Original Article

Diagnostic Accuracy of RIPA-SA Score in Detecting Acute Appendicitis

Hunain[1], Uzma[1] and Saif Ur Rahman[2]

ABSTRACT

Objective: Determining the sensitivity and specificity of the RIPA-SA score is the main goal in evaluating its diagnostic accuracy in identifying acute appendicitis. Specificity evaluates the score's capacity to accurately identify real negatives, offering vital information about its clinical relevance, while sensitivity evaluates the score's capacity to properly detect true positives.

Study Design: A cross-sectional study

Place and Duration of Study: This study was conducted at the Department of General Surgery, Saidu Group of Teaching Hospital and Swat Medical Complex, Swat from January 2022 to December 2022.

Methods: Between January 2022 and December 2022, 224 acute appendicitis patients at the General Surgery Department of the Saidu Group of Teaching Hospital and the Swat Medical Complex in Swat participated in a cross-sectional research. Patients who had discomfort in the right iliac fossa (RIF) for less than seven days were recruited. Taking into account the surgical team's experience as well as imaging results, surgeons evaluated the surgical propensities of their patients. After the RIPA-SA score was assessed, scores based on fifteen distinct factors were produced. Based on the Receiver Operating Characteristic (ROC) study, the ideal cut-off threshold score was found to be 7.5.

Results: The overall mean age was 26.4 ± 8.98 years. Age-wise distribution of patients were as follows; 146 (65.2%) in 10-20 years, 36 (16.1%) in 21-30 years, 28 (12.5%) in 31-40 years and 14 (6.3%) in 41-50 years. Of the total 224 patients, there were 140 (62.5%) male and 84 (37.5%) female. Histopathology confirmed 128 positive cases of acute appendicitis, while the RIPA-SA score diagnosed 133 cases. There were 102 true negatives, 5 false negatives, 125 real positives, and 8 false positives among them. A 96.1% sensitivity, 92.7% specificity, 94.7% diagnostic accuracy, 94.0% positive-predictive-value, and 95.3% negative-predictive-value were all shown by the RIPA-SA score.

Conclusion: The present study indicated that the RIPA-SA score exhibited effective proficiency in identifying cases of acute appendicitis. Nevertheless, it achieves a balance by identifying cases early, thereby mitigating the risk of potential complications.

Key Words: Acute appendicitis, diagnostic accuracy, RIPA-SA score

INTRODUCTION

Acute appendicitis is a common surgical emergency, occurring in a range of 13% to 77%, with an average incidence of approximately 50%[1]. Acute appendicitis are frequently encountered affecting approximately one in seven individuals during their lifetime causing unbearable pain in the right lower side of abdominal region[2].

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The preoperative diagnosis of this common condition is challenging, emphasizing the importance of accurate diagnosis, clinical details, and prompt response. While imaging modalities such as ultra-sonography and computed tomography enable a more accurate diagnosis of acute appendicitis, their widespread availability is limited, particularly in countries. Confirmation of the diagnosis is typically achieved through histopathology, as evidenced by the presence of leukocytosis. The identification of acute appendicitis involves the neutrophils presence in the submucosa, mucosa, and lamina propria[3]. The primarily parameters involved in the acute appendicitis diagnosis are medical history, elevated count of white cell, clinical details, and other laboratory investigations. This difficulty in diagnosis of acute appendicitis arises due to the resemblance of signs and symptoms to various genitourinary and gynecological inflammatory conditions. Delaying an appendectomy results into increasing risk of sepsis and perforation in turns lead to higher mortality rate[4, 5].

Having the ability to accurately identify acute appendicitis is crucial for emergency department

doctors, since it is a prevalent ailment that often presents in the ER. This has led to the development of a plethora of grading systems that take clinical indications, symptoms, and test findings into account. The three components of this system are the Alvarado score, the Modified Alvarado score, and the RIPA-SA system.[6-8]. When compared to the Alvarado score, the new RIPA-SA scoring system for acute appendicitis shows much higher sensitivity, specificity, and diagnostic accuracy. When treating patients with right iliac fossa pain, a surgeon may decide early on to operate on those with a RIPA-SA score > 7.5; those with a score < 7.0 in the unit will either be monitored or released. A previous study focused on the RIPA-SA score, a revolutionary scoring system that demonstrated up to 88% and 67% of sensitivity and specificity, respectively[9]. Hence, the present study sought to explore the diagnostic precision of RIPA-SA in detecting acute appendicitis.

METHODS

From January to December 2022, 224 acute appendicitis patients at the Department of General Surgery, Saidu Group of Teaching Hospital, and Swat Medical Complex, Swat were studied in a cross-sectional research. Patients with right iliac fossa (RIF) discomfort for fewer than 7 days were included. Acute appendicitis has a 40% lifetime incidence [10]. Sample size was computed using confidence interval 95%, absolute precision 5%, and expected population proportion 40% (p=0.4). Consultant evaluated patients' surgical inclinations based on imaging and surgical team skills. The RIPA-SA score was calculated from 15 parameters with scores. The appropriate cut-off threshold score was 7.5, according to ROC analysis. SPSS 27 was used for descriptive statistics. For quantitative data like age, mean and standard deviation were used; for qualitative data like gender, frequency and percentage estimates were used. RIPASES score was provided as a 2 x 2 table with sensitivity, specificity, diagnostic accuracy, positive and negative predictive values.

RESULTS

The average age was 26.4 ± 8.98 years. 146 (65.2%) patients were 10-20 years old, 36 (16.1%) 21-30 years old, 28 (12.5%) 31-40 years old, and 14 (6.3%) 41-50 years old. Out of 224 patients, 140 (62.5%) were male and 84 (37.5%) female. The RIPA-SA score detected 133 acute appendicitis patients, whereas histopathology confirmed 128. These included 125 real positives, 8 false positives, 5 false negatives, and 102 true negatives. RIPA-SA had 96.1% sensitivity, 92.7% specificity, 94.7% diagnostic accuracy, 94.0% positive-predictive-value, and 95.3% negative predictive value. Age distribution of patients is shown in Figure-1. Figure-2 shows RIPASES score sensitivity, specificity,

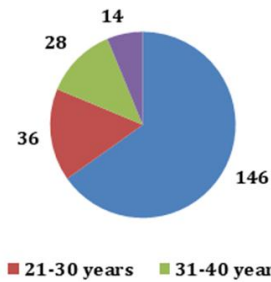diagnostic accuracy, positive and negative predictive values. RIPA-SA score frequency is presented in Figure-3.

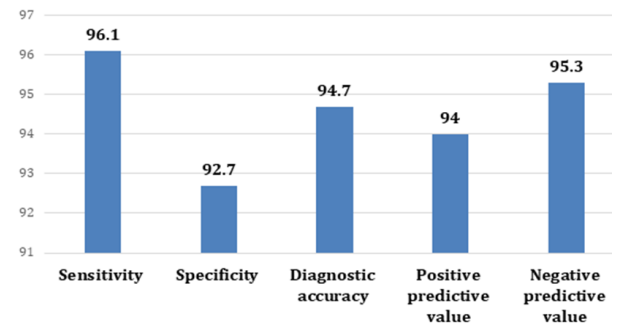
Figure No.1: Age-wise distribution of patients (N=224)

Figure No. 2: sensitivity, specificity, diagnostic accuracy, positive-predictive-value, and negative-predictive-value of the RIPASES score
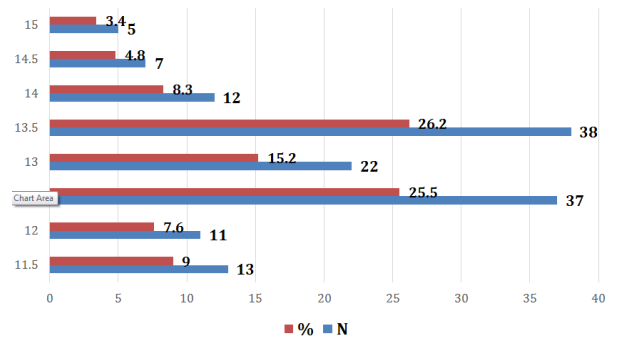

Figure No. 3: Frequency of RIPA-SA score (N=145)

DISCUSSION

Acute appendicitis poses a significant challenge as often associated with the risk of appendiceal perforation and peritonitis, leading to elevated mortality and morbidity rates[11]. Relying solely on a patient's signs and symptoms for the decision to perform surgery results in the removal of normal appendices, known as negative appendectomy, occurring in 15% to 30% of cases[12-14]. A more rational approach seeks to reduce both negative appendectomy and appendiceal rupture rates. The goal is to minimize unnecessary appendectomies without compromising the rate of appendiceal perforation[15,16]. Immediate surgical intervention is essential for acute appendicitis, a highly prevalent medical emergency[17]. Abdominal pain,

elevated temperature, guarding, anorexia, anorexia, and severe pain in right iliac fossa were common symptoms of acute appendicitis[18]. Numerous studies reported that higher sensitivity and specificity of CT scans could assist in primary revealing of AA[19-21].

RIPA-SA score is a new scoring system comprised of 14 factors determined through physical examination, clinical details, and laboratory investigations. A recent study reported that RIPA-SA score shown 88% and 67% sensitivity and specificity respectively that is more superior to 59% and 23% of Alvarado score[22]. Sharma et al.[23] In suspected instances of AA, the diagnostic accuracy of the Alvarado and RIPA-SA scores were compared. It was discovered that the latter is more superior to the former in terms of both sensitivity and diagnostic accuracy.

According to the current research, the RIPA-SA score showed 96.1% sensitivity, 92.7% specificity, 94.7% diagnostic accuracy, 94.0% positive-predictive-value, and 95.3% negative predictive value. Furthermore, Aslam et al[24] reported comparable findings, majority of cases were accurately diagnosed of AA based on (RIPA-SA score >7.5) and receiving appropriate treatment.

The RIPA-SA score proves to be a valuable diagnostic tool for the detection of acute appendicitis. A significant majority of patients could be accurately categorized as acute appendicitis high probability or low probability following the urinalysis, clerking completion, and clinical examination without considering of elevated white cells. In limited cases of acute appendicitis, patients wait for the elevated white cell.

CONCLUSION

The present study indicated that the RIPA-SA score exhibited effective proficiency in identifying cases of acute appendicitis. Nevertheless, it achieves a balance by identifying cases early, thereby mitigating the risk of potential complications. This advantage is counterbalanced by its lower specificity, leading to a slightly higher negative appendectomy rate and the associated morbidity and mortality linked to unnecessary surgical interventions.

Author's Contribution:

Concept & Design of Study:	Uzma
Drafting:	Hunain, Saif Ur Rahman
Data Analysis:	Saif Ur Rahman
Revisiting Critically:	Uzma, Hunain
Final Approval of version:	Uzma

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Mumtaz H, Sree GS, Vakkalagadda NP, Anne KK, Jabeen S, Mehmood Q, et al. The RIPA-SA scoring system: A new Era in appendicitis diagnosis. Annals Med Surg 2022;80:104174.

2. Heiranizadeh N, Mousavi Beyuki SM, Kargar S, Abadiyan A, Mohammadi HR. Alvarado or RIPA-SA? Which one do you use to diagnose acute appendicitis? A cross-sectional study. Health Science Reports 2023;6(1):e1078.

3. Nanjundaiah N, Mohammad A, Shanbhag V, et al. Abstract of: A Comparative Study of RIPA-SA and ALVARADO Score in the Diagnosis of Acute Appendicitis. J Clin Diagn Res 2014;8(11):NC03-NC05.

4. Zeb M, Khattak SK, Samad M, Shah SS, Shah SQA, Haseeb A. Comparison of Alvarado score, appendicitis inflammatory response score (AIR) and Raja Isteri Pengiran Anak Saleha appendicitis (RIPA-SA) score in predicting acute appendicitis. Heliyon 2022;9(1):e13013.

5. Singla A, Singla S, Singh M, Singla D. A comparison between modified Alvarado score and RIPA-SA score in the diagnosis of acute appendicitis. Updates Surg 2016;68(4):351-355.

6. Kularatna M, Lauti M, Haran C, MacFater W, Sheikh L, Huang Y, et al. Clinical prediction rules for appendicitis in adults: which is best? World J Surg 2017;41:1769-81.

7. Mathew G, Agha R, Albrecht J, Goel P, Mukherjee I, Pai P, et al. STROCSS 2021: strengthening the reporting of cohort, cross-sectional and case-control studies in surgery. Int J Surg Open 2021;37:100430..

8. Singh A, Parihar US, Kumawat G, Samota R, Choudhary R. To determine validation of RIPA-SA score in diagnosis of suspected acute appendicitis and histopathological correlation with applicability to Indian population: a single institute study. Ind J Surg 2018;80:113-7.

9. Shuaib A, Shuaib A, Fakhra Z, Marafi B, Alsharaf K, Behbehani A. Evaluation of modified Alvarado scoring system and RIPA-SA scoring system as diagnostic tools of acute appendicitis. World J Emerg Med 2017;8(4):276.

10. Frountzas M, Stergios K, Kopsini D, Schizas D, Kontzoglou K, Toutouzas K. Alvarado or RIPA-SA score for diagnosis of acute appendicitis? A meta-analysis of randomized trials. Int J Surg 2018;56:307-314.

11. Suresh P, Janardhanan R, Paul D. A comparative study of RIPA-SA and Alvarado score for the diagnosis of acute appendicitis. Int J Surg 2020; 7(12):406-410.

12. Parmeshwar T, Ghag GS, Nandu VV. RIPA-SA score or Alvarado score: diagnosing acute appendicitis. Int J Surg 2021;8(3): 879-884.

13. Rodrigues W, Sindhu S. Diagnostic importance of Alvarado and RIPA-SA score in acute appendicitis. Int J Sci Study 2017; 4(11): 57-60.

14. Damani S, Sagheer S, Shah H, Hashami A. Effective diagnosis of acute appendicitis–comparison of RIPA-SA and Alvarado scoring systems. J Surg Pak 2016;21(3):3-6.

15. Malik MU, Connelly TM, Awan F, et al. The RIPA-SA score is sensitive and specific for the diagnosis of acute appendicitis in a western population. Int J Colorectal Dis 2017;32(4): 491-497.

16. Regar MK, Choudhary GS, Nogia C, Pipal DK, Agrawal A, Srivastava H. Comparison of Alvarado and RIPA-SA scoring systems in diagnosis of acute appendicitis and correlation with intraoperative and histopathological findings. Int J Surg 2017;4(5): 1755-1761.

17. Chisthi MM, Surendran A, Narayanan JT. RIPA-SA and air scoring systems are superior to alvarado scoring in acute appendicitis: diagnostic accuracy study. Ann Med Surg 2020;59:138-142.

18. Pasumarthi V, Madhu C. A comparative study of RIPA-SA score and ALVARADO score in diagnosis of acute appendicitis. Int J Surg 2018; 5(3): 796-801.

19. Korkut M, Bedel C, Karancı Y, Avcı A, Duyan M. Accuracy of Alvarado, Eskelinen, Ohmann, RIPA-SA and Tzanakis scores in diagnosis of acute appendicitis; a cross-sectional study. Arch Acad Emerg Med 2020;8(1):20.

20. Shuaib A, Shuaib A, Fakhra Z, Marafi B, Alsharaf K, Behbehani A. Evaluation of modified Alvarado scoring system and RIPA-SA scoring system as diagnostic tools of acute appendicitis. World J Emerg Med 2017;8(4): 276.

21. Moussa BS, Ali MA, Mohamed DA, Shahhat AM. Comparing the diagnostic accuracy of modified RIPA-SA and MASS in patients diagnosed with acute appendicitis in Suez Canal University Hospital Emergency Department: a cross-sectional study. BMC Emerg Med 2022;22(1):1-9.

22. Jaiswal AK, Mathur SK, Kumar S, Tripathi DK, Kumari S. Comparative study of Alvarado score and RIPA-SA score in the diagnosis of acute appendicitis. Int Surg J 2023;10(9):1496-501.

23. Sharma K, Thomas S, Chopra A, Choudhury M. Evaluation of the diagnostic accuracy of Eight Reported Clinical Scoring Systems in the Diagnosis of Acute Appendicitis. Ind J Surg 2022; 84(4):741-8.

24. Aslam F, Adil S, Tahir S. The RIPA-SA score in comparison to the ALVARADO score for diagnosis of acute appendicitis. Profess Med J 2022;29(05):629-33.