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A Study Comparing Modified Alvarado Score and Tzanakis Score For Diagnosing Acute Appendicitis

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ABSTRACT

Background & Methods: The aim of the study is to compare the accuracy of the Modified Alvarado Score and Tzanakis Score in Diagnosing Acute Appendicitis. Informed written consent was obtained from all patients. This prospective, non-randomized study included patients admitted to the Department of General Surgery at KD Medical College, Mathura, over two years, with clinical suspicion of acute appendicitis who underwent appendicectomy.

Results: 60 had a Tzanakis score of more than 8, with 56 having a Modified Alvarado score of more than 7. The remaining 18 cases had a Tzanakis score of less than 8, with 15 having a Modified Alvarado score of less than 7

Conclusion: The study demonstrates that both the MAS and the Tzanakis Score are reliable and effective tools for the preoperative diagnosis of acute appendicitis. However, the Tzanakis Score offers superior sensitivity and specificity, particularly in cases where the diagnosis is uncertain. Its higher accuracy, as evidenced by its correlation with histopathological confirmation, suggests that it may be a preferred diagnostic tool in clinical settings. While the MAS remains a useful tool, the Tzanakis Score's broader scoring range allows for finer diagnostic stratification, potentially reducing unnecessary appendectomies and improving patient outcomes

Keywords: *Alvarado, tzanakis, diagnosing, acute & appendicitis.*

Study Design: A Prospective non-randomized study.

1. INTRODUCTION

Acute appendicitis is the inflammation of the vermiform appendix requiring emergency surgery. This condition impacts roughly 6% of the population, and the likelihood of developing it in one's lifetime is 8.6% for males and 6.7% for females[1]. The condition typically presents with right lower quadrant pain, nausea, vomiting, and fever, though these symptoms overlap with other abdominal disorders. The global incidence ranges from 7–10%, varying by age, healthcare access, and socioeconomic factors[2].

Diagnosing acute appendicitis is challenging due to its nonspecific symptoms, which overlap with other gastrointestinal conditions like infections, inflammatory bowel disease, and urinary tract infections. Certain populations, including children, the elderly, and pregnant women, may present with atypical symptoms, further complicating diagnosis. While clinical evaluation is crucial, it may not always be reliable in atypical cases. Therefore, laboratory tests and imaging techniques are often required for accurate diagnosis[3].

While imaging techniques like CT and ultrasound aid in diagnosing acute appendicitis, their accessibility is limited in resource-constrained settings, and CT involves radiation exposure, making it less suitable for young patients and pregnant women[4]. To address these limitations, clinical scoring systems have gained importance. Two such clinical scoring systems that have garnered attention are the Modified Alvarado Score (MAS) and the Tzanakis Score[5].

The Modified Alvarado Score (MAS) simplifies the original version for assessing acute appendicitis risk, assigning points to key clinical and laboratory findings like migratory right iliac fossa pain, anorexia, nausea/vomiting, tenderness, and leukocytosis. Scores range from 1–4 (low probability), 5–6 (equivocal cases requiring further evaluation), and 7–9 (high probability, often necessitating surgery). MAS is simple, cost-effective, and useful in resource-limited settings but has

limitations in atypical cases and depends on clinical judgment, which may affect accuracy[6]..

Aim: To compare the accuracy of the Modified Alvarado Score and Tzanakis Score in Diagnosing Acute Appendicitis.

2. MATERIAL AND METHODS

Informed consent was obtained after approval from the local bioethics committees. A thorough history and clinical examination were performed upon admission. Total and differential leukocyte counts were measured using an autoanalyzer. Ultrasonographic criteria were applied to identify acute appendicitis, with USG-positive cases confirmed by the radiologist.

Sonographic Criteria's for Appendicitis-

The following diagnostic criteria were used for acute appendicitis: Noncompressible appendix with an anterior-posterior (AP) diameter > 6 mm. Hyperechoic thickened appendix wall > 2 mm, referred to as the 'Target sign.' Presence of appendicolith. Interruption of submucosal continuity. Peri-appendicular fluid. Both the MAS and Tzanakis scores were assessed for all patients upon admission and prior to surgery. Even patients with scores below the cut-off values were subjected to appendicectomy based on clinical assessment and judgment.

•The final diagnosis was confirmed through histopathological examination of the specimen and operative findings.

Inclusion Criteria

- Patients aged between 16 and 65 years, of both sexes.
- Patients with suspected acute appendicitis based on clinical history and examination.
- Patients with written informed consent.

Exclusion Criteria

- Patients who did not provide consent to participate in the study were excluded.
- Individuals younger than 16 years or older than 65 years were not included.
- Patients who were found to have an alternative diagnosis during surgery, regardless of whether the appendix was inflamed, including those undergoing incidental appendectomy in trauma cases, were excluded.
- Those admitted for interval appendectomy following an appendicular mass that was previously managed conservatively were not considered for the study.
- Patients with concomitant conditions that cause an elevated total leukocyte count, such as rheumatoid arthritis, systemic lupus erythematosus (SLE), and tuberculosis (TB), were also excluded.

3. RESULT

Table-1: Distribution according to gender.

Gender	No.of cases	%
Female	31	40%
Male	47	60%
Total	78	100%

In this study of 78 patients, 60% were male and 40% were female. The Modified Alvarado and Tzanakis scores showed no significant gender differences. Higher Modified Alvarado (>7) and Tzanakis (>8) scores correlated significantly with acute appendicitis (p<0.0001). The mean age was 23.02 years, with mean Alvarado and Tzanakis scores of 7.52 and 11.56, respectively.

Table-2: Distribution according to Modified Alvarado score.

Modified Alvardo score.	SEX						Chi-sq.	p-value
	Female		Male		Total			
	No. of cases	%	No. of cases	%	No. of cases	%		
Less than 7	8	26 %	9	19 %	17	22 %	0.05	0.80
More than 7	23	74 %	38	81 %	61	78 %	3.68	0.054

The above table showed that 22% had less than 7 cases, with 26% female and 19% male. The remaining 78% ad more than 7 cases, with 74% female and 81% male.

Table-3: Distribution according to Tzanakis score

	SEX						Chi-sq	p-value
	Female		Male		Total			
	No. of cases	%	No. of cases	%	No. of cases	%		
Less than 8	6	19 %	8	17 %	14	18 %	0.28	0.59
More than 8	25	81 %	39	83 %	64	82 %	3.06	0.08

The above table showed that the 18% had less than 8 cases, with 19% female and 17% male. The remaining 82% had more than 8 cases, with 81% female and 83% male.

Table-4: Distribution according to Modified Alvarado score post op correlation with HPE report

	HPE REPORT						Chi-sq	p-value
	Normal		Acute Appendicitis		Total			
	No. of cases	%	No. of cases	%	No. of cases	%		
More than 7	2	11 %	56	95 %	58	74 %	50.27	< 0.0001
Less than 7 Total	17	89 %	3	5%	20	26 %	9.80	0.0017

The above table showed that the 74% had more than 7 cases, with 11% normal and 95% acute appendicitis. The remaining 26% had less than 7 cases, with 89% normal and 5% acute appendicitis.

Table-5: Tzanakis, Modified Alvarado score comparison

		Modified Alvarado		
		More than 7	Less than 7	Total
Tzanakis	More than 8	56	4	60
	Less than 8	3	15	18
	Total	59	19	78

The above table showed that 60 had a Tzanakis score of more than 8, with 56 having a Modified Alvarado score of more than 7. The remaining 18 cases had a Tzanakis score of less than 8, with 15 having a Modified Alvarado score of less than 7.

4. DISCUSSION

In the present study, the diagnostic accuracy of both the Tzanakis Score and the MAS was found to be high, with the Tzanakis Score demonstrating slightly superior sensitivity and specificity. The sensitivity and specificity of the MAS were 94% and 96%, respectively, with an area under the curve (AUC) of 0.95, indicating excellent diagnostic performance. In comparison, the Tzanakis Score showed a sensitivity of 96% and a specificity of 95%, with an AUC of 0.97, marginally outperforming the MAS. Furthermore, the Tzanakis Score demonstrated a higher proportion of true positives (97%) and a lower rate of false negatives (11%), suggesting its greater reliability in confirming acute appendicitis.

Muhammad Mudasir Saleem et al.[7] found that out of 158 patients, 117 (74.1%) were males, while 41 (25.9%) were females. These findings collectively reinforce the observation that acute appendicitis is more prevalent in males across different study populations.

These findings align with those of Awan, Abdul Rafeh et al.,[8] who reported a pooled sensitivity of 86% and specificity of 73% for the Tzanakis Score. The AUC was calculated as 0.9261, and the diagnostic odds ratio (OR) was 22.52, further supporting the strong diagnostic capability of the Tzanakis Score. In comparison, the pooled sensitivity and specificity of the MAS were lower at 67% and 74% respectively, with an AUC of 0.7389 and a diagnostic OR of 4.92[9]. Similarly, Ashok Kumar Rajpura et al. found the sensitivity and specificity of the MAS to be 84.26% and 72.7%, respectively, with a positive predictive value (PPV) of 96.15% and a negative predictive value (NPV) of 36.3%. The Tzanakis Score in their study demonstrated slightly better sensitivity (88.2%) and an identical specificity of 72.7%, with a PPV of 96.31% and an NPV of 43.24%. The overall diagnostic accuracy was 83% for the MAS and 86.5% for the Tzanakis Score, consistent with the present study's findings[10].

Further supporting the superior performance of the Tzanakis Score, Korkut Mustafa et al. reported an AUC of 0.965, sensitivity of 84.4%, and specificity of 100% at a cut-off value of 8, indicating a highly reliable diagnostic tool. In contrast, the Modified Alvarado Score showed a lower AUC of 0.938, with a sensitivity of 60.9% and specificity of 89.9%[11]. Muhammad Mudasir Saleem et al. also highlighted the strong diagnostic ability of the Tzanakis Score, reporting a sensitivity of 91.9%, specificity of 85.1%, PPV of 93.6%, NPV of 81.6%, and an overall diagnostic accuracy of 89.9%. These results are further corroborated by Malla BR et al.,45 who found the sensitivity of the Tzanakis Score to be 86.9% in diagnosing acute appendicitis.'

5. CONCLUSION

The study demonstrates that both the MAS and the Tzanakis Score are reliable and effective tools for the preoperative diagnosis of acute appendicitis. However, the Tzanakis Score offers superior sensitivity and specificity, particularly in cases where the diagnosis is uncertain. Its higher accuracy, as evidenced by its correlation with histopathological confirmation, suggests that it may be a preferred diagnostic tool in clinical settings. While the MAS remains a useful tool, the Tzanakis Score's broader scoring range allows for finer diagnostic stratification, potentially reducing unnecessary appendectomies and improving patient outcomes.

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