

A COMPARATIVE STUDY BETWEEN MODIFIED ALVARADO AND TZANAKIS SCORE IN DIAGNOSIS OF ACUTE APPENDICITIS.

General Surgery

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ABSTRACT

Background: Acute appendicitis is a surgical emergency requiring accurate diagnosis and risk stratification using the Modified Alvarado and Tzanakis Scores, despite ongoing debate on their efficacy. This prospective study aims to conduct a comparative analysis between the two to provide insights into the optimal approach for diagnosing acute appendicitis, ultimately improving patient outcomes and resource utilization in clinical practice. **Materials And Methods:** The present prospective observational study was conducted on 70 patients admitted with right iliac fossa pain at Sri Siddhartha Medical College Hospital, Tumkur for a period of 24 months. Prior to the initiation of the study, Ethical and Research Committee clearance was obtained from Institutional Ethical Committee. **Results And Observations:** All patients presented with right iliac fossa pain and symptoms like nausea, vomiting, fever, and tenderness. Ultrasonography confirmed appendicitis in 92.86% of cases. The Modified Alvarado score indicated a higher probability of appendicitis in 72.86% of patients, while the Tzanakis score showed 90% of subjects scoring ≥ 8 , suggesting higher diagnostic accuracy. A significant difference between the two scores indicated that the Tzanakis score may have better sensitivity and specificity. The study emphasizes the importance of using accurate diagnostic tools in acute appendicitis assessment, with the Tzanakis score potentially providing a more robust diagnostic capability. **Conclusion:** The Tzanakis score, which integrates clinical examination with ultrasonographic findings, showed higher sensitivity and specificity, reducing false-positive diagnoses and preventing unnecessary surgical interventions. However, the modified Alvarado score remains useful in resource-constrained environments.

KEYWORDS

Acute appendicitis, Modified Alvarado score, Tzanakis score.

INTRODUCTION

Acute appendicitis is a common surgical emergency characterized by inflammation of the vermiform appendix, often presenting with nonspecific symptoms that can mimic other abdominal conditions. Prompt and accurate diagnosis is crucial to prevent complications such as perforation and peritonitis. Over the years, several scoring systems have been proposed to aid clinicians in diagnosing acute appendicitis. Among these, the Modified Alvarado Score and the Tzanakis Score have emerged as prominent tools for risk stratification and decision-making in clinical practice^{1,2}.

The Modified Alvarado Score, initially developed by Alvarado et al. in 1986, incorporates clinical signs, symptoms, and laboratory findings to stratify patients into low, intermediate, and high-risk categories for acute appendicitis. On the other hand, the Tzanakis Score, introduced by Tzanakis et al. in 2011, offers a different approach by integrating a combination of clinical and laboratory parameters to assess the likelihood of appendicitis^{3,4}.

By elucidating the strengths and limitations of the Modified Alvarado and Tzanakis Scores, this study seeks to provide valuable insights into the optimal approach for diagnosing acute appendicitis, ultimately contributing to improved patient outcomes and resource utilization in clinical practice.

MODIFIED ALVARADO SCORING SYSTEM⁽¹⁾

Table 1: Modified Alvarado scoring system

SYMPTOMS	SCORE
Migratory RIF pain	1
Nausea/Vomiting	1
Anorexia	1
SIGNS	
Tenderness in RIF	2
Rebound tenderness in RIF	1
Elevated temperature	1
LABORATORY FINDINGS	
Leukocytosis ($>12,000$)	2
TOTAL	9

Interpretation of score

- Score <5 = very unlikely of acute appendicitis
- Score $5-7$ = maybe, acute appendicitis
- Score >7 = Acute appendicitis is definite, operate.

TZANAKIS SCORE⁽²⁾

Table 2: TZANAKI scoring

FEATURE	SCORE
Presence of right lower abdominal tenderness	4
Rebound tenderness	3
Lab findings- WBC $>12,000$ cells/cumm	2
USG- positive findings	6
TOTAL	15

Interpretation of score

- <8 – Appendicitis unlikely
- >8 – Definitive Appendicitis.

AIMS AND OBJECTIVES

- To assess the Modified Alvarado scoring system and Tzanakis scoring system for their sensitivity, specificity, and diagnostic values.
- To compare both the Modified Alvarado and Tzanakis scoring system with histopathological diagnosis.

MATERIALS AND METHODS

Cross sectional comparative study was done for a duration of 24 months on patients admitted with right iliac fossa pain at Sri Siddhartha Medical College Hospital, Tumkur.

Inclusion Criteria:

- All patients above 18 years of age, presenting with right lower quadrant pain.
- Patients willing to give consent.
- Patients willing to participate and get operated.

Exclusion Criteria:

- Patients those who have been admitted by other specialties for other complaints but who subsequently developed right iliac fossa pain.
- Patients who received antibiotic in last 2 days for other complaints.

- Patients not willing for surgery.
- Patients with appendicitis in pregnancy.
- Patients with appendicular mass or abscess.
- Patients who were not willing to give consent.
- Patients not willing to participate and get operated.

Statistical Analysis

A version 24 of the International Business Machines Statistical Package for the Social Sciences (IBM SPSS) was employed in order to carry out the statistical study.

Qualitative data was represented in the form of frequency and percentage.

Association between qualitative variables was assessed by Chi Square test with continuity correction for 2 x 2 tables and

Fisher's exact test for all 2 x 2 tables, where P value of chi square test was not valid due to small counts.

Quantitative data was represented using mean and standard deviation.

Analysis of quantitative data within the groups was done using paired t test if data passes 'Normality test'.

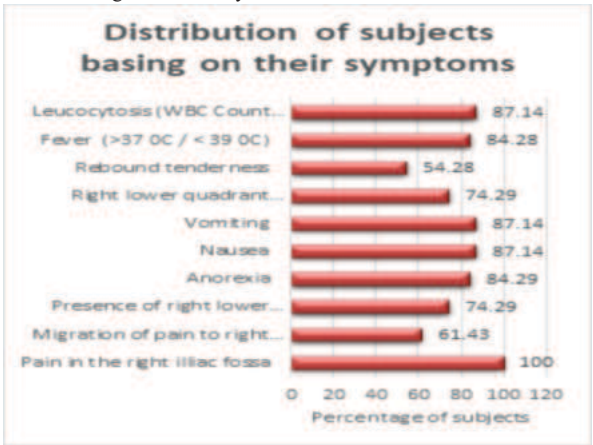
One Way Analysis (ANOVA) was used to compare more than two groups.

A 'P' value of <0.05 was considered statistically significant.

RESULTS

The present prospective observational study was conducted on 70 patients admitted with right iliac fossa pain at Sri Siddhartha Medical College Hospital and Research Centre, Tumkur for a period of 24 months.

The following were the study results –



Graph 1: Distribution Of Subjects Basing On Their Symptoms

Majority subjects had pain in the right iliac fossa e, i.e., 70 subjects (100%); followed by 61 subjects (87.14%) each had nausea, vomiting and leucocytosis; 59 subjects (84.29%) had anorexia and fever; 52 subjects (74.29%) each had presence of right lower abdominal tenderness and right lower quadrant tenderness, 43 subjects (61.43%) had migration of pain to right lower quadrant, and finally 38 subjects (54.28%) had rebound tenderness.

Table 3: Distribution Of Subjects Basing On Their Ultrasonographic Evidence Of Appendicitis.

Ultrasonographic evidence of appendicitis	Number of subjects (N)	Percentage (%)
Present	70	100
Absent	0	0
Total	70	100

The above table gives data on distribution of subjects basing on their ultrasonographic evidence of appendicitis. All subjects had ultrasonographic evidence of appendicitis, i.e., 70 subjects (100%).

Table 4: Distribution Of Subjects Basing On Their Histopathological Evidence Of Appendicitis.

Histopathological evidence of appendicitis	Number of subjects (N)	Percentage (%)
Present	65	92.86
Absent	5	7.14
Total	70	100

The above table gives data on distribution of subjects basing on their family history appendicitis. Majority of subjects had histopathological evidence of appendicitis, i.e., 65 subjects (92.86%) while 5 subjects (7.14%) had no histopathological evidence of appendicitis.

Table 5: Distribution of subjects basing on their Modified Alvarado Score.

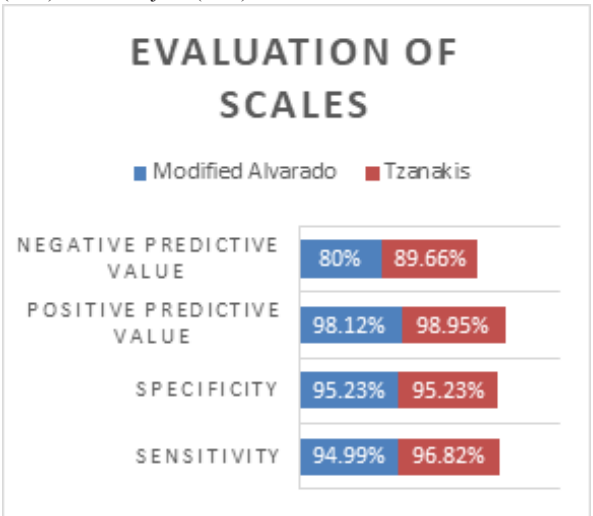
Modified Alvarado score	Number of subjects (N)	Percentage (%)
≥ 7	51	72.86
< 7	19	27.14
Total	70	100

The above table gives data on distribution of subjects basing on their Modified Alvarado Score. Majority of subjects had score of ≥ 7, i.e., 51 subjects (72.86%) while 19 subjects (27.14%) had score of <7.

Table 6: Distribution Of Subjects Basing On Their Tzanakis Score.

Tzanakis score	Number of subjects (N)	Percentage (%)
≥ 8	63	90
< 8	7	10
Total	70	100

The above table gives data on distribution of subjects basing on Tzanakis score. Majority of subjects had score of ≥ 8, i.e., 63 subjects (90%) while 7 subjects (10%) had score of <8.



Graph 2: Evaluation of scales

The Modified Alvarado score had a sensitivity of 94.99%, specificity of 95.23%< positive predictive value of 98.12% and negative predictive value of 80%. The Tzanakis score had a sensitivity of 96.82%, specificity of 95.23%, positive predictive value of 98.95% and negative predictive value of 89.66%. The p-value calculated was 0.01 indicating a significant statistical difference between Modified Alvarado score and Tzanakis score.

DISCUSSION

Acute appendicitis (AA) is the most common diseases of the appendix in humans. The early diagnosis of appendicitis can be highly estimated, and a high sensitivity and specificity of diagnostic measures are crucial to prevent hazards of complications.⁵

The clinical diagnosis of acute appendicitis classically depends on the history and clinical examination of the patients. Clinical and laboratory scores have been adapted to increase positive appendectomies and simplify the process of diagnosis. One such score was the Modified Alvarado score which is an easier, simpler, and

cheaper diagnostic tool for making right decisions of laparotomies in acute appendicitis. A score of 7 or more is highly indicative for acute appendicitis.⁶ The Tzanakis score (TZS) is a triple evaluation scale depending on two clinical examinations, an abdominal ultrasound examination, and laboratory results of white blood cells. The true AA that must be removed by appendectomy has scores of 8 or more. This study compares the accuracy of MAS and TZS in reaching the diagnosis of acute appendicitis.⁷

The results obtained from this study were compared with other similar studies and discussed below:

SYMPTOMS:

Majority subjects had pain in the right illiac fossa e, i.e., 100% subjects; followed by 87.14% subjects each had nausea, vomiting and leukocytosis; 84.29% subjects had anorexia and fever; 74.29% subjects each had presence of right lower abdominal tenderness and right lower quadrant tenderness; 61.43% subjects had migration of pain to right lower quadrant, and finally 54.28% subjects had rebound tenderness.

Our study was in correlation with **Mundada AV et al⁸, Awan AR et al⁹**.

Study by	Majority symptoms (Percentage)
Mundada AV et al ⁸	Pain in the right illiac fossa (94.6%)
Awan AR et al ⁹	Pain in the right illiac fossa (97%)
Present study	Pain in the right illiac fossa (100%)

ULTRASONOGRAPHIC EVIDENCE OF APPENDICITIS:

All subjects had ultrasonographic evidence of appendicitis, i.e., 100% subjects.

Our study was in correlation with **Çomçalı B et al¹⁰, Malik AA et al¹¹**.

Study by	Majority ultrasonographic evidence of appendicitis (Percentage)
Çomçalı B et al ¹⁰	Present (94.9%)
Malik AA et al ¹¹	Present (96%)
Present study	Present (100%)

HISTOPATHOLOGICAL EVIDENCE OF APPENDICITIS:

Majority of subjects had histopathological evidence of appendicitis, i.e., 92.86% subjects while 7.14% subjects had no histopathological evidence of appendicitis.

Our study was in correlation with **Korkut M et al¹², Iftikhar a et al¹³, Sağ S et al¹⁴**.

Study by	Histopathological evidence of appendicitis (Percentage)
Korkut M et al ¹²	Present (90.6%)
IFTIKHAR A et al ¹³	Present (86%)
Sağ S et al ¹⁴	Present (89.5%)
Present study	Present (92.86%)

MODIFIED ALVARADO SCORE:

Majority of subjects had score of ≥ 7 , i.e., 72.86% subjects while 27.14% subjects had score of <7 .

Our study was in correlation with **Singla A et al¹⁵, Peyvaste M et al¹⁶**.

Study by	Majority modified Alvarado score (Percentage)
Singla A et al ¹⁵	≥ 7 (74.7%)
Peyvaste M et al ¹⁶	≥ 7 (68%)
Present study	≥ 7 (72.86%)

TZANKIS SCORE:

Majority of subjects had score of ≥ 8 , i.e., 90% subjects while 10% subjects had score of <8 .

Our study was in correlation with **Lakshminarasimhaiah AK et al¹⁷, Shashikala V et al¹⁸**.

Study by	Majority Tzankis score (Percentage)
Lakshminarasimhaiah AK et al ¹⁷	≥ 8 (83.2%)
Shashikala V et al ¹⁸	≥ 8 (93.6%)
Present study	≥ 8 (90%)

EVALUATION OF SCALES:

The Modified Alvarado score had a sensitivity of 94.99%, specificity of 95.23% $<$ positive predictive value of 98.12% and negative predictive value of 80%. The Tzanakis score had a sensitivity of

96.82%, specificity of 95.23% $<$ positive predictive value of 98.95% and negative predictive value of 89.66%. The p-value calculated was **0.01** indicating a significant statistical difference between Modified Alvarado score and Tzanakis score.

Our study was in correlation with **Anupriya R et al¹⁹, Memon SN et al²⁰**.

CONCLUSION:

The Tzanakis score demonstrated higher sensitivity and specificity compared to the modified Alvarado score, likely due to its inclusion of ultrasonographic findings. This improvement in specificity reduces the likelihood of false-positive diagnoses, which are critical in preventing unnecessary surgical interventions. The PPV and NPV of the Tzanakis score were superior to those of the modified Alvarado score, indicating a higher probability that patients with a positive Tzanakis score had acute appendicitis and those with a negative score did not have the condition.

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