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Original Research Article

A STUDY ON DIFFERENTIAL DIAGNOSIS OF RIGHT ILIAC FOSSA PAIN AND ROLE OF ALVARADO SCORE IN DIAGNOSIS OF ACUTE APPENDICITIS

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ABSTRACT

Background: Acute Appendicitis is one of major frequent causes of emergencies in surgical department in the world. Diagnosis uncertainty still persists despite there is advancements in imaging and clinical score systems. Because of its ease of Application and Clinical relevancy, Alvarado score is frequently used, but fewer studies have demonstrated its applicability among Indian population. Study is to assess the differential diagnoses of right iliac fossa (RIF) pain and evaluate the clinical utility of the Alvarado Score in diagnosing acute appendicitis in a tertiary care setting.

Materials & Methods: A hospital based-prospective study conducted at tertiary care Maheshwara medical college and teaching hospital during 2023 to 2025. A total of 150 patients, above >18 years who are presented with RIF pain was assessed based on Predefined definition.

Results: Of the 150 patients, most were between the ages of 41 and 50, and 60.7% were men. The two most prevalent clinical complaints were RIF tenderness (89.3%) and pain (96.7%). The most common diagnoses (30.7% each) were acute appendicitis and renal colic. In 26.7% of patients, Alvarado ratings between 7 and 8 were noted.

Conclusion: The Alvarado score is a helpful tool in the diagnosis of acute appendicitis, even though clinical observations and experience are crucial. The Alvarado scoring system is a quick, easy, reproducible, safe, and non-invasive diagnostic process. Recommend regular and early Screening of patients with Alvarado Score in all patients who are admitted with RIF pain.

Keywords: Right Iliac Fossa pain, Acute Appendicitis, Alvarado Score.

INTRODUCTION

Approximately 7–8% of people worldwide will experience acute appendicitis at some point in their lives, making it a common surgical emergency. In India, the prevalence is higher in people in their second and third decades of life, with recorded incidences ranging from 1.5 to 1.9 per 1,000 people annually. Misdiagnosis is usually seen despite there is an improvement in grading of appendicitis and imaging of diagnostics, which may result in delays of the treatment or not necessary appendectomies.[1,2]

Diagnosis generally incudes an combination of Radio-imaging methods, clinical tests, physical examination, history of patients, and grading systems. Because of its ease of application and clinical relevance, the Alvarado Score (AS) is one of the most used scoring systems.[3,4]

Migration of pain, anorexia, nausea or vomiting, rebound soreness, right lower quadrant tenderness (2 points), raised temperature rise to ≥37.3°C, leukocytosis (2 points), and neutrophilia are the eight characteristics of the Alvarado Score.6 Patients whose score is ≥4 are usually considered suitable for discharge, and in patients who score more than 7 are monitored, and those who score ≥8 have a significant chances of developing appendicitis and requires surgery.[5,6]

Because of symptoms that may overlap with possible abdominal illnesses, diagnostic challenges still persist in spite of its wide usage, particularly in

patients who are young and in elderly, and women who are in reproductive age group.

According to these studies, between 2 and 7% of patients who initially comes to emergency with suspected appendicitis may end up diagnosed different. Appendicitis usually cause complications like perforation, peritonitis, and septic shock if it is not identified and treated properly. To decrease the morbidity and mortality, early diagnosis and prompt surgical treatment are therefore essential.[7]

While the Alvarado Score has shown the sensitivities ranging from 75% to 86% and specificities between 59% and 80% across various populations, AS predictive value can change with age, gender, and demographic factors. However, a very few research have studies the Alvarado Score's in treating appendicitis in the Indian population, particularly in this study are. This study aims to assess the differential diagnoses of right iliac fossa (RIF) pain and evaluate the clinical utility of the Alvarado Score in diagnosing acute appendicitis in a tertiary care setting.

MATERIALS AND METHODS

This prospective observational study was conducted over a period of 1.5 years at the Department of surgery, Maheshwara Medical College, Hospital, Hyderabad. Patients aged 18 years or older with with Right iliac fossa pain on the basis of clinical assessment and hospital protocol were recruited based on predefined inclusion and exclusion criteria. Written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.[8]

Ethical clearance was obtained from the Institutional Ethics Committee (Reference No. MMCH/IEC/DESS-2022/038/2023).

Sample Size and Statistical Analysis

The study aimed to validate feasibility by assessing predefined inclusion and exclusion criteria over a two-year period. Based on the previous year's records of the hospital, A total of 150 patients were enrolled. Sampling Method is connivence sampling

Data were analysed using Stata 14.1 and normality of data were tested before applying parametric tests. Results are expressed as mean ± standard deviation, median, interquartile ranges, counts, and percentages. Categorical variables are compared using the Chi-square test, parametric/numerical data were analysed using T test, one-way ANOVA. A p-value < 0.05 was considered statistically significant.

Study Design

According to hospital protocol, patients with right iliac fossa pain of both sexes genders enlisted with their approval. Each patient received a comprehensive clinical evaluation upon admission, which included imaging such as abdominal ultrasonography and additional tests (e.g., ECG, chest X-ray) as needed, laboratory tests for haemoglobin, total and differential leukocyte count, blood sugar, blood urea, serum creatinine, and urinalysis, and a general physical and systemic examination. A standardized proforma was used to record clinical observations, date of operation, date of admission, and demographic information (age, gender, height, and weight). Grading method were used to evaluate each patient. (Fig-1)

Based on thorough clinical judgment, including the results of the investigation, history, and examination, the treating surgeon independently decided to proceed with the appendectomy. The results of the operation were recorded at the time of the procedure. Histopathological analysis of the removed appendices was performed, and the findings were utilized to validate the diagnosis. The diagnostic value of these findings was assessed by comparing them to both MASS and AIRS scores.

RESULTS

A total of 150 patients, 91 (60.7%) of them were male and 59 (39.3%) were female, who are admitted in hospital with right iliac fossa (RIF) pain. There were fewer patients in younger or older age categories, with the bulk of patients (47.4%) being between the ages of 41 and 50, followed by those between the ages of 51 and 60 (30%) (Table-1). With 96.7% of patients reporting pain, it was the most prevalent presenting symptom in clinical settings. This was followed by RIF tenderness (89.3%), nausea or vomiting (68.7%), and anorexia (66.7%). A mean neutrophil percentage of 63.8 ± 6.2 and a mean white blood cell count of 11,438.6 ± 1710.3 cells/mL (Table-2). Out of 150 patients, 30.7% of them underwent surgical option and 69.3% were treated Conservatively.

Acute appendicitis and renal colic accounted for 30.7% of the differential diagnosis of RIF pain, while mesenteric adenitis (8.7%), pelvic inflammatory disease (7.3%), gastroenteritis (6%), diverticulitis (6%), and urinary tract infection (6.7%) were the most common diagnoses (Table-3). Ovarian cysts (0.6%) and early appendicitis (3.3%) were identified in a minor percentage of individuals. According to the Modified Alvarado Score, 26.7% of patients had a score between 7 and 8, 49.3% received a score between 5 and 6, and 24% received a score between 0 and 4 (Table-4).

Higher Alvarado scores were significantly correlated with CT findings (RR = 1.6, 95% CI: 1.0–2.7, p = 0.001), although there was no significant relationship between the score and histological findings (RR = 0.9, p = 0.8) (Table-5).

Table: 1 Age Distribution of Study Population (N=150)

Age	Number	Percentage
18-30 years	5	3.3%
31-40 years	17	11.3%

41-50 years	71	47.4%
51-60 years	45	30%
>60 years	12	8%

Table 2: Distribution of Clinical Presentation among study patients (N=150)

Clinical Presentation	Number	Percentage
Pain	145	96.7%
Anorexia	100	66.7%
Nausea/Vomiting	103	68.7%
RIF Tenderness*	134	89.3%
Rebound Tenderness	98	65.4%
Fever	87	58%
Laboratory Investigation	Mean	SD
WBC Count (ml)	11438.6	±1710.3
Neutrophils (ml)	63.8	±6.2

RIF- Right iliac Fossa

Table 3: Distribution Differential Diagnosis of patients with Right Iliac Fossa pain among study patients (N=150)

variables	Frequency	Percentage
Acute Appendicitis	46	30.7%
Early Appendicitis	5	3.3%
Diverticulitis	9	6%
Gastroenteritis	9	6%
Mesenteric Adenitis	13	8.7%
Pelvic Inflammatory Disease	11	7.3%
Renal Colic	46	30.7%
UTI*	10	6.7%
Ovarian Cyst	1	0.6%

UTI- Urinary Tract Infection

Table 4: Distribution Alvarado score for diagnosing Appendicitis among study patients (N=150)

S. No.	Alvarado Score	Frequency	Percentage
1.	**0-4**	36	24%
2.	**5-6**	74	49.3%
3.	**7-8**	40	26.7%

Table 5: Comparison Alvarado score with CT, USG and Histopathological Findings

Alvarado Score	RR	95%CI	P value
CT findings	1.6	1.0-2.7	0.001*
Biopsy Positive	0.9	0.9-1.0	0.8

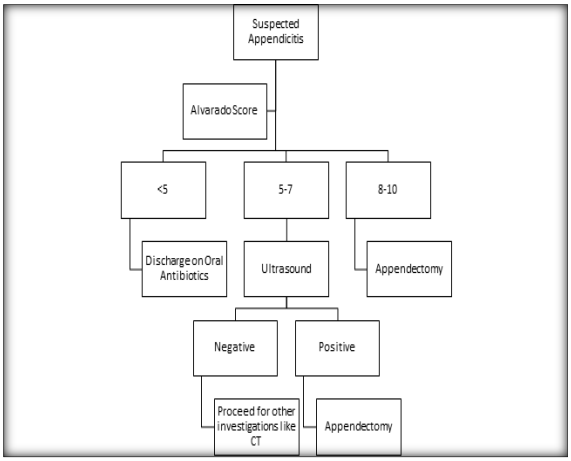

Figure 1: Criteria for Alvarado score diagnosis of AA

DISCUSSION

The Alvarado score is a straightforward, noninvasive diagnostic method that can be utilized in an emergency situation without the need for costly and sophisticated auxiliary diagnostic tools. It is also dependable, safe, repeatable, and cost-effective. Among 150 patients who gave consent for the study, the differential diagnosis was found to be 46 (30.7%) had acute appendicitis, 46 (30.7%) had renal colic, 13 (8.7%) had mesenteric adenitis, 11 (7.3%) had pelvic inflammatory disease, 9 (6%) each had diverticulitis and gastroenteritis, 10 (6.7%) had UTI, 5 (3.3%) had early appendicitis, and 1 (0.6%) had ovarian cysts. A study done by Gammeri E et al,[9] recorded that 27% of the study patients had appendicitis, 15% had gastroenteritis, and 10% had colonic diverticulitis. 88 One study conducted by Sayem shows that 61% of patients had appendicitis and 1% of the patients had diverticulitis. 96 Another study analyzed retrospectively shows that out of 158 patients, 53 had appendicitis, 48 stomach discomfort, 22 had lymphadenitis, and 5 had colitis and tumors.[10] These results are in line with a number of studies that show that the most common causes of RIF pain in both urgent and outpatient environments are ureteric colic and appendicitis.[11,12]

Other differentials observed were pelvic inflammatory illness 11 (7.3%), which usually affects women of reproductive age, and mesenteric adenitis 13 (8.7%), which is frequently observed in younger patients. Both diverticulitis and gastroenteritis, which can clinically resemble appendicitis, were seen in 9

(6%) of patients. Ovarian cysts, urinary tract infections, and early appendicitis were found in a small percentage of patients, highlighting the diagnostic difficulty in assessing RIF pain because to overlapping clinical signs. The diagnostic difficulty of RIF pain is reflected in this distribution, highlighting the use of imaging tools like CT and ultrasound in conjunction with clinical scoring methods such as the Alvarado score to help with prompt and precise diagnosis. These results highlight the need, which is corroborated by related research, to take into account a variety of differential diagnoses in females who present with right iliac fossa pain.[11-13]

In our study assessing the diagnosis of appendicitis by Alvarado score, 74 (49.3%) had a score between 5 and 6, followed by 40 (26.7%) of patients had a score of 7-8 and 36 (24%) patients with a score of 0-4. A cohort study conducted by caliskan,[14] showed that the 56% patients had 7-8 alavarado score, 28% had 5-6 and 7% 0-4. Sardar et al,[15] study showed that out of 67 patients, 67% with a score of 7-10, followed by 22.3% with a score of 4-6 and 10% with 1-4. The modified Alvarado score is currently the most often used score, despite the fact that several scoring schemes have been proposed to standardize clinical and laboratory evaluation for acute appendicitis. It is possible that the clinical-laboratory method performs quite modestly since there is still much room for improvement in terms of the clinical assessment. This is supported by studies that use this approach, and the Alvarado score also yields wildly contradictory results.[16,17] With these scores, the likelihood of appendicitis is determined. The lower performance with a cohort with right iliac fossa pain encompassing other illnesses can be explained by the fact that this affliction is not the only one that can cause pain in the right iliac fossa. Pre-treatment imaging should be used to further assess patients with low Alvarado scores.

Comparison of Alvarado Score with CT and HPE

A positive relationship was seen between the Alvarado score and CT findings; among 46 acute appendicitis confirmed cases of CT, 40 (87%) patients had a score of >7 and 6 (13%) patients had a score <7, with a significant p-value of <0.01. In contrast A study conducted by Erkan et al. [18] didn't show a significant difference; the observed difference could be due to differences in study setting and population. When we compared Alvarado scores with histopathological examinations among 46 patients who underwent surgery, we didn't find any statistically significant p-value >0.05; however, we have seen most patients found to have confirmed results, with 39 patients having positive results in>7 and 6 had positive results in <7. One patient had negative results in >7.

A study conducted by Sardar et al,[15] also showed biopsy-positive results of 10 out of 56 patients who underwent surgery. The observed difference could be due to a difference in the study's geographical area. Some studies conducted by Chan, Crnograc, and Gwynn,[19-21] also showed similar results to our study. Oankar et al,[22] study also showed similar results. 26 patients had positive HPE results in patients with a score >7. A study conducted by Rafique et al,[23] showed that the negative appendectomy rate was 20% in the patients who underwent surgery, 3.8% in the CT group, and 27.5% in the USG group, according to a comparison with the histopathological report. However, contemporary diagnostic techniques like ultrasonography are not required for individuals displaying typical clinical presentations of acute appendicitis based on the Alvarado score. Furthermore, in situations where the Alvarado Score was negative or unclear, the information provided by ultrasonography did not increase the diagnostic accuracy.

Study limitations: Despite its strengths, the study has notable limitations. Conducting the research in a single center restricts the generalizability of its findings to broader and more diverse populations. While the study findings corroborate the effectiveness of the Alvarado Score, potential limitations include the single-center nature of the study and no placebo. The study's design only records diagnosis and therapy at one moment in time, which restricts the ability to evaluate results and accuracy across time, especially for illnesses with changing clinical characteristics.

CONCLUSION

This study demonstrated the strong diagnostic utility of the Alvarado Scoring System in the diagnosis of acute appendicitis. Consistent with existing literature, the score significantly minimizes Chances of differential diagnosis. Therefore, the Alvarado score is a helpful tool in the diagnosis of acute appendicitis, even though clinical observations and experience are crucial. The Alvarado scoring system is a quick, easy, reproducible, safe, and non-invasive diagnostic process. we would like to recommend regular and early Screening of patients with Alvarado Score in all patients who are admitted with RIF pain. A Increase in score of Alvarado indicates clinicians to be more vigilant for Acute Appendicitis.

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