



“EVALUATING RIPASA SCORE IN THE DIAGNOSIS OF ACUTE APPENDICITIS”

Surgery

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ABSTRACT

Background: Acute appendicitis is one of the commonest causes for acute abdomen. Having understood that clinical evaluation provides the most accurate diagnostic modality for appendicitis, many clinical scoring systems have been developed over the years. Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score is a newer scoring system developed in 2008, where a study was done in RIPAS Hospital, Brunnei, to find a more favourable scoring system. A randomized control trial was done comparing the RIPASA and Alvarado scoring systems. **Aims And Objectives:** To evaluate the efficacy, sensitivity and specificity of RIPASA score in diagnosis of Acute appendicitis. **Methods:** This was a prospective observational study. Sample Size was 210 patients. Ripasa score was calculated on the basis of history, clinical findings, radiological investigations and laboratory investigations if managed conservatively or if operated on the basis of histopathological findings. Results: The sensitivity of RIPASA was (92.20%). The specificity was (91.30%). P value at cut off score of 7.5 was <0.001. **Conclusion:** The RIPASA score is a simple scoring system with high sensitivity and specificity for the diagnosis of acute appendicitis. The 14 clinical parameters are all present in a good clinical history and examination and can be easily and quickly applied. Therefore, a decision on the management can be made early.

KEYWORDS

RIPASA score, Acute Appendicitis, RIF pain, Appendicectomy

INTRODUCTION

As quoted by *Bailey & Love*, “Notwithstanding advances in modern radiographic imaging and diagnostic laboratory investigations, the diagnosis of appendicitis remains essentially clinical, requiring a mixture of observation, clinical acumen, and surgical science”.⁽¹⁾ Acute appendicitis is one of the commonest causes for acute abdomen in any general surgical practice.⁽²⁾

From the time that it was first described by Reginald Heber Fitz in 1886,⁽³⁾ it has remained a topic of serial research works for various factors ranging from its aetiology, to its management options. One of the most researched fields pertaining to appendicitis is the one involving diagnosis. Over the years various types of investigations including laboratory and radiological, have been studied in detail with the aid of trials.

Appendicitis, which if caught early and managed appropriately can be the most uneventful surgery, while the other end of the spectrum is also true, that when missed, appendicitis can turn into a disease with great morbidity and mortality. Hence, having understood the importance for early and right diagnosis, and having understood that clinical evaluation provides the best and most accurate diagnostic modality for appendicitis, many clinical scoring systems have been developed over the years.⁽⁴⁾ This has aided the clinician to a large extent in coming to the right diagnosis and providing early management.

Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score is a fairly newer scoring system developed in 2008, where a study was done in RIPAS Hospital, Brunnei Darssalem,^(5,6) to find a more favourable scoring system than Alvarado and Modified Alvarado as these were found to have poor sensitivity and specificity in Middle Eastern and Asian population. Following the development of it, a randomized control trial was also done at the same hospital comparing the RIPASA and Alvarado scoring systems and proving the superiority of the former over the latter.

In this study we were **Evaluating RIPASA score in the diagnosis of Acute Appendicitis.**

MATERIALS AND METHODS

This was a prospective observational study carried out at Sir Sayajirao General Hospital from February 2020 to November 2020 and achieved Sample Size- 210 patients. All patients presenting with RIF pain and clinically diagnosed as acute appendicitis were included. Patients presenting with non-RIF pain and those who have been

admitted by other specialties for other complains but who subsequently developed RIF pain and Patient with generalized peritonitis were excluded from the study.

Written informed consent was taken for clinical examination. A Detailed history had been taken and clinical examination and investigations will be performed. And RIPASA scoring system applied on patient according to criteria. Prospective evaluation of the RIPASA score was done by the completion of the score sheet.

Data regarding patients' admission and discharge dates, date of appendicectomy if performed, name and signature of confirming surgeon, post-operative complications and use of radiological investigations recorded in the score sheet.

If appendicetomy performed than the histopathological specimen was sent to histo-pathology laboratory and follow up had been taken, after histo-pathology report came comparison of RIPASA scoring system done with the diagnosis given by histo-pathology report. Those who were managed conservatively and discharged, the efficacy of RIPASA scoring system was done by comparing it with the results of usg abdomen or CECT abdomen+ pelvis.

RIPASA Score:

PARAMETER		SCORE
SEX	MALE	1.0
	FEMALE	0.5
AGE	<40.0	1.0
	>40.0	0.5
RIGHT ILIAC FOSSA(RIF) PAIN		0.5
MIGRATION OF RLQ PAIN		0.5
ANOREXIA		1.0
NAUSEA AND VOMITING		1.0
DURATION OF SYMPTOMS	<48HRS	1.0
	>48HRS	0.5
RIF TENDERNESS		1.0
RIF GAURDING		2.0
REBOUND TENDERNESS		1.0
ROVING'S SIGN		2.0
FEVER		1.0
RAISED WBC		1.0
NEGATIVE URINE ANALYSIS		1.0
Foreign NRIC		1.0

Management guidelines for patients presenting with RIF pain suspected of acute appendicitis.

TOTAL RIPASA SCORE	
<5.0	Probability of acute appendicitis is unlikely, observe patient in the day-ward and repeat score after 1 to 2 hrs, if reducing score, discharge and review in clinic. If increasing score, treat according to score level.
5.0-7.0	Low probability of acute appendicitis, observe in the day-ward and repeat scoring after 1 to 2 hrs and perform radiological investigations (abdominal ultrasound) to rule out acute appendicitis. If reducing score, discharge and review in clinic. If increasing score or no change, patient may need admission for observations, discussed with surgeon on-call.
7.5-11.5	Probability of acute appendicitis high, refer patient to on-call surgeon for admission and repeat score in 1 to 2 hours time. If remain high, prepare patients for appendicectomy procedure. In female patients, suggest perform radiological investigations such as an abdominal ultrasound investigations to rule out gynaecological causes of RIF pain
>12.0	Definite acute appendicitis, refer to surgeon on-call for admission an appendicectomy. Keep nil by mouth. Start appropriate antibiotics based on institutional antibiotic guidelines.

The patients with RIF pain will evaluate and managed on basis of RIPASA score, though the decision of appendicectomy solely based on surgeon's own clinical judgment for this prospective study.

Usg criteria for the diagnosis of acute appendicitis for patient who managed conservatively.⁽⁷⁾

Acute appendicitis: - diameter >8mm Raised vascularity
Features of complicated appendix: - free fluid, air foci, Breach in appendicular wall, fluid collection around it, lump formation.

CECT Abdomen and Pelvis criteria for the diagnosis of acute appendicitis for patient who managed conservatively⁽⁸⁾:

appendicular diameter more than 6 mm, presense of wall thickening, wall hyper enhancement with or without fat stranding.

Those who undergone appendicectomy, the efficacy of scoring system in that patient done by comparing it with histopathology report of sent specimen.

Histopathological criteria for diagnosis of acute appendicitis for operative cases.⁽⁹⁾

Inflammatory infiltrates up to muscularis mucosa and serosa. Acute appendicitis: neutrophilic infiltrates.

Statistical Analysis

A score of 7.5 was the optimal cut off threshold for RIPASA scoring system. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of the test derived after applying diagnostic test. Using the Chi-square test, statistical analysis had been done and P value for this study found to established its statistical significance of this study at 7.5 cut off score.

RESULTS

In this study of 210 patients, we found that majority of patient of right iliac fossa were belongs to age group less than 40 years In this study we found that Acute Appendicitis is more common in <40 yrs age patient.

Tablet 1: Age Wise Distribution Of The Patients In The Study

AGE GROUP	No. of Patients	Percentage(%)
1month-15 years	40	19.04
16years-30years	67	31.90
31years-45years	56	26.66
46years-60years	26	12.38
61years-75years	15	7.14
76years-90years	06	2.85
Total	210	100

Table 2: Age Wise Distribution Of The Patients Who Diagnosed As Appendicitis

AGE GROUP	No. of Patients	Percentage
1month-15 years	32	22.69
16years-30years	50	35.46
31years-45years	30	21.27
46years-60years	17	12.05
61years-75years	09	6.38
76years-90years	03	2.12
Total	141	100

Out of this 141 patients 137 patients managed by Appendicectomy and diagnosis was confirmed by histopathology report, and 4 patient are managed conservatively and out of 4, diagnosis of 2 patient confirmed on basis of CT report and other 2 patient's diagnosis confirmed by Usg report.

Table 3: Symptoms frequency distribution.

SYMPTOMS	FREQUENCY	PERCENTAGE(%)
RIF pain	210	100%
Anorexia	66	31.42%
Nausea and Vomiting	71	33.80%
Migration of pain to RLQ	196	93.33%
Fever	154	73.33%
Duration of symptoms <48 hrs	76	36.19%

According Table 3 right iliac fossa pain was present in all the 210 patients in the study group. Anorexia was present in 66 patients. Nausea and vomiting was present in 71 patients. Pain migration was present in 196 patients. Patients presenting with duration of symptoms less than 48 hours were 76 and fever was present in 154 patients. (Patient may have more than one symptom.)

Table 4: Signs Frequency Distribution

SIGNS	FREQUENCY	PERCENTAGE(%)
RIF tenderness	173	82.38%
RIF Guarding	108	51.42%
Rovsing sign	32	15.23%
Rebound tenderness	67	31.90%

According Table 4 RIF tenderness was present in 173 patients in study group. Rebound tenderness was present in 67 patients, Rovsing sign was present in 32 patients and RIF guarding was present in 108 patients.

Table 5: Patients In This Study According To Wbc Count

Diagnosis	No. of cases	No of patients with raised Wbc Count
Appendicitis	141	124
Other than appendicitis	69	36

According Table 5 out of 141 patients who diagnosed as acute appendicitis, 124 of their CBC reports shows raised wbc count (>11,000wbc/cumm) and out of 69 patients who diagnosed other than acute appendicitis, 36 of their CBC reports shows raised wbc count.

In this study out of 210 patient 37 patient present with urinary complaint and present pus cells in their urine microbiology report.

Table 6: Distribution Of Patients According To Ripasa Scoring System

Category in RIPASA scoring system	Score	No. of patient
Unlikely(U)	<5	20
Low probability(LP)	5.0-7.0	58
High probability(HP)	7.5-12	102
Definite(D)	>12	30
TOTAL		210

Out of total 210 patients of RIF pain 78 patients had <7.5 RIPASA score, and 132 patients had score ≥7.5.

Table 7: Distribution of patients according to diagnosis (on basis of usg/ct scan for patient managed conservatively and histopathology report for patient undergoing operative intervention)

Diagnosis	No. of Patients	Percentage
Acute appendicitis	118	56.16%

Acute on chronic appendicitis	08	5.67%
Complicated appendix(mucocele, perforated appendix, ruptured appendix, appendicular lump, appendicular abscess)	15	7.14%
Iliocecal Tuberculosis	22	10.47%
Mesenteric adenitis	10	4.76%
Mesenteric cyst	1	0.47%
Ruptured ectopic pregnancy	3	1.42%
Torsion of rt. Ovarian cyst	5	2.38%
Right uretric stone	13	6.19%
Right sided pyelonephritis	7	3.33%
Ca.Cecum	4	1.90%
Cystitis	4	1.90%
Total	210	100%

Table 8: Comparison of RIPASA scoring system with HP report/CT/USG diagnosis

	Appendicitis (Based on HP/CT/USG report)	Diagnosed other than appendicitis (Based on HP/CT/USG report)	Total
RIPASA Positive (D and HP)	130	6	132
RIPASA Negative (LP & U)	11	63	78
Total	141	69	210

After the comparison of RIPASA score to Histopathology report/CECT abdomen pelvis/USg abdomen by applying diagnostic test we found that the Sensitivity of RIPASA scoring system is 92.20% and Specificity is 91.30%, Positive predictive value(PPV) is 95.59% and Negative predictive value(NPV) is 85.14%.

Table 9: RIPASA score and operative management :

RIPASA score	Operative intervention done(decision taken by surgeon on call)	Patient managed conservatively (decision taken by surgeon on call)	Total	P value
<7.5	12	62	74	<0.0001
≥7.5	125	11	136	
	137	73	210	

According to table 9 operative intervention done in total 137 patient, this decision was taken by surgeon on call after clinically evaluating the patient and after evaluating the investigation reports of patient. Out of that 137 patient 125 patients had RIPASA score of ≥7.5 and 12 patient has RIPASA score of <7.5(this all diagnosed as acute appendicitis by HP report). Total 73 patient managed conservatively after clinically evaluated by on call surgeon and by evaluating his/her investigation report, out of that 73 patient only 11 has RIPASA score of ≥7.5 and 62 patient has RIPASA score of <7.5(out of this 73, 4 patient diagnosed as Acute appendicitis on basis of CT/USG).

Chi-square test applied on this table and P value for that is <0.001, which is suggest that if RIPASA score is ≥7.5 then patient may required operative intervention for Acute Appendicitis. And cut off value of 7.5 for diagnosis of acute appendicitis in RIPASA score is statistically significant.

DISCUSSION

Acute appendicitis is one of the most common surgical emergencies encountered in the world particularly in age group less than 30 years. A good clinical acumen is considered to be the most important requisite in the diagnosis of acute appendicitis. Several other conditions can mimic this condition. Only CECT abdomen can diagnose this condition with high sensitivity and high specificity, but it is not feasible to get this investigation done for each and every patient suspected to have acute appendicitis, particularly in countries with limited resources.

From the time the concept of clinical scoring systems have been introduced, multiple studies have been done in search of the most sensitive, specific and diagnostically accurate clinical scoring system to aid in the diagnosis of acute appendicitis.

The RIPASA score is a simple and easy to use quantitative scoring system and most of these 14 clinical parameters are easily obtained from a good clinical history and examination. This also include a

urinalysis which can be easily performed on the spot. Hence a score can be obtained quickly and a rapid diagnosis made without having to wait for the full investigations to be available when a score of >7.5 is obtained. Therefore, a decision on the management can be made early. So we planned to evaluate the RIPASA scoring system for diagnosis of acute appendicitis.

In this study all 210 cases admitted in the department of general surgery were evaluated as described earlier in the patients and methodology. All the patients were appropriately assessed and Managed accordingly.

Age:

In this study mean age was 32.89 years, these findings suggest that acute appendicitis is more common in people age <40 years. A study by Regar MK et al, included clinically suspected 100 cases, with 91% patients in <40 years age group and 9% patients in ≥40 years. Mean age of the patients was 24.86 years⁽¹⁰⁾. In a study by Nanjundaiah N et al 87% cases were below 40 year of age and 13% cases were above 40 years of age⁽¹¹⁾. In study by Chong et al of 144 cases of suspected acute appendicitis, mean age of patients were 29.5 ± 13.3 yrs.⁽⁵⁾

Gender:

In this study out of 210 cases of RIF pain cases 146 were male and 64 cases were female; from this 210 total patients, 141 patients were diagnosed as acute appendicitis out of this 141 patients 109 were male and 32 patients were female. A study by Regar MK et al, included clinically suspected 100 cases, 61 cases were male and 39 cases were female. A study by Bhatnagar SP et al, included 100 patients with RIF pain, 71 patients were male and 29 patients were female.

Symptoms frequency distribution in different studies:

In present study RIF pain was present in all the 100% patients in the study group. Anorexia was present in 31.42% patients. Nausea and vomiting was present in 33.80% patients. Pain migration was present in 93.33% patients. Patients presenting with duration of symptoms less than 48 hours were 36.19% and fever was present in 73.33% patients.

In a study by Regar MK et al, included clinically suspected 100 cases symptoms such as migration of pain to the RIF was present in 67% cases of acute appendicitis, anorexia in 93% cases, nausea and vomiting in 88%, and fever in 41% cases. RIF pain was present in all the cases of acute appendicitis.

In a study by Bhatnagar SP et al, included 100 patients with RIF pain, 100% had pain in the right iliac fossa. 84% and 89% cases had complained of anorexia and nausea, vomiting respectively. History of migratory RIF pain was given by 89% cases. Fever (elevated temperature >37.5°C), were present in 49%.

In present study 36.16% had reported within 48 hours of appearance of symptoms. In study by Bhatnagar SP et al of appendicitis, 82% cases had reported within 48 hours of appearance of symptoms.⁽⁵⁾

Signs frequency distribution in different studies:

In present study signs such as RIF tenderness was present in 82.38% cases, rebound tenderness in 31.90% cases, guarding in 51.42% cases, Rovsing sign in 15.32% cases.

In a study by Regar MK et al, signs such as RIF tenderness was present in all the 100 cases of acute appendicitis, rebound tenderness in 94% cases, guarding in 5% cases, Rovsing sign in 29% cases.

In a study by Rodrigues W, Sindhu S. on about 105 patients with symptoms and signs of acute appendicitis, Right iliac fossa pain and rebound tenderness were observed in all the patients.⁽¹²⁾

In present study of 210 cases of RIF pain, 141 patients who diagnosed as acute appendicitis, 124 of their CBC reports shows raised wbc count (>11,000 wbc/cumm) and out of 69 patients who diagnosed other than acute appendicitis, 36 of their CBC reports shows raised wbc count.

In study by Bhatnagar SP et al, leucocyte count was less than 10,000 in 24% cases. In this study out of 210 patient 37 patient present with urinary complaint and present pus cells in their urine microbiology report.

In this study as per observation we found Average pulse rate in patients with acute appendicitis was 114/min, And Average pulse rate in patients had other diagnosis were 88/min.

Comparison Of Statistical Analysis Of Ripasa By Different Studies:

Chong *et al* developed a scoring system for diagnosis of acute appendicitis. He prospectively evaluates the RIPASA score for the diagnosis of acute appendicitis in 144 patients presenting to the Accident and Emergency department or the Surgical wards with right iliac fossa pain. The optimal cut-off threshold score from the ROC was 7.5, with a sensitivity of 97.5%, specificity of 81.8%, PPV of 86.5%, NPV of 96.4% and a diagnostic accuracy of 91.8%. ($p=0.3$).⁽⁶⁾

Butt *MQ et al* conducted a cross-sectional study on 267 patients and found RIPASA to have a sensitivity and specificity of 96.7% and 93% respectively. Its positive predictive value (PPV) was 98% and negative predictive value (NPV) was 95%. Hence they concluded that RIPASA was a great tool in diagnosis of acute appendicitis.⁽¹³⁾

In the **present study** RIPASA was found to have a sensitivity of 92.20%, specificity of 91.30%, positive predictive value (PPV) of 95.59%, a negative predictive value (NPV) of 85.14% and diagnostic accuracy being 91.90%.

CONCLUSION

The RIPASA score is a simple scoring system with high sensitivity (92.20%) and specificity (91.30%) for the diagnosis of acute appendicitis. The positive predictive value (PPV) of RIPASA score was (95.59%). The negative predictive value (NPV) of RIPASA was (85.14%). The diagnostic accuracy of RIPASA was (91.90%). P value at cut off score of 7.5 is <0.001 .

The 14 clinical parameters are all present in a good clinical history and examination and can be easily and quickly applied. Therefore, a decision on the management can be made early.

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