Dr. K Stalin**  
Assistant Professor, Department of  
General Surgery, Mamata Medical  
College, Khammam, Telangana,  
India

**Corresponding Author:**

**Dr. Yeramaneni Venkat Prashanth**  
Assistant Professor, Department of  
General Surgery, Mamata Medical  
College, Khammam, Telangana,  
India

# International Journal of Surgery Science

## A comparative study of RIPASA score and modified Alvarado score in diagnosis of acute appendicitis

**Dr. Sabbella Sai Siva Priya Reddy, Dr. Yeramaneni Venkat Prashanth and Dr. K Stalin**

DOI: <https://doi.org/10.33545/surgery.2024.v8.i2a.1079>

### Abstract

**Introduction:** Acute appendicitis is one of the most common surgical emergencies. Various scoring systems have been developed for supporting the diagnosis of acute appendicitis. The most common and widely applied scoring system is Modified Alvarado Scoring system. The RIPASA Score, a new diagnostic scoring system developed for the diagnosis of Acute Appendicitis has shown significantly higher sensitivity, specificity and diagnostic accuracy compared to Alvarado Score, particularly in Asian population.

### Aims and Objectives

- 1) To compare RIPASA Score and Modified Alvarado Score in the diagnosis of acute appendicitis.
- 2) To assess the accuracy of RIPASA Score and Modified Alvarado Score as reliable indicator for Appendicectomy surgeries and attenuating the "Negative Appendicectomy" rates.

**Materials and Methods:** 68 clinically suspected cases of acute appendicitis, admitted in the surgical wards of Mamata General Hospital, were included in the study after obtaining their consent. Every patient was scored with both scores after taking detailed history, clinical examination and relevant investigations. A score of >7 for Modified Alvarado scoring system and >7.5 for RIPASA scoring system was taken as high probability of acute appendicitis. Following the data compilation sensitivity, specificity and accuracy of Modified Alvarado and RIPASA scoring systems for diagnosing acute appendicitis were calculated and compared.

**Results:** With the cut-off value greater than 7.5 for RIPASA score; sensitivity, specificity, positive predictive value, negative predictive values were 100%, 23.08%, 84.62% and 100% respectively. With the cut-off value greater than 7 for Modified Alvarado score sensitivity, specificity, positive predictive value, negative predictive values 80.00%, 76.92%, 93.62%, 47.62% respectively. Diagnostic accuracy of RIPASA and Modified Alvarado score were 86.24% and 79.41% respectively.

**Conclusion:** RIPASA score was better than Modified Alvarado score in diagnosing acute appendicitis.

**Keywords:** Modified Alvarado score, RIPASA, acute appendicitis

### Introduction

Acute appendicitis is one of the commonest surgical emergencies in any hospital. The lifetime prevalence rate of appendicitis is approximately one in seven <sup>[1]</sup>. The incidence is 1.5 to 1.9 per 1000 in the population, with a male preponderance of 1.4 <sup>[2]</sup>.

There have been numerous advances in the diagnosis and treatment of appendicitis. Nonetheless, acute appendicitis continues to challenge surgeons to this day <sup>[3]</sup>. Symptoms of appendicitis overlap with a number of other conditions making diagnosis a challenge, particularly at an early stage of presentation <sup>[4]</sup>.

The decision of performing an appendicectomy is largely based on history, clinical examination and investigations. A negative appendicectomy rate of 20-40% has been reported in literature and many surgeons advocate early surgical intervention for the treatment of acute appendicitis to avoid perforation, accepting a negative appendicectomy rate of about 15-20% <sup>[5]</sup>. Removing normal appendix is an economic burden on both patients and health resources. Misdiagnosis and delay in surgery can lead to complications like perforation and finally peritonitis <sup>[6]</sup>.

A number of scoring systems have been employed for aiding in diagnosis of acute appendicitis and its prompt management. These scores make use of clinical history, physical examination and laboratory findings.

Classic Alvarado score included a shift to the left of neutrophil maturation (score1) yielding a total score of 10.

However, Kalan *et al.* omitted this parameter which was not routinely available in many laboratories and produced a Modified Alvarado score with an aggregate score of 9. [7] Chong *et al.* from the Department of Surgery at Raja Isteri Pengiran Anak Saleha Hospital, Brunei Darussalam have recently developed a new appendicitis scoring system RIPASA Score consisting of 15 clinical and laboratory variables with a maximum score of 16. [8].

The RIPASA Score is a new diagnostic scoring system developed for the diagnosis of Acute Appendicitis and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy compared to Alvarado Score, particularly when it was applied to Asian population [9].

The present study was carried out to compare the efficacy of RIPASA score with that of Modified Alvarado Score for the diagnosis of acute appendicitis.

The purpose of this study was to compare modified Alvarado score vs RIPASA score in diagnosis of acute appendicitis in order to arrive at a diagnosis preoperatively in order to reduce the rate of negative appendectomies.

**Aims and Objectives**

**Aims**

- To compare RIPASA Score and Modified Alvarado Score in the diagnosis of acute appendicitis.
- Assessing the accuracy of RIPASA Score and Modified Alvarado Score as a reliable indicator for Appendicectomy surgeries and attenuating the “Negative Appendicectomy” rates.

**Objectives**

- Applying the RIPASA score in the diagnosis and prognosis of patients with right iliac fossa pain.
- Comparing the Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value with the widely used Modified Alvarado Score and RIPASA Score.
- Assessing the RIPASA Score and Modified Alvarado Score with clinical and histopathological examination findings.

**Materials and Methods**

**Method of collection of data**

This study comprises of 68 cases of Acute Appendicitis from the surgical in-patient wards of Mamata General Hospital over a period of one year from august 2022 to July 2023. The study was carried out after obtaining clearance from Ethical and Research Committee, Mamata Medical College, Khammam.

Patients above the age of 16 years irrespective of sex, willing to undergo appendicectomy, willing to participate in the study and gave consent were included.

Patients less than 16 years of age, pregnant women, patients with right iliac fossa mass, previous history of urolithiasis and pelvic inflammatory disease and those not willing to participate in the study were excluded.

**Methodology**

Clinically suspected cases of acute appendicitis, admitted in the surgical wards of Mamata General Hospital, were included into the study after obtaining their consent for the same. Detailed history, clinical findings along with relevant investigations like hematological examination, urinalysis, biochemical parameters as required, ultrasound of abdomen etc., were recorded in the proforma for individual patients. Every patient was scored with

both modified Alvarado and RIPASA scoring systems and a score of > 7 for Modified Alvarado scoring system and > 7.5 for RIPASA scoring system was taken as high probability of acute appendicitis. Operative findings and diagnosis were recorded in the concerned proforma for the respective patients. Histopathology findings of the excised appendix were recorded in the respective proforma for correlation with the pre and per operative diagnosis as well as with both the scores. Scores were tabulated and compared by applying Chi-square test.

Following parameters and variables were recorded in both the scoring systems for each case.

**Table 1:** RIPASA Scoring System for Appendicitis

Characteristics	RIPASA Score
<b>Patients</b>	
Female	0.5
Male	1.0
Age<39.9 years	1.0
Age>40 years	0.5
<b>Symptoms</b>	
Right iliac fossa pain	0.5
Pain migration to Right iliac fossa	0.5
Anorexia	1.0
Nausea and vomiting	1.0
Duration of symptoms<48 hrs	1.0
Duration of symptoms >48 hrs	0.5
<b>Signs</b>	
Right iliac fossa tenderness	1.0
Guarding	2.0
Rebound Tenderness	1.0
Rovsing sign	2.0
Fever >37 °C<39 °C	1.0
<b>Investigations</b>	
Raised WBC	1.0
Negative urine analysis	1.0
Additional Score	
Foreign NRIC	1.0
Total Score	16

**Table 2:** RIPASA Scoring System Interpretation

Total RIPASA	Score Decision making guidelines
<5.0	Probability of acute appendicitis is unlikely
5.0-7.0	Low probability of acute appendicitis
7.5-11.5	Probability of acute appendicitis is high
>12	Definite acute appendicitis

**Table 3:** Modified Alvarado Scoring System for Appendicitis

Symptoms	Score
Migratory right iliac fossa pain	1
Anorexia	1
Nausea/Vomiting	1
Rebound tenderness in right iliac fossa	1
<b>Signs</b>	
Tenderness in right iliac fossa	2
Elevated temperature	1
<b>Laboratory Findings</b>	
Leucocytosis	2
Total	09

**Table 4:** Interpretation of Modified Alvarado Score

Mass score	Interpretation
1-4	Unlikely diagnosis of appendicitis
5-6	Possible diagnosis
7-9	Acute appendicitis present

**Observations and Results**

The study was conducted on 68 patients with clinical features of acute appendicitis over a period one year from august 2022 to July 2023. Each patient was scored with Modified Alvarado and RIPASA scoring system and the results were compared. The results were analyzed and are discussed here.

**Age distribution and association of age with acute appendicitis**

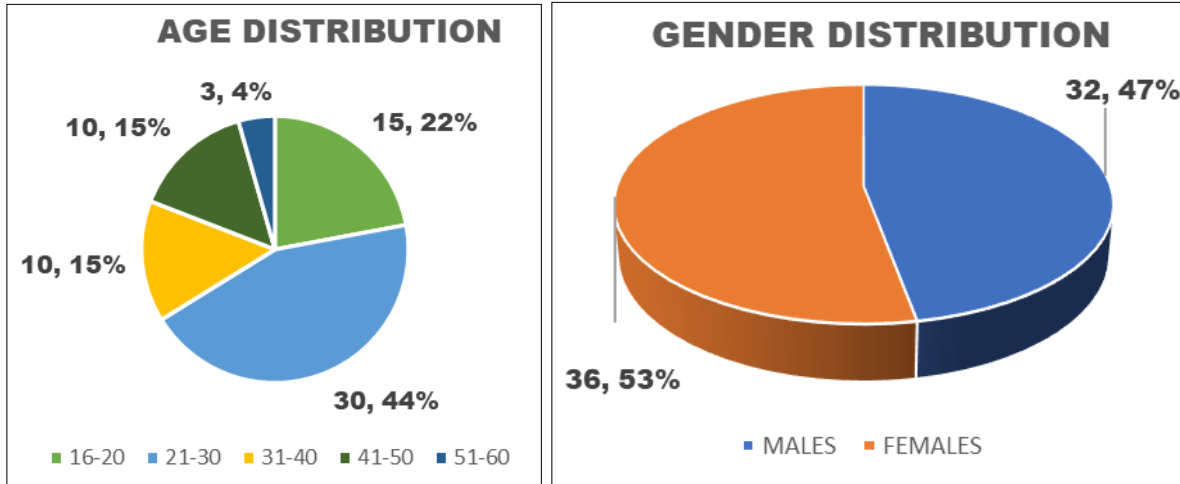
Among 68 patients, the youngest patient was of age 16 years,

whereas the oldest was 60 years old.

Mean age of patients in the present study with acute appendicitis was 29.38 years whereas mean age in normal cases was 28.85 years. No significant association was seen with age and incidence of acute appendicitis with a P value of 0.880.

**Gender Distribution**

Among 68 patients, majority of them were females which accounted for 36 cases (52.9%). 32 patients were males accounting for 47.1% of patients. Male to female ratio was 0.89.



**Fig 1:** Age and Gender distribution among patients

**Ultrasonography Findings**

Among 68 patients undergoing USG, 59 (86.8%) patients were reported as having acute appendicitis on USG.

**Table 5:** Ultrasonography findings among patients.

	No. of patients (n=68)	Percentage (%)
Acute Appendicitis	59	86.8
Normal	09	13.2
Total	68	100.0

**Histopathological Findings**

Histopathological examination was done in all cases and the reporting was done under the groups as acute appendicitis, acute on chronic appendicitis and normal (follicular hyperplasia). 48 (70.6%) patients had HPE report as acute appendicitis, 07 (10.3%) patients had HPE report of acute on chronic appendicitis and the rest 13 (19.1%) patients had normal findings on HPE.

**Table 6:** HPE Findings among patients

HPE Finding	No. of patients(n=68)	Percentage (%)
Acute appendicitis	48	70.6
Acute on chronic appendicitis	07	10.3
Follicular hyperplasia	13	19.1
Total	68	100.0

**Comparison of USG with HPE Report**

Out of 59 cases which were suggestive of acute appendicitis on USG 49 (72.05%) patients were found to have acute appendicitis after HPE report and 10 (14.7%) patients had normal findings on HPE report. Sensitivity and specificity of USG in diagnosing acute appendicitis was found to be 89.09% and 23.08% respectively with a PPV of 83.05% and an NPV value of 33.33%. No significant difference was seen in diagnosis of

appendicitis by USG and HPE with a P value of 0.244.

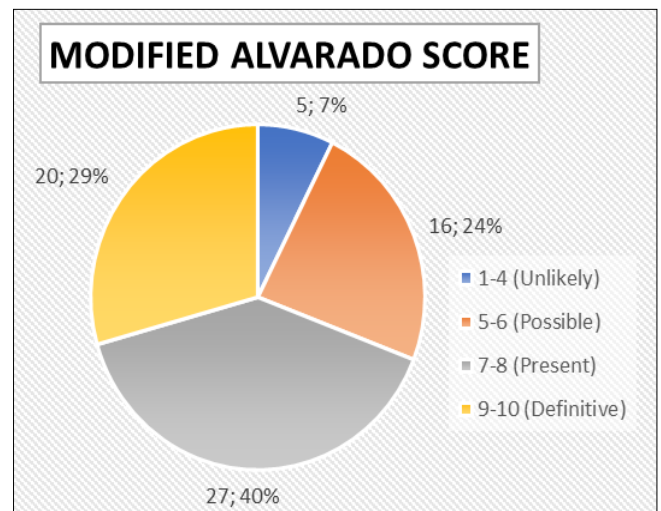
**Table 7:** Comparison of USG findings with HPE report

Ultrasonography finding		HPE		No of patients (n=68).
		Acute appendicitis	Normal	
USG	Acute appendicitis	49	10	59
	Normal	06	3	9
Total		55	13	68 (100%)

[P Value = 0.244]

**Modified Alvarado scoring**

Distribution of patients according to Modified Alvarado Score was depicted in Figure No 2.



**Fig 2:** Modified Alvarado Score among patients

**Comparison of Modified Alvarado Score with HPE Report**

Table No 8 shows the comparison of Modified Alvarado Score with HPE report.

On comparison of Modified Alvarado score with HPE P value (0.001) was found to be significant.

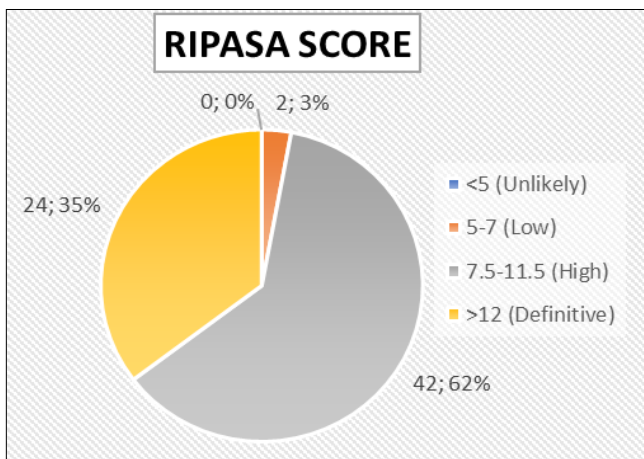
**Table 8:** Comparison of Modified Alvarado Score with HPE

Modified Alvarado Score	HPE		No. of Patients (n=68)
	Appendicitis(n=55)	Normal(n=13)	
1-4	02 (40%)	03 (60%)	05 (7.4%)
5-6	09 (56.25%)	07 (43.75%)	16 (23.5%)
7-8	24 (88.88%)	03 (11.11%)	27 (39.7%)
9-10	20 (100%)	0 (0.0%)	20 (29.4%)

[P Value = 0.001]

**RIPASA Scoring**

RIPASA scoring among study subjects was depicted UN Figure No 3.



**Fig 3:** RIPASA scoring among patients

**Comparison of RIPASA score with HPE report**

Among the study subjects, comparison of RIPASA score with HPE report shown in Table No 9. P value was significant (0.001).

**Table 9:** Association of RIPASA Score with HPE

RIPASA Score	HPE		No. of patients(n=68)
	Acute appendicitis	Normal	
5-7	0	2 (100%)	2 (13.2%)
7.5- 11.5	31 (73.81%)	11(26.19%)	42(61.8%)
>12	24(100%)	0(0.0%)	24(19.1%)
Total	55(100%)	13(100.0%)	68(100.0%)

[P Value = 0.001]

**Comparison of modified Alvarado score according to cut off value with HPE**

Table 10 shows the comparison of Modified Alvarado Scoring according to cutoff value with HPE report among the subjects.

**Table 10:** Comparison of Modified Alvarado Score according to cut off value with HPE

Modified Alvarado Scoring according to cutoff value	HPE Report n (%)		Total (%)
	Acute Appendicitis	Others	
≥ 7	44	3	47
<7	11	10	21
Total	55	13	68(100%)

**Comparison of RIPASA score according to cut off value with HPE**

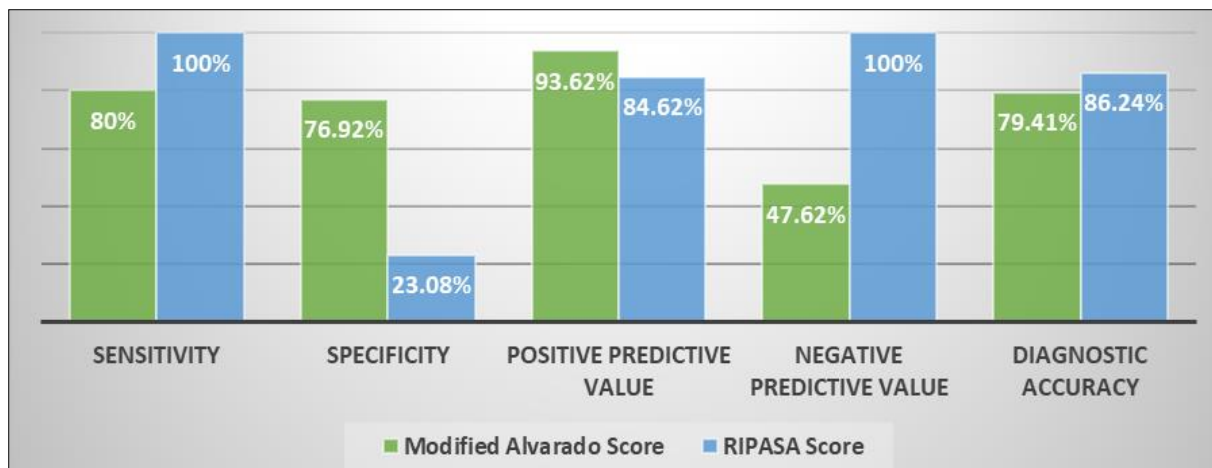
Table 11 shows the comparison of Modified Alvarado Scoring according to cutoff value with HPE report among the subjects.

**Table 11:** Comparison of RIPASA Score according to cut off value with HPE

RIPASA Scoring according to cutoff value	HPE Report N (%)		Total (%)
	Acute Appendicitis	Others	
≥ 7.5	55	10	65
<7	0	03	03
total	55	13	68(100%)

**Comparison of RIPASA score and Modified Alvarado scoring**

Figure 4 shows the sensitivity, specificity, Positive Predictive Value, Negative Predictive Value and diagnostic accuracy of RIPASA and Modified Alvarado Scores.



**Fig 4:** Analysis of RIPASA scoring and Modified Alvarado Scoring (n=68)

**Discussion**

Despite being a common problem, acute appendicitis remains a difficult diagnosis to establish, particularly among the young, the elderly and females of reproductive age, where other

genitourinary and gynecological inflammatory conditions can present with signs and symptoms that are similar to those of acute appendicitis [10]. It becomes increasingly common throughout childhood and reaches its maximum incidence

between the age of 10 and 30 years. Among teenagers and young adults, the male/female ratio is about 3:2. After the age of 25 years, the ratio gradually declines until the sex ratio is equal by the mid-30s<sup>[11]</sup>.

In the present study, among 68 cases majority of them belonged to the age group of 21-30yrs (44.1%) and the least no. of patients were from the age group of 51- 60yrs (4.4%) which was similar to a study done by Sanjay Jain *et al.*<sup>[12]</sup>.

Mean age of the patients in the present study was  $29.28 \pm 11.344$  years. Mean age of patients in the present study with acute appendicitis was 29.38 years whereas mean age in normal cases was 28.85years. No significant association was seen with age and incidence of acute appendicitis with a P value of 0.880. This was similar to study done by Tzanakis *et al.*<sup>[13]</sup>. In which the mean age was  $28.3 \pm 13.3$  years whereas the mean age was 20.2 years in study carried out by Khan *et al.*<sup>[14]</sup>.

In the present study, the majority were females, accounting for 52.9% (36 patients), while males accounted for 47.1% (32 patients) with male to female ratio was 0.89. In a similar study conducted by Sanjay Jain *et al.*<sup>[12]</sup>, males comprised 39% and females comprised 64% of the patients. Another study by Anand Singla *et al.*<sup>[15]</sup> found that 64% were males and 32% were females.

In Western countries nearly 7% of people have appendicitis. This incidence was quite low previously has been rising in developing countries in proportion to economic gain and change of lifestyle<sup>[16]</sup>.

The diagnosis of acute appendicitis is based on a thorough clinical judgment including a detailed history and clinical examination. The etiology of acute appendicitis is thought to be multifactorial in which luminal obstruction, dietary and familial factors have all been documented. Many trials have been conducted to assess the role of conservative treatment for acute appendicitis. However, classically the treatment of choice is an emergency appendectomy<sup>[17]</sup>.

The removal of a healthy appendix is associated with a greater risk of abdominal adhesions as compared to acute appendicitis<sup>[18]</sup>. This contrasts with an increasing rate of appendiceal perforations associated with delayed surgical interventions for the purpose of increasing diagnostic accuracy at the opposite end of spectrum<sup>[19]</sup>.

A delay in performing an appendectomy in order to improve its diagnostic accuracy increases the risk of appendicular perforation and sepsis, which in turn increases morbidity and mortality<sup>[20]</sup>. The opposite is also true, where with reduced diagnostic accuracy, the negative or unnecessary appendectomy rate is increased, and this is generally reported to be approximately 20%-40%<sup>[5]</sup>.

Diagnostic accuracy can be further improved through the use of ultrasonography or computed tomography imaging. However, such routine practice may inflate the cost of health care substantially. A recent study has suggested that such indiscriminate use of CT imaging may lead to early low-grade appendicitis and unnecessary appendectomies which would otherwise be resolved spontaneously by antibiotics therapy<sup>[5]</sup>.

Several scoring systems have been developed to aid in the diagnosis of acute appendicitis. The Alvarado score and the modified Alvarado score are the two most commonly used scoring systems<sup>[21]</sup>. Both the Alvarado and modified Alvarado scores lack parameters that have been shown to be important determinants in the diagnosis of acute appendicitis, such as age, gender and the duration of symptoms.

Wani *et al.*<sup>[19]</sup>. Have shown that the sensitivity and specificity of the Alvarado scoring system vary with age, gender and the

duration of symptoms. Moreover, this score was developed in Western countries, with different diet and environmental factors and several studies have reported very low sensitivity and specificity when these scores are applied to a population with a completely different ethnic origin and diet. There has been a need of scoring system that can overcome these problems with acceptable sensitivity, specificity and negative appendectomy rate. RIPASA score has been developed, which claimed to have better outcome in Asian settings.

In 2010, a group in Raja Isteri Pengiran Anak Saleha (RIPAS) Hospital, in Brunei, developed a new scoring system called RIPASA score<sup>[3]</sup>. The evaluation is mainly based on history and clinical findings, which is an important parameter in reaching a diagnosis of acute appendicitis<sup>[22]</sup>.

The RIPASA score is simple and easy to use as a quantitative scoring system and most of the parameters are easily obtained from a good clinical history and examination. This also includes urinalysis, which can be easily performed. Hence, a score can be obtained quickly, and a rapid diagnosis can be made without having to wait for the full investigations<sup>[23]</sup>.

The minimum and maximum total scores achievable with this new appendicitis scoring system were 2 and 16, respectively. The sensitivity and specificity achieved were 88% and 67%, respectively, with a diagnostic accuracy of 81%, which is comparable to the Alvarado score when the latter was applied in a Western population.

This was a definite improvement from the Alvarado score (sensitivity 50.6%-59.0%, specificity 23.0%-94.5%) and modified Alvarado score (sensitivity 53.8%, specificity 80%) when applied to Middle Eastern, Asian or Oriental populations.

The PPV and NPV for the new appendicitis score, at 93% and 53%, respectively, are also comparable to those achieved with the Alvarado and modified Alvarado scores. Using the new appendicitis scoring system, the predicted negative appendectomy rate was 6.9%, which was a 9.4% reduction from the raw data, and highly significant statistically ( $p = 0.0007$ )<sup>[3]</sup>.

In the present study out of 68 patients, 59 (86.8%) patients had finding suggestive of acute appendicitis on USG and 09 (13.2%) patients had normal findings. In a prospective study done by Sudershan Kapoor *et al.*<sup>[24]</sup> on 50 patients off suspected acute appendicitis ultrasonography of abdomen showed positive results in 41cases (82%) out of 50 cases.

Out of 59 cases which were suggestive of acute appendicitis on USG 49 (72.05%) patients were found to have acute appendicitis after HPE report and 10 (14.7%) patients had normal findings on HPE report. Sensitivity of USG in diagnosing acute appendicitis was found to be 89.09% with a PPV of 83.05% and an NPV value of 33.33%. In a study done by Sanjay Jain *et al.*<sup>[12]</sup> study found ultrasonography sensitivity of 94.68%, with 95.70% positive and negative predictive values, and 91% accuracy, while in a study done by Pinto *et al.*<sup>[25]</sup> study showed 86% sensitivity and 84% positive predictive value. In the present study, 48 (70.6%) had acute appendicitis, 10.3% had acute on chronic appendicitis, and 19.1% had normal findings on histopathological examination. In a similar study done by Ramgopal Meena *et al.*<sup>[26]</sup> had found 56%(28) of patients with acute appendicitis, 16%(08) with recurrent appendicitis, 8%(04) with perforated or gangrenous appendix, and 16%(08) with normal HPE findings, while Anand Singla *et al.*<sup>[15]</sup> found 90%(45) of patients with appendicitis and 10%(05) had normal findings on HPE.

In the present study of 68 patients, among 05 (7.4%) patients with a Modified Alvarado score of 1-4, 02 (40%) had acute appendicitis and 03 (60%) patients had a normal finding on

HPE. Among 16 (23.5%) patients with score of 5-6, 09 (56.25%) patients had appendicitis and 07 (43.75%) patients had normal findings on HPE. Among 27 (39.7%) patients with Score of 7-8, 24 (88.88%) patients had acute appendicitis and 03 (11.11%) patients had normal findings on HPE. Among 20 (29.4%) patients with a score of 9-10 all 20 (100%) patients had HPE suggesting acute appendicitis. On comparison of Modified Alvarado score with HPE P value (0.001) was found to be significant. The study found that the sensitivity of the Modified Alvarado score in predicting appendicitis increased as the score approached 9, with almost 100% positive results obtained. In comparison, a similar study done by Prateek Goyal *et al.* [27] on comparison of ALVARADO score with HPE P value (<0.001) was found to be significant.

In the present study, 02 (13.2%) patients had RIPASA score of 5-7 of which all patients (100%) had normal finding on HPE. Out of 42 (61.8%) patients with a score of 7.5-11.5, 31 (73.81%) had appendicitis and 11 (26.19%) patients had a normal finding on HPE. Out of 24 (19.1%) patients with a score greater than 12 all 100% patients had findings consistent with appendicitis on HPE. P value was significant (0.001). It was noted that as the score increases the sensitivity of prediction of appendicitis increases. In a similar study done by Prateek Goyal *et al.* [27] on comparison of RIPASA score with HPE P value (<0.001) was found to be significant comparable to the present study.

Statistical comparison of Modified Alvarado Score and RIPASA Score's cutoff values of present study in terms of sensitivity, specificity, PPV and NPV with various other studies was depicted in the Table 12 and Table 13.

**Conclusion**

Acute appendicitis remains a diagnostic challenge, especially in specific demographics such as the young, elderly, and females of reproductive age. It peaks in incidence between ages 10 and 30, with a male-to-female ratio of 3:2 among teenagers and young adults. This study analyzed 68 cases, primarily within the 21-30 age group, with a mean patient age of 29.28 years. The gender distribution was almost equal, with 52.9% females. Diagnosis often relies on clinical judgment, but imaging techniques like ultrasonography and computed tomography can improve accuracy, despite increasing healthcare costs. The RIPASA score, developed in Brunei, has shown better diagnostic performance in Asian populations compared to the Alvarado score. In this study, the sensitivity and specificity of ultrasonography were 89.09% and 33.33%, respectively. Histopathological examination confirmed acute appendicitis in 70.6% of cases. The Modified Alvarado score demonstrated increasing sensitivity with higher scores, and the RIPASA score showed similar trends, achieving significant predictive accuracy. Comparing these scoring systems, the RIPASA score was more effective for the studied population, highlighting its potential utility in enhancing diagnostic accuracy and reducing unnecessary appendectomies in diverse ethnic and dietary contexts.

**Table 12:** Comparison of statistical analysis of modified Alvarado score among various studies

Study	Cut off value	Sensitivity	Specificity	PPV	NPV
Jain S. <i>et al.</i> [12]	7-8	86.1%	83.3%	98.9%	27.8%
	9	35.1%	100.0%	100.0%	8.9%
Nanjundaiah N <i>et al.</i> [28]	7	58.9%	85.7%	97.3%	19.1%
Present Study	7	80%	76.92%	93.62%	47.62%

**Table 13:** Comparison of statistical analysis of RIPASA score among various studies

Study	Sensitivity	Specificity	PPV	NPV
Nanjundaiah <i>et al.</i> [28]	96.2%	90.5%	98.9%	73.1%
Chong CF <i>et al.</i> [3]	98%	81.3%	85.3%	97.4%
Banepali <i>et al.</i> [8]	97.17%	57.14%	94.5%	72.7%
Present study	100%	23.08%	84.62%	100%

The RIPASA score is currently a better diagnostic scoring system for acute appendicitis compared to the Alvarado score, with the former achieving significantly higher sensitivity and diagnostic accuracy, particularly in Indian population. We can get information of 14 fixed parameters of the RIPASA score by taking a complete history, and conducting clinical examination and investigations. Unwanted admissions and expensive imaging studies can also be avoided by using RIPASA score.

**Conflict of Interest**

Not available

**Financial Support**

Not available

**References**

- Cuschieri A, Hanna GB. The small intestine and vermiform appendix. *Essential Surgical Practice*. 1995;3:1325-8.
- Stephens PL, Mazzucco JJ. Comparison of ultrasound and the Alvarado score for the diagnosis of acute appendicitis. *Connecticut Medicine*. 1999 Mar 1;63(3):137-40.
- Chong CF, Adi MI, Thien A, Suyoi A, Mackie AJ, Tin AS, *et al.* Development of the RIPASA score: a new appendicitis scoring system for the diagnosis of acute appendicitis. *Singapore Medical Journal*. 2010 Mar 1;51(3):220.
- Bundy DG, Byerley JS, Liles EA, Perrin EM, Katznelson J, Rice HE. Does this child have appendicitis?. *JAMA*. 2007 Jul 25;298(4):438-51.
- Kalan M, Talbot D, Cunliffe WJ, Rich A. Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study. *Annals of the Royal College of Surgeons of England*. 1994 Nov;76(6):418.
- Ohmann C, Yang Q, Franke C. Diagnostic scores for acute appendicitis. *Abdominal Pain Study Group. The European Journal of Surgery = Acta Chirurgica*. 1995 Apr 1;161(4):273-81.
- Harsha BK, Bhaskaran A, Prasad CSBR, Basavarajappa, Ambikavathy M, Vasant H Kumar. Evaluation of Modified Alvarado score in the diagnosis of acute appendicitis and its correlation with ultrasonography and histopathology. *Journal of Clinical and Biomedical Sciences*. 2011;1(4):149-57.
- Banepali N, Koirala K, Mukhiya R, Sthapit RR. A comparative study of RIPASA score and modified Alvarado score in acute appendicitis in Nepalese population. *Nepalese Medical Journal*. 2019 Dec 16;2(2):224-8.
- Naik AT. An observational comparative study between RIPASA & modified Alvarado scoring in the diagnosis of acute appendicitis. *International Journal of Surgery*. 2019;3(4):510-3.
- Gilmore OJ, Browett JP, Griffin PH, Ross IK, Brodribb AJ, Cooke TJ, *et al.* Appendicitis and mimicking conditions: a prospective study. *The Lancet*. 1975 Sep 6;306(7932):421-4.

11. Lewis FR, Holcroft JW, Boey J, Dunphy JE. Appendicitis: a critical review of diagnosis and treatment in 1,000 cases. *Archives of Surgery*. 1975 May 1;110(5):677-84.
12. Jain S, Gehlot A, Songra MC. Modified Alvarado score in diagnosis of acute appendicitis: a clinicopathological study. *International Surgery Journal*. 2018 Feb 26;5(3):878-82.
13. Tzanakis NE, Efstathiou SP, Danulidis K, Rallis GE, Tsioulos DI, Chatzivasiliou A, *et al*. A new approach to accurate diagnosis of acute appendicitis. *World Journal of Surgery*. 2005 Sep;29(9):1151-6.
14. Khan I, UR Rehman A. Application of Alvarado scoring system in diagnosis of acute appendicitis. *Journal of Ayub Medical College Abbottabad*; c2005, 17(3).
15. Singla A, Singla S, Singh M, Singla D. A comparison between modified Alvarado score and RIPASA score in the diagnosis of acute appendicitis. *Updates in Surgery*. 2016 Dec;68(4):351-5.
16. Wallace D, Hahn BH. Dubois' Lupus Erythematosus and Related Syndromes E-Book: Expert Consult-Online. Elsevier Health Sciences; c2012 Sep 27.
17. Akopian G, Alexander M. De Garengeot hernia: appendicitis within a femoral hernia. *The American Surgeon*. 2005 Jun;71(6):526-7.
18. Ochsner AJ. *A Handbook of Appendicitis*. GP Engelhard; c1906.
19. Wani MM, Yousaf MN, Khan MA, BabaAbdul A, Durrani M, Wani MM, *et al*. Usefulness of the Alvarado scoring system with respect to age, sex and time of presentation, with regression analysis of individual parameters. *Internet Journal of Surgery*. 2007;11(2):1-5.
20. Velanovich V, Satava R. Balancing the normal appendectomy rate with the perforated appendicitis rate: implications for quality assurance. *The American Surgeon*. 1992 Apr 1;58(4):264-9.
21. Alvarado A. A practical score for the early diagnosis of acute appendicitis. *Annals of Emergency Medicine*. 1986 May 1;15(5):557-64.
22. Ergul E, Ucar AE, Ozgun YM, Korukluoglu B, Kusdemir A. Family history of acute appendicitis. *Journal of the Pakistan Medical Association*. 2008 Nov 1;58(11):635-7.
23. Chong CF, Thien A, Mackie AJ, Tin AS, Tripathi S, Ahmad MA, *et al*. Comparison of RIPASA and Alvarado scores for the diagnosis of acute appendicitis. *Singapore Medical Journal*. 2011 May 1;52(5):340.
24. Kapoor S, Kumar P, *et al*. Acute Appendicitis: A Comparative Study of Clinical, Radiological and Operative Findings. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*. 2016 Jul;15(7):36-42.
25. Pinto F, Pinto A, Russo A, Coppolino F, Bracale R, Fonio P, *et al*. Accuracy of ultrasonography in the diagnosis of acute appendicitis in adult patients: review of the literature. *Critical Ultrasound Journal*. 2013 Dec;5(1):1-3.
26. Meena R, Neniwal VK, Meena A, Sharma P, Khandelwal M. Application of Alvarado Scoring System in Diagnosis of Acute Appendicitis.
27. Goel P, Mishra RK, Sharma R, Singla M, Niket A. The Study to Evaluate the Efficacy of Alvarado Score and RIPASA Score in Diagnosis of Acute Appendicitis and Correlation with Intra Operative and Pathological Findings. *Annals of International Medical and Dental Research*; c2017, 3(6).
28. Verma M, Vashist MG, Goyal K, Yadav P. Comparison of Alvarado and RIPASA scoring systems in diagnosis of

acute appendicitis. *Indian Journal of Research*. 2015;4:55-7.

#### How to Cite This Article

Reddy SSSP, Prashanth YV, Stallin K. A comparative study of RIPASA score and modified Alvarado score in diagnosis of acute appendicitis. *International Journal of Surgery Science*. 2024;8(2):26-32.

#### Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.