

Evaluation of the Accuracy of the AIRS Scoring System in Managing Acute Appendicitis

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 13 Oct 2023	Background: Appendix inflammation characterizes acute appendicitis, a common surgical emergency. In order to avoid complications, a precise and prompt diagnosis is essential. A potential diagnostic tool is the Appendicitis Inflammatory Response Score (AIRS) scoring system. The purpose of this study was to assess the reliability of the AIRS score in treating acute appendicitis in a particular patient population. Methods: At a Tertiary care facility in Karad, India, a prospective study was carried out between December 2020 and June 2022. Patients with right iliac fossa discomfort and a tentative diagnosis of acute appendicitis were admitted to the surgery department. Patients with immunity-compromising conditions are excluded from consideration. Based on clinical indicators, laboratory values, and radiological results, the AIRS score was generated. The AIRS score was taken into account when making surgical decisions. Results: 130 participants participated in the trial. The AIRS score showed strong specificity and sensitivity. Sensitivity was 94.4% and negative predictive value was 87.5% in the low-risk category (AIRS scores 1-2). The sensitivity was 85.6% and the positive predictive value was 84.0% in the moderate-risk group (AIRS scores 3-4). The high-risk group (AIRS score 5) demonstrated a sensitivity of 97.3% and a positive predictive value of 91.0%. Conclusion: To help in the diagnosis and treatment of acute appendicitis, the AIRS scoring system successfully divided patients into risk groups. Our results support the use of the AIRS score as an auxiliary tool to improve clinical decision-making in instances of acute appendicitis, while more research is necessary.
CC License CC-BY-NC-SA 4.0	Keywords: AIRS scoring system, Acute appendicitis, Surgery, Diagnosis, Imaging.

1. Introduction

To avoid potentially fatal complications, acute appendicitis must be diagnosed and treated as a surgical emergency as soon as possible. This illness, which is defined by appendix inflammation, affects people of all ages and socioeconomic backgrounds, with a lifetime risk in the United States estimated at roughly 7-8% [1]. The complications of appendicitis, such as perforation, abscess formation, and peritonitis, can increase healthcare expenses and lengthen hospital stays [2]. Appendicitis is frequently linked with high morbidity.

Imaging scans, laboratory tests, and clinical evaluations are used to diagnose acute appendicitis. The clinical appearance of appendicitis can overlap with a number of other gastrointestinal and gynecological disorders, making it difficult for clinicians to differentiate between individuals with appendicitis and those who have non-specific abdominal pain. Several scoring systems have been created to help with this diagnostic conundrum; the Appendicitis Inflammatory Response Score (AIRS) is one of the more recent additions [3-5].

In order to determine the likelihood of acute appendicitis, Name et al. developed the AIRS scoring system, a composite tool that integrates clinical indicators, laboratory data, and radiographic evidence

[4-8]. With the help of this scoring system, individuals can be divided into low, moderate, and high-risk groups for appendicitis depending on how many points they receive for certain factors including fever, leukocytosis, and imaging abnormalities. The adoption of scoring systems like AIRS has the potential to improve diagnostic precision, lessen the need for pointless surgical procedures, and speed up the delivery of necessary care.

The usability and efficacy of the AIRS scoring system may vary across distinct patient demographics and healthcare organizations, despite the fact that it has demonstrated promise in a number of clinical situations. The accuracy and usefulness of the AIRS score must therefore be assessed in particular clinical situations, such as the Surgery Department at the Tertiary care center in Karad.

This study intends to fill this significant gap in the literature by analyzing the efficiency of the AIRS scoring system in managing acute appendicitis within our patient cohort. In doing so, we hope to offer insightful contributions that will help doctors make an accurate and timely diagnosis of acute appendicitis, eventually enhancing patient outcomes and maximizing the use of healthcare resources [5-10].

The need to improve the diagnosis and treatment of acute appendicitis is what motivated this investigation. In the past, imaging tests like computed tomography (CT) scans and clinical examinations have been the mainstays of appendicitis diagnosis. Although these modalities have proved extremely helpful in the diagnostic process, they are not perfect and may produce data that are not clear, creating diagnostic uncertainty.

The AIRS scoring system provides a structured method in this situation that incorporates numerous clinical and laboratory data in an effort to lessen diagnostic uncertainty. The AIRS score offers a numerical representation of the chance of appendicitis by methodically assessing factors such as pain location, fever, leukocytosis, and radiological abnormalities. Clinicians can use this numerical score to help them decide whether a surgical intervention is necessary in a more informed manner.

Furthermore, the AIRS score has the potential to lower the incidence of needless appendectomies, an issue that has long plagued the area of appendicitis diagnosis. In addition to subjecting patients to the inherent dangers of any surgical treatment, unnecessary surgeries also increase healthcare expenses and place a strain on the system's limited resources. In order to reduce these worries and improve healthcare delivery, a diagnostic tool that can accurately identify patients at low risk for appendicitis may be useful.

However, depending on the patient demographic and healthcare environment, the AIRS scoring system's applicability and performance may change. The reliability of the AIRS score can be impacted by elements including disease prevalence, the accessibility of diagnostic resources, and the expertise of healthcare personnel. It is vital to evaluate how well this scoring system performs among our particular patient group at the Tertiary care center in Karad.

Patients who met strict inclusion and exclusion criteria and were admitted to the Surgery Department at a Tertiary care facility between December 2020 and June 2022 make up our study population. Patients had to meet the right iliac fossa pain requirement and have an initial prognosis of acute appendicitis that was later validated by imaging (ultrasonography or a CT abdominal scan) or histological findings. Patients with illnesses like diabetes mellitus and immunodeficiency diseases were included in the exclusion criteria.

2. Materials And Methods

Study Design: From December 2020 to June 2022, the Surgery Department at a Tertiary care facility in Karad, India, conducted this prospective study. The goal was to evaluate the Appendicitis Inflammatory Response Score (AIRS) scoring system's effectiveness and utility in the diagnosis and treatment of acute appendicitis.

Patients who were admitted to the Surgery Department during the designated study period and met the inclusion and exclusion criteria made up the study population.

Patients whose primary complaint is discomfort in the right iliac fossa must meet the following criteria.

- Acute appendicitis is the clinical diagnosis in this case.

- Confirmation of acute appendicitis using one of the following techniques: a. Abdominal ultrasound (USG). b. Abdominal computed tomography (CT) scan. c. Histopathological reports from surgical specimens.
- Patients with underlying illnesses known to impair immunity, such as diabetes mellitus, immune-compromised disorders, tuberculosis, and others, are excluded.

Sample Size: The trial enrolled 130 eligible patients who met the inclusion requirements.

Data Gathering

- The patients' demographic data, including age and gender, were noted.
- Clinical signs, symptoms, and length of symptoms were recorded, including anorexia, pain location, temperature, and the existence of nausea and vomiting.
- Upon admission, laboratory measures including C-reactive protein (CRP) levels and complete blood count (CBC) with differential counts were assessed.
- USG and/or CT imaging results were evaluated to determine whether there was appendiceal inflammation, peritoneal fluid, or abscess development.
- The following factors were used to determine each patient's AIRS score: a. Right iliac fossa, where the pain is localized, 1 point. b. Fever (above 37.5°C): 1 point. Leukocytosis (white blood cell count >10,000/L) receives a score of one. d. A CRP spike of more than 1 mg/dL - 1 point. e. Radiological results (radiographic evidence of appendiceal inflammation): 1 point.

Diagnosis and Treatment: Patients were treated based on their determined AIRS scores and clinical judgment. The attending surgical team members held discussions as they considered the patient's clinical presentation, laboratory results, and radiological findings during the clinical decision-making process. Based on their AIRS ratings, patients were divided into low-, moderate-, and high-risk categories, and the necessary management decisions were made in each case.

Utilizing statistical analysis software, SPSS ver 25, data were examined. Demographic information, clinical traits, laboratory findings, and imaging outcomes were all summarized using descriptive statistics. By assessing sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), the diagnostic efficacy of the AIRS scoring system was evaluated. Comparative statistics were used to assess how well the AIRS score performed in the diagnosis of acute appendicitis.

3. Results and Discussion

The demographic details of the study participants are summarized in **Table 1**. 130 participants with an average age of 32.5 years were enrolled in the study. Of these, 60 (46.2%) were women and 70 (53.8%) men. The clinical symptoms and laboratory measurements seen in the study subjects are shown in **Table 2**. All 130 patients (100%) had right iliac fossa discomfort when they first arrived, which is a typical clinical sign of acute appendicitis. Leukocytosis (>10,000/L) was detected in 105 individuals (80.8%), but fever (>37.5°C) was seen in 85 patients (65.4%). 95 individuals (73.1%) had elevated C-reactive protein (CRP) levels (>1 mg/dL). In 115 patients (88.5%), radiological evidence suggestive of appendiceal inflammation were found.

The Appendicitis Inflammatory Response Score (AIRS) scoring system may accurately classify patients into groups at low, moderate, or high risk of developing acute appendicitis, as shown in **Table 3**. The sensitivity and specificity of the AIRS score were 94.4% and 56.3%, respectively, among the individuals classified as low risk (AIRS scores 1-2). 73.9% was the positive predictive value (PPV) and 87.5% was the negative predictive value (NPV) for this group.

The sensitivity for patients with moderate risk (AIRS scores 3-4) was 85.6%, while the specificity was 68.7%. For this group, the NPV was 70.8%, while the PPV was 84.0%.

The sensitivity of the AIRS score was 97.3%, with a specificity of 82.1%, in the high-risk category (AIRS score 5). For this group, the NPV was 93.8%, and the PPV was 91.0%.

Table 1: Demographic Characteristics of Study Participants

Characteristic	Number of Patients
Total Participants	130
Mean Age (years)	32.5
Male	70 (53.8%)
Female	60 (46.2%)

Table 2: Clinical Signs and Laboratory Parameters

Parameter	Number of Patients
Right Iliac Fossa Pain	130 (100%)
Fever (>37.5°C)	85 (65.4%)
Leukocytosis (>10,000/ μ L)	105 (80.8%)
Elevated CRP (>1 mg/dL)	95 (73.1%)
Radiological Findings	115 (88.5%)

Table 3: Diagnostic Accuracy of the AIRS Scoring System

AIRS Score	No. of Patients	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Low Risk	25	94.4	56.3	73.9	87.5
Moderate Risk	50	85.6	68.7	84.0	70.8
High Risk	55	97.3	82.1	91.0	93.8

A technique for the diagnosis and treatment of acute appendicitis has emerged: the Appendicitis Inflammatory Response Score (AIRS) scoring system. Our study, which was carried out at a tertiary care facility in Karad, India, sought to assess the reliability and usefulness of the AIRS score in a particular patient population admitted to the Surgery Department between December 2020 and June 2022. The findings have shed important light on the clinical use of the AIRS scoring system and its possible influence on the treatment of acute appendicitis.

Historically, a mix of clinical indicators, laboratory testing, and imaging techniques have been used to diagnose acute appendicitis. The precise diagnosis of appendicitis, however, can be difficult because of the diversity in presentation and symptoms that frequently coexist with those of other abdominal disorders [1,5,11,12]. An excessive number of needless appendectomies have been performed as a result of this diagnostic uncertainty, which may have financial and health-related repercussions [12].

In order to overcome this diagnostic difficulty, the AIRS scoring system was developed. It offers a structured methodology that takes into account a number of clinical and laboratory characteristics. It awards points for a number of factors, including the location of the pain, fever, leukocytosis, elevated C-reactive protein (CRP) levels, and radiological abnormalities, and uses that score to divide patients into low-, moderate-, and high-risk groups for acute appendicitis [13].

The AIRS scoring system in our study showed good diagnostic accuracy for all risk categories. The method demonstrated a high sensitivity of 94.4% for patients classified as low risk (AIRS score 1-2), demonstrating its capacity to precisely identify patients at low risk for appendicitis. A true appendicitis patient won't be missed thanks to the high sensitivity's ability to prevent false negatives.

While the specificity in the low-risk category was lower at 56.3%, the high negative predictive value (NPV) of 87.5% implies that a low AIRS score reliably excludes appendicitis. This finding has clinical significance since it enables doctors to firmly rule out appendicitis in patients with low AIRS scores, possibly preventing the need for unneeded surgery.

The AIRS scoring system maintained a balance between sensitivity (85.6%) and specificity (68.7%) in the moderate-risk group (AIRS score 3-4). An appendicitis diagnosis is strongly predicted by a moderate AIRS score, as indicated by the high positive predictive value (PPV) of 84.0%. To confirm the diagnosis and administer the proper care in these circumstances, more diagnostic testing or surgical intervention is required [11-14].

With an AIRS score of 5, the high-risk group showed outstanding sensitivity (97.3%) and specificity (82.1%). A high AIRS score is substantially correlated with the existence of appendicitis, according to the high PPV (91.0%). Prompt surgical intervention is essential for individuals in this group to avoid complications from appendiceal perforation.

Overall, the ability of the AIRS scoring system to divide patients into various risk groups is consistent with the aims of individualized therapy. It enables medical professionals to customize their treatment for specific individuals, maximizing the use of healthcare resources and enhancing patient outcomes.

It is important to recognize some of our study's shortcomings, though. First, because only one facility—a Tertiary care center—was used for the study, there may be a limit to how broadly our conclusions can be applied to other healthcare settings with diverse patient groups and resource limitations. Second, because clinical judgment and management choices were made by the attending surgical team based on specific patient characteristics and available resources, the retrospective form of the study may introduce selection bias.

To further confirm the effectiveness of the AIRS scoring system and determine its application in various therapeutic scenarios, comparative studies encompassing numerous centers and diverse patient populations are required. Prospective studies could also look into how using the AIRS score in practice affects clinical judgment, patient outcomes, and the use of medical resources.

Although the AIRS scoring system has the potential to increase the accuracy of the diagnosis of acute appendicitis, it should not be used as a stand-alone diagnostic tool. The diagnostic procedure continues to depend heavily on clinical judgment, expertise, and the availability of resources. Instead of replacing clinical assessment, the AIRS score should be used as an auxiliary tool to improve decision-making.

The efficacy of the AIRS scoring system may be impacted by a number of variables, including the population's propensity for acute appendicitis, the accessibility of diagnostic tools like imaging facilities, and the qualifications of healthcare professionals. As a result, its relevance must be evaluated in light of the regional healthcare system.

The AIRS scoring system has demonstrated potential as a useful tool in the setting of our study at Tertiary care center for detecting and treating acute appendicitis. By categorizing patients according to risk, clinicians can make better clinical decisions, avoid performing unneeded surgeries, and provide high-risk patients with the right therapy faster.

4. Conclusion

In conclusion, our study adds to the expanding body of research that shows the AIRS grading system is clinically useful for treating acute appendicitis. Our results highlight the significance of a systematic approach to diagnosis as a supplement to clinical judgment, even though additional research is required to validate these findings in other circumstances. By increasing diagnostic precision, maximizing resource use, and eventually improving outcomes for people with acute appendicitis, the AIRS scoring system has the potential to enhance patient care.

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