DIAGNOSING ACUTE APPENDICITIS IN 6-14 YEAR OLD PATIENTS WITH ACUTE ABDOMINAL PAIN BY ASSESSMENT OF PAEDIATRIC APPENDICITIS SCORES

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ABSTRACT

Background: One of the most frequent causes of severe abdominal discomfort in children is acute appendicitis, which requires prompt surgical intervention. In order to reduce radiation exposure in pediatric patients, it is typically evaluated using PAS (pediatric appendicitis scores). Regarding the accuracy of PAS in diagnosing acute appendicitis in pediatric patients, the literature evidence is contradictory.

Aim: This study evaluated the diagnostic performance of pediatric appendicitis scores, or PAS, in identifying acute appendicitis in children who were experiencing severe abdominal pain and were attending the emergency room**.**

Methods: The current study evaluated institutional data from children who presented to the pediatric emergency department between the ages of 6 and 14 and had a clinical suspicion of acute appendicitis. The diagnostic accuracy of pediatric appendicitis scores was evaluated using specificity, sensitivity, negative predictive value, and positive predictive value.

Results: the mean age of 52 participants was of 10.7±3.3 years. Of the individuals, 25% were female and 75% were male (n = 39). 90.38% (n=47) of the patients had moderate to high PAS scores of ≥4, and 98.07% (n=51) of the cases had biopsy-proven appendicitis. For pediatric appendicitis scores that were high, ambiguous, or low risk, the corresponding likelihood ratios were 2.51, 2.15, and 0.12. In order to predict acute appendicitis, the positive predictive value, specificity, and sensitivity for equivocal PAS were, respectively, 98.7%, 80%, and 96.6%.

Conclusion: The current study suggests that when pediatric patients with acute abdominal pain enter the emergency room, PAS have a high diagnostic accuracy in predicting acute appendicitis.

Keywords: Perforation, pediatric appendicitis scores, abdominal discomfort, and acute appendicitis.

INTRODUCTION

When pediatric patients arrive at the pediatric emergency room complaining of acute abdominal discomfort, one of the most frequent diagnoses is acute appendicitis. In certain situations, acute

appendicitis is a clinical emergency requiring prompt surgical intervention. Pediatric patients with acute appendicitis must be diagnosed promptly and correctly. This is because there is strong evidence that between 12% and 30% of instances of acute appendicitis result in an increased risk of perforation. Acute appendicitis has also been documented to be misdiagnosed in between 25% and 56% of pediatric patients, indicating a significant likelihood of misdiagnosis.[1,2]

Computed tomography (CT) scans and ultrasonography are typically used to identify acute appendicitis. These imaging techniques, however, might not be accessible right once, and a CT scan exposes a youngster whose organs are still developing and maturing to a high level of ionising radiation. Therefore, different scoring methods are employed in pediatric patients to identify acute appendicitis in order to rule out the subjective character of ultrasonography and its limits in child subjects with high body mass, as well as to minimize the exposure of ionizing radiations used in CT scans.3. In kid subjects, the PAS (pediatric appendicitis scores) and Alvarado scoring systems are most frequently utilized. Both of these scoring methods provide cut-off values to identify the existence of appendicitis based on point values for data gathering from laboratory tests, physical examinations, and subject histories.4,5

Regarding the effectiveness of pediatric appendicitis scores and Alvarado scores in the diagnosis of acute appendicitis in kid subjects, the available research evidence is contradictory. The use of these scores is beneficial in underdeveloped countries where access to various diagnostic tests in most medical facilities is restricted.6

In order to determine how accurate PAS rare in diagnosing acute appendicitis in pediatric patients presenting to the emergency room with severe abdominal pain, this study was conducted. The study also sought to determine if gold-standard histology and ultrasound imaging were related to pediatric appendicitis scores.

MATERIALS AND METHODS

In order to evaluate the diagnostic accuracy of pediatric appendicitis scores (PAS) in identifying acute appendicitis in pediatric patients presenting to the emergency room with acute abdominal pain, a retrospective assessment study was conducted at Grant Government Medical College Mumbai, Maharashtra. The study also sought to determine if gold-standard histology and ultrasound imaging were related to pediatric appendicitis scores.

Subjects having full data to assess appendicitis and those presenting with acute abdominal pain with a clinical suspicion of acute appendicitis met the study's inclusion criteria. Subjects with previously confirmed diagnoses of appendicitis, abdominal trauma, lympho-proliferative illness, ectopic pregnancy, and insufficient data for evaluation were excluded from the research.

The study's data were gathered from the institute's historical records. The information was taken from the Institute's Pediatric Department's files. Histopathology results, laboratory results, clinical symptoms, signs, and the demographics of the participants were among the data gathered. An examiner who was blind to the evaluation procedure entered the preliminary data gathered from the records into a file. The senior pediatrician, a specialist in his profession, conducted a thorough evaluation of the documents. All of the enrolled patients who had been

clinically diagnosed with acute appendicitis were evaluated using the Pediatric Appendicitis Score (PAS)7, which was collected at the time of the subject's initial presentation to the institution. For the purposes of this study, appendicitis was defined as an appendectomy with positive gold-standard findings and a positive histology. Next, the relationship between the histopathological findings and the PAS scores was evaluated.

After that, the collected data were statistically evaluated using IBM Corp.'s SPSS program, version 25.0 (Armonk, NY, USA). For acute appendicitis, PAS was evaluated as a continuous variable with values ranging from 0 to 10. The information was presented as frequencies, percentages, mean, and standard deviation. There is a proven correlation between PAS and other clinical outcomes such as CT, ultrasound, and histology reports.

RESULTS

This retrospective assessment research evaluated the diagnostic performance of pediatric appendicitis scores, or PAS, in identifying acute appendicitis in patients under the age of five who were presenting to the emergency room with severe abdominal pain. 52 participants with a mean age of 10.7±3.3 years were evaluated for the research. There were thirteen girls and seventy-five men (n = 39). 75% of the individuals (n = 39) reported having lower right abdomen discomfort, while 65.38% of the subjects (n = 34) reported experiencing pain migration. Fever and leukocytosis were recorded in 46.15% (n=24) and 82.69% (n=43) of the research participants, respectively. Table 1 displays the following findings for the study subjects: 23.07% (n=12) reported cough/hoping and pain on percussion; 92.30% (n=48) reported lower right quadrant tenderness; 84.61% (n=44) reported vomiting and nausea; 38.46% (n=20) reported anorexia; and 86.53% (n=45) reported WBC differential left shift.

In this investigation, abdominal imaging was performed on each participant. In contrast, 3.84% (n=2) of the participants with clinical suspicion of acute appendicitis but no ultrasound evidence of the illness underwent a CT scan. Prior to any surgical intervention, computed tomography was performed on these participants.

The department of Surgery conducted surgery on all 52 individuals. Of these 52 participants, a biopsy revealed appendicitis in 94.23% (n=49) of the research individuals. A biopsy revealed appendicitis in 48.07% (n=25), 40.38% (n=21), and 5.76% (n=3) of the high-risk, equivocal, and low-risk pediatric appendicitis score participants, respectively.

High-risk, equivocal, and low-risk research participants were compared for PAS, and specificity, sensitivity, positive predictive value, and negative predictive value were evaluated for each group. Additionally, PAS was compared to the groups for histology and ultrasonography. For PAS <4, PAS 4-6, and PAS >6, the accuracy of the point estimates (95% CI) was 92.1 (85.2-96.64), 95.94 (89.96-98.87), and 75.2 (66.53-82.95), in that order. For PAS <4, PAS 4-6, and PAS >6, the corresponding negative predictive values are 33.1 (14.84-58.94), 57.12 (28.74-81.54), and 13.77 (8.44-21.76). Positive predictive values are 97.87 (94.05-99.25), 98.93 (94.01-99.83), and 98.65 (92.72-99.75) for PAS <4, PAS 4-6, and PAS >6. The specificity values were 60.2 (14.64-94.71), 80.2 (28.34-99.47), and 80.2 (28.34-99.47) for PAS <4, PAS 4-6, and PAS

>6. For PAS <4, PAS 4-6, and PAS >6, the corresponding sensitivity values were 93.92 (87.25-97.72), 96.83 (90.94-99.32), and 74.73 (65.04-82.92) (Table 2).

DISCUSSION

The mean age of the 52 individuals evaluated in this retrospective research was 10.7±3.3 years. There were thirteen girls and seventy-five men (n = 39). 75% of the individuals (n = 39) reported having lower right abdomen discomfort, while 65.38% of the subjects (n = 34) reported experiencing pain migration. Fever and leukocytosis were recorded in 46.15% (n=24) and 82.69% (n=43) of the research participants, respectively. WBC differential left shift was observed in 86.53% (n=45) study subjects, vomiting/nausea was observed in 84.61% (n=44) subjects, anorexia was observed in 38.46% (n=20) subjects, and cough/hoping and pain on percussion were observed in 23.07% (n=12) subjects. These results were comparable to those from studies conducted in 2006 by Doria AS et al[8] and in 2013 by Kulik DM et al[9] in which the authors evaluated patients who had a similar clinical presentation after appendicitis.

It was observed that 88.46% (n=46) of the research participants had abdominal imaging completed. An abdominal ultrasound was the most popular imaging modality, chosen by 65.38% (n=34) of the research participants. In contrast, 3.84% (n=2) of the participants with clinical suspicion of acute appendicitis but no ultrasound evidence of the illness underwent a CT scan. Prior to any surgical intervention, computed tomography was performed on these participants. The findings aligned with the research conducted by Ebell MH et al[10] (2014) and Sayed A et al[11] (2017), which established the validity of ultrasonography and CT scans in the diagnosis of acute appendicitis.

The study's findings demonstrated that the department of Surgery performed surgery on each of the 52 participants. Of these 52 participants, a biopsy revealed appendicitis in 94.23% (n=49) of the research individuals. A biopsy revealed appendicitis in 48.07% (n=25), 40.38% (n=21), and 5.76% (n=3) of the high-risk, equivocal, and low-risk pediatric appendicitis score participants, respectively. The present study's results were consistent with those of Kim DY et al[12] (2016) and Bhatt M et al[13] (2009), who reported good reliability in biopsies and PAS scores.

In the current investigation, the PAS was compared among high-risk, equivocal, and low-risk study participants. Specificity, sensitivity, negative predictive value, and positive predictive value were evaluated for each group. Additionally, PAS was compared to the groups for histology and ultrasonography. The accuracy in point estimates (95% CI) for PAS <4, PAS 4-6, and PAS >6 was 92.1 (85.2-96.64), 95.94 (89.96-98.87), and 75.2 (66.53-82.95) respectively. For PAS <4, PAS 4-6, and PAS >6, the corresponding negative predictive values are 33.1 (14.84-58.94), 57.12 (28.74-81.54), and 13.77 (8.44-21.76). Positive predictive values are 97.87 (94.05-99.25), 98.93 (94.01-99.83), and 98.65 (92.72-99.75) for PAS <4, PAS 4-6, and PAS >6. The specificity values were 60.2 (14.64-94.71), 80.2 (28.34-99.47), and 80.2 (28.34-99.47) for PAS <4, PAS 4-6, and PAS >6. For PAS <4, PAS 4-6, and PAS >6, the corresponding sensitivity values were 93.92 (87.25-97.72), 96.83 (90.94-99.32), and 74.73 (65.04-82.92). These findings were consistent

with the high sensitivity and specificity of PAS scores reported by the authors in their separate investigations by Rehman S et al[14] in 2014 and Goldman RD et al[15] in 2008.

CONCLUSION

The current study, taking into account its limitations, finds that pediatric appendicitis scores are very accurate in predicting acute appendicitis in child subjects presenting to the emergency room with severe abdominal pain. The study evaluated participants from a specific geographic area using a low sample size and a brief observation time. Therefore, larger sample numbers and longer monitoring periods are required for future prospective longitudinal research.

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TABLES

Characteristics	Number (n=52)	Percentage (%)
Mean age (years)	10.7±3.3	
Gender		
Males	39	75
Females	13	25
Right lower abdomen pain	39	75
Pain migration	34	65.38
Leukocytosis	43	82.69
Fever	24	46.15
Percussion pain/hopping/cough	12	23.07
Tenderness of lower right quadrant	48	92.30
Vomiting/nausea	44	84.61
Anorexia	20	38.46
WBC differential left shift	45	86.53

Table 1: Clinical and demographic characteristics of child subjects with clinical suspicion of acute appendicitis

Variable	PAS <4	PAS 4-6	PAS >6
Accuracy	92.1 (85.2-96.64)	95.94 (89.96-98.87)	75.2 (66.53-82.95)
Negative predictive value	33.1 (14.84-58.94)	57.12 (28.74-81.54)	13.77 (8.44-21.76)
Positive predictive value	97.87 (94.05-99.25)	98.93 (94.01-99.83)	98.65 (92.72-99.75)
Specificity	60.2 (14.64-94.71)	80.2 (28.34-99.47)	80.2 (28.34-99.47)
Sensitivity	93.92 (87.25-97.72)	96.83 (90.94-99.32)	74.73 (65.04-82.92)

Table 2: Efficacy of pediatric appendicitis scores at different cut-off values