ORIGNAL ARTICLE

COMPARING RIPASA SCORE AND ALVARADO SCORE IN AN ACCURATE DIAGNOSIS OF ACUTE APPENDICITIS

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Background: The clinical diagnosis of acute appendicitis remains difficult despite the use of different scoring systems. A high rate of negative appendectomies is no longer acceptable. This study was aimed to compare RIPASA score and Alvarado score in Pakistani population for the diagnosis of acute appendicitis using histopathology as a gold standard. **Methods:** This cross-sectional prospective study was carried out from January to September 2018 in the Accident and Emergency Department and Department of Surgery, Khyber Teaching Hospital, Peshawar. Patients clinically suspected as acute appendicitis aided by routine ultrasound were included in the study. RIPASA and Alvarado scoring were done in all patients. After appendectomies, specimen was sent for histopathological examination. A score of 7.5 was considered as optimal cutoff threshold for RIPASA and 7 for Alvarado score. Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and accuracies of both scores were calculated. **Results:** A total of 300 patients were included in the study. The mean age of patients was 28±10.0 years and there were 176 males. Sensitivity, Specificity of RIPASA score and Alvarado score was found to be 98.52% and 90%, and 68.15% and 80% respectively. Positive Predictive Value and NPV of RIPASA score was 98.88% and 97.67% as compared to 96.84% and 21.82% for Alvarado score. Diagnostic accuracy of RIPASA and Alvarado score was 97.67% and 69.33% respectively. **Conclusion:** RIPASA scoring system is a more accurate, sensitive and specific indicator of diagnosing acute appendicitis as compared to Alvarado scoring system

Keywords: RIPASA; Alvarado; Acute Appendicitis

Citation: Noor S, Wahab A, Afridi G, Kaleemullah. Comparing RIPASA score and Alvarado score in an accurate diagnosis of acute appendicitis J Ayub Med Coll Abbottabad 2020;32(1):38–41.

INTRODUCTION

Acute appendicitis is the most common surgical emergency presenting to the accident and emergency department having a lifetime prevalence of about 7%.[1] The incidence is 1.5 to 1.9/1000 and is greater in men as compared to women.[2] Appendectomy is the most commonly performed emergency operation and can mimic other acute conditions of the abdomen known to cause right iliac fossa pain.[3] Although appendicitis is a common problem presenting to the Accident and emergency department, its diagnosis remains difficult and is mainly clinical helped by a few laboratory investigations such as a high white blood cell count.[4] A negative appendectomy is a surgery performed for a clinically diagnosed case of acute appendicitis that turns out to be negative on histopathological examination. A high rate of negative appendectomies 20–25% was considered as acceptable in the middle of 19th century so as to reduce the risk of perforated appendicitis.[5] High negative appendectomy rates are no longer acceptable.[6] A number of scoring system have been suggested to decrease the number of negative appendectomies being carried out in the surgical departments. Alvarado and Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scores have been used to clinically diagnose cases of acute appendicitis accurately. These scores involve clinical history, physical examination and certain laboratory investigations. RIPASA score is more extensive than Alvarado score and in addition to the variables in Alvarado score includes age, gender, urinalysis, guarding, Rovsing sign and Asian origin which are absent in the Alvarado score.[7] Alvarado scoring system was mainly developed for western population and showed lower rates of sensitivity and specificity for Asian population when compared with RIPASA scoring system[8]. We prospectively compared Alvarado and RIPASA score by subjecting all the patients who were clinically suspected of acute appendicitis to these scoring systems so as to find a more accurate method to predict acute appendicitis.

MATERIAL AND METHODS

This cross-sectional prospective study was carried out from January to September 2018 in the Accident and Emergency Department and Department of Surgery, Khyber Teaching Hospital, Peshawar. Institutional ethical clearance was obtained from the department prior to the start of this study. Informed written consent was taken from all the patients who were to be included in the study. All patients who were

clinically suspected of having acute appendicitis aided by ultrasound examination were included in the study. Children below 14 years of age, pregnant women, those with appendicular mass and features of peritonitis were excluded from the study. RIPASA and Alvarado scoring were done for all patients who qualified for the study. Alvarado scoring was done on the basis of 8 parameters whereas RIPASA score contained a total of 18 parameters as demonstrated in [Table-1,2] respectively. The threshold for Alvarado score was taken as 7 while that for RIPASA was taken as 7.5 and both scores were considered to be positive when above 7 and 7.7 respectively. The selected patients underwent appendectomies and the sample retrieved was sent for histopathology. Patients were followed post-operatively to look for any complications till their discharge and then were re-examined in the outpatient department a week later. Histopathological findings were then documented to identify positive as well as negative appendectomies and results were correlated with both the scores. Scores were tabulated and chi square test was used to compare categorical variables using SPSS version 20. *p*-value of less than 0.05 was taken as significant.

RESULTS

The study comprised of 300 patients who underwent appendectomies. The mean age of patients was 28±10.0 years and constituted of 176 males and 124 females. Alvarado score was greater than 7 in 190 patients and less than 7 in 110 whereas RIPASA score was positive in 269 patients and negative in 31 as shown in [Table-3,4] respectively. A combined score wise distribution of patients based on Alvarado and RIPASA score is given in [Table-5]. Application of fisher's test shows a positive correlation with regards to diagnosis of the disease. (p<0.0001)

Alvarado score was greater than 7 in 190 patients of which 184 tested positive for appendicitis on histopathology while the score was less than 7 in 110 of which 86 tested positive and 24 tested negative [Table-6]. RIPASA score was more than 7.5 in 269 of which 266 tested positive while 3 negatives for appendicitis. Thirty-one patients had a RIPASA score of less than 7.5 of which 4 tested positive while 27 negatives on histopathology [Table-7].

Sensitivity, specificity, negative predictive, positive predictive values and accuracies for both Alvarado score was found to be 68.1%, 80%, 21.82% and 96.84% while that of RIPASA was 98.5%, 90%, 87.10% and 98.88%. The accuracies of Alvarado and RIPASA scores were 69.33% and 97.67% respectively as shown in [Table-8]. Negative appendectomy rate for Alvarado score was 20% and that for RIPASA score was 10%.

Table-1: Alvarado score parameters

Characteristics	Score
Pain Migrating to RIF	01
Anorexia	01
Nausea-Vomiting	01
RIF Tenderness	02
Rebound Tenderness	01
Elevated Temp/ Fever	01
Leukocytosis	02
Shift to Left	01
Total Score	10

Table-2: RIPASA score parameters

Characteristics	Score
Male	1.0
Female	0.5
Age < 39.9 years	1.0
Age > 40 years	0.5
RIF Pain	0.5
Pain Migrating to RIF	0.5
Anorexia	1.0
Nausea/ Vomiting	1.0
Duration of symptoms < 48 hrs.	1.0
Duration of symptoms > 48 hrs.	0.5
RIF Tenderness	1.0
RIF Guarding	2.0
Rebound Tenderness	1.0
Rovsing Sign	2.0
Fever	1.0
Elevated WBC	1.0
Negative Urinalysis	1.0
Foreign NIC	1.0
Total score	17.5

Table-3: Alvarado score wise distribution

Score	Frequency	Percentage
>7	190	63.3
<7	110	36.7

Table-4: RIPASA score wise distribution

Score	Frequency	Percentage
>7.5	269	89.7
<7.5	31	10.3

Table-5: Combined distribution

	RIPASA >7.5	RIPASA <7.5	Total
Alvarado >7	180	10	190
Alvarado <7	89	21	110
Total	269	31	

Table-6: Histopathology and Alvarado

Alvarado Score	Histopathology		Total
	Positive	Negative	
>7	184	6	190
<7	86	24	110
Total	270	30	300

Table-7: Histopathology and RIPASA

RIPASA score	Histopathology		Total
	Positive	Negative	
>7.5	266	3	269
<7.5	4	27	31
Total	270	30	300

Table-8: Comparing Alvarado and RIPASA score

	Alvarado	RIPASA	*p*-value
Sensitivity	68.1%	98.5%	<0.0001
Specificity	80%	90%	0.0006
NPV	21.82%	87.10%	<0.0001
PPV	96.84%	98.88%	0.0845
Accuracy	69.33%	97.67%	<0.0001

DISCUSSION

Acute appendicitis is a frequently presenting surgical emergency to the emergency department throughout the world especially in younger individuals less than 30 years of age, with emergency appendectomies amounting to about 10% of all abdominal surgical procedures performed in the emergency department.[9–11] Clinical assessment by a surgeon is considered the most important element in diagnosing acute appendicitis. Making a decision when to perform appendectomy only on one's clinical approach results in high appendectomy rates of 15–30%.[12,13] Although contrast enhanced computerized tomography (CECT) scan can achieve high levels of sensitivity and specificity, it is not possible to subject all patients suspected of acute appendicitis to CECT particularly in countries with lack of resources.[14] A number of scoring systems have been developed in this regard of which RIPASA and Alvarado are commonly used. This study was conducted to compare both scoring systems in Asian population so as to find a better score with greater sensitivity, specificity and accuracy. In our study the sensitivity, specificity of RIPASA score was found to be 98.52%, 90%, and that of and Alvarado score was 68.15% and 80% respectively. PPV and NPV of RIPASA score was 98.88% and 97.67% as compared to 96.84% and 21.82% for Alvarado score. Diagnostic accuracy of RIPASA and Alvarado score was 97.67% and 69.33% respectively.

A study conducted by Dey *et al* reported a sensitivity and specificity of 94.2% and 70% and a PPV, NPV of 86.9% and 69.80% respectively for Alvarado score.[15] This was significantly different and better from the values reported in our study. Khan *et al* is his study reported a sensitivity, specificity of 59% and 23% when applied to Asian population as compared to 68.15% and 80% in our study. Negative appendectomy rate is this study was 15.62% as compared to 20% in our study.[16] A retrospective study conducted by Chong *et al* reported a sensitivity and specificity of 88% and 67% respectively. Positive and negative predictive values were reported as 93% and 53% with a diagnostic accuracy of 81%.[7] As compared to our study the sensitivity was 10% while specificity was significantly lower. PPV was comparable but NPV was much lower as compared to our study. The diagnostic accuracy in this study was also much lower than our study. Another study reported a sensitivity of 93.2% and 73.7% for RIPASA and Alvarado score which was comparable with our study although specificity for RIPASA was much lower than our study.[17] Regar MK *et al* reported results that were comparable with those in our study.[3] A study conducted in Kohat Pakistan to find the usefulness of RIPASA score reported results similar to our study.[18] Another study done in India also reported similar findings to those observed in our study.[19]

CONCLUSION

RIPASA scoring system has better accuracy, sensitivity, specificity, PPV, NPV and negative appendectomy rates as compared to Alvarado scoring when applied to Pakistani population.

AUTHORS' CONTRIBUTION

SN: Concept of study design, literature search, data collection. AW: Data collection, interpretation. GA: Data collection, proof reading and writing. KU: Data analysis, write-up, correspondence between authors and patient follow-up.

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Submitted: 11 November, 2018	*Revised: 14 November, 2018*	*Accepted: 4 August, 2019*

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