

## ALVARADO SCORE VS. TZANAKI SCORE: WHICH PERFORMS BETTER AS DIAGNOSTIC TOOL IN ACUTE APPENDICITIS? - A RETROSPECTIVE OBSERVATIONAL STUDY

Mehulkumar M Tadvi<sup>1</sup>, Chirag K Sangada<sup>2</sup>, Arpan S Shah<sup>3</sup>

Received : 25/02/2024  
Received in revised form : 26/04/2024  
Accepted : 13/05/2024

**Keywords:**

Acute appendicitis, ALVARADO score, TZANAKI score

Corresponding Author:

**Dr. Mehulkumar M Tadvi,**

Email: mehultadvi\_10988@yahoo.com

DOI: 10.47009/jamp.2024.6.3.205

Source of Support: Nil,  
Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2024; 6 (3); 928-931



<sup>1</sup>Assistant Professor, Department of General Surgery, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat, India

<sup>2</sup>Associate Professor, Department of General Surgery, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat, India

<sup>3</sup>Professor, Department of General Surgery, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat, India

### Abstract

**Background:** Acute appendicitis is the most common surgical emergency, and early surgical intervention can improve outcomes. Diagnosing appendicitis can be difficult, and a high level of suspicion is important to prevent serious complications. The aim of this study was to evaluate accuracy and effectiveness of the Alvarado scoring system and Tzanaki scoring systems in the diagnosis of acute appendicitis to compare Sensitivity, Specificity, Positive predictive value (PPV), Negative predictive value (NPV) and Diagnostic accuracy. **Materials and Methods:** A total of 92 patients were included in this study. Data collected from the Database were carefully entered into a Microsoft Excel worksheet. After appendectomy was performed on each patient, The samples were sent for Histopathological examination. We personally measure the ALVARADO score and TZANAKI score. We then correlated these scores with histopathological results and performed statistical analysis. **Result:** Of the 92 patients 55(59.78%) male and 37(40.21%) were female. The highest number of patients was seen in the 12-20 age group (32.60%), followed by the 21 -30 age group (29.34%). In our study we found that the sensitivity of TZANAKI scoring system (86.36%) was more as compared to that of ALVARADO scoring system (43.93%) whereas the specificity of ALVARADO scoring system (92.30%) was higher than that of TZANAKI scoring system (73.07%). The Positive predictive value of ALVARADO scoring system (93.54%) was higher than TZANAKI scoring system (89.06%). The Negative predictive value of TZANAKI scoring system (67.85%) was higher than ALVARADO scoring system (39.34%). The diagnostic accuracy of TZANAKI scoring system (82.60%) was higher than ALVARADO scoring system (57.60%). **Conclusion:** The TZANAKI scoring system offers a superior diagnostic approach than ALVARADO scoring system for identifying acute appendicitis.

## INTRODUCTION

The vermiform appendix is commonly thought of as a vestigial organ. Its propensity to produce discomfort and result in appendicitis is the only reason it matters during surgery.<sup>[1]</sup> The most frequent surgical emergency is acute appendicitis, and results can be improved with prompt surgery. Appendicitis diagnosis can be challenging, thus it's critical to have a high degree of suspicion in order to avoid major complications from the illness. Experienced doctors diagnose appendicitis approximately 80% of the time depending on a combination of physical examination, medical

history, & laboratory studies.<sup>[2]</sup> Men had a lifelong risk of 8.6 percent & women had a lifelong risk of 6.7 percent of appendicitis, with a peak incidence occurring in the next ten years of existence. Right lower abdominal pain, gastrointestinal symptoms starting after the onset of pain, and a systemic inflammatory response with leucocytosis and neutrophilia, high CRP concentration, & fever are considered for the diagnosis of appendicitis.<sup>[3]</sup> To aid with diagnosis, a variety of lab-based and clinical grading systems have been established.<sup>[4]</sup> The Alvarado score is a scoring system utilized to diagnose acute appendicitis.<sup>[5]</sup> This scale, also called MANTRELS, has two laboratory tests and six

clinical domains (three symptoms and three signs), each of which is assigned an additive point score that can reach a maximum of ten points.<sup>[6]</sup> An acute case of appendicitis is consistent with an Alvarado score of 5 or 6. A score of 7 or 8 suggests that there may be a higher risk of appendicitis, and a score of 9 or 10 shows that the diagnosis has been made.<sup>[7]</sup> The Tzanaki scoring system, which has four criteria and a total score of fifteen, is a straightforward method developed by Tzanakis and associates for the diagnosis of appendicitis. This is an amalgam of ultrasonography, clinical examination, and assays for indicators of inflammatory response. Overall 15 points; >8: Surgery is necessary if appendicitis is diagnosed.<sup>[8]</sup> This study's objective was to assess the PPV, NPV, specificity, sensitivity, & precision of diagnosis of the Alvarado and Tzanaki scoring systems in the acute appendicitis diagnosis.

## MATERIALS AND METHODS

This retrospective observational study had been conducted on 92 patients of AA at the Department of General Surgery, Parul Institute of Medical Science and Research, Parul University, Vadodra, Gujarat, India between 1<sup>st</sup> April 2023 to 31<sup>st</sup> March 2024.

### Inclusion Criteria

Patients were clinically suspected of having acute appendicitis when they complained of right iliac fossa pain.

### Exclusion Criteria

- Patient's age <12 years and >60 years
- Pregnant Females
- Palpable Appendicular mass

### Methodology

This study had 92 patients in total. Every patient had a thorough medical history recorded, and then clinical examinations and any required investigations were carried out. The gathered data from the record section were carefully entered into a Microsoft Excel worksheet. Patients were evaluated using two different scoring systems- ALVARADO scoring system & TZANAKI scoring system.<sup>[8,9]</sup> [Table 1 & 2]

## RESULTS

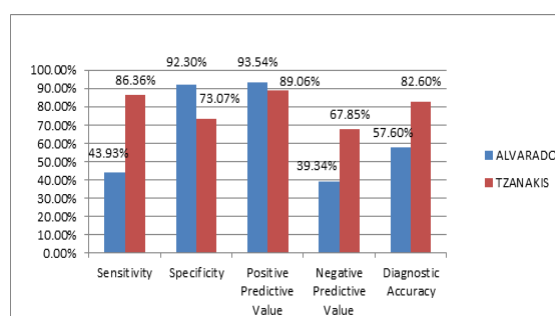


Figure 1: Comparison of Alvarado score and Tzanaki score in diagnosis of Acute appendicitis

Table 1: Alvarado scoring system.

Features	Score
Symptoms	
Migratory RIF Pain	1
Nausea/ Vomiting	1
Anorexia	1
Signs	
tenderness in RIF	2
Fever (>37.5 C)	1
Rebound tenderness	1
Lab Reports	
Raised WBC (>11000/cm3)	2
Shift of WBC to left	1
TOTAL	10

Table 2: Tzanaki scoring system

Components	Present	Absent
Presence of right lower abdominal tenderness	4	0
Raised WBC (>12000/cm3)	2	0
Rebound tenderness	3	0
Positive ultrasound scan findings of Appendicitis	6	0
TOTAL	15	

Table 3: Categorization in the groups

Category	Alvarado	Tzanakis
D(Definite)	>8	>12
HP (High Probability)	7-8	8-12
LP(Low Probability)	5-6	5-7
U(Unlikely)	<5	<5

Following the final score, patients in both groups were divided into 4 groups.

After appendectomy was performed on each patient, The samples were sent for Histopathological examination. We personally measure the

ALVARADO score and TZANAKI score. We then correlated these scores with histopathological results and performed statistical analysis.

Our findings are based on an examination of ninety-two patients who had an appendectomy after receiving a diagnosis.

Of the 92 patients, 55(59.78%) male and 37(40.21%) were female.

In our study total of 92 patients clinically suspected and diagnosed with acute appendicitis underwent appendectomy. According to histopathological results, 52 patients (56.52%) had acute appendicitis, 14 patients (15.21%) had perforated appendicitis, and 26 patients (28.06%) had subacute appendicitis.

**Table 4: Distribution of patients according to Age in years**

Age (years)	Number of patients	Percentage
12- 20	30	32.60
21-30	27	29.34
31-40	18	19.56
41-50	8	8.69
51-60	9	9.72

The age group of 12 to 20 saw the most patients (32.60%), followed by the age group of 21 to 30 (29.34%).

**Table 5: Distribution of patients according to Alvarado scoring system and Tzanaki scoring system**

Category	Alvarado	Tzanakis
D(Definite)	16	33
HP (High Probability)	29	34
LP(Low Probability)	27	22
U(Unlikely)	20	3
TOTAL	92	92

**Table 6: Comparison of Alvarado scoring system with histopathological diagnosis**

		Histopathological examination Report		
		Acute	Subacute	
Alvarado score	>7	29(TP)	2 (FP)	31
	<7	37(FN)	24 (TN)	61
Total		66	26	92

To enhance our evaluation, we sub-divided the cases in 2 different categories: acute and subacute. The acute group includes perforated cases.

TP- True positive, TN- True negative, FP- False positive, FN- False negative

**Table 7: Comparison of Tzanaki scoring system with histopathological diagnosis**

		Histopathological examination Report		
		Acute	Subacute	
Tzanaki score	>8	57(TP)	7(FP)	64
	<8	9(FN)	19(TN)	28
Total		66	26	92

**Table 8: Comparison of Alvarado scoring system and Tzanaki scoring system in diagnosis of Acute appendicitis**

Statistical analysis	Alvarado	Tzanakis
Sensitivity	43.93%	86.36%
Specificity	92.30%	73.07%
PPV	93.54%	89.06 %
NPV	39.34%	67.85%
Diagnostic Accuracy	57.60%	82.60%

## DISCUSSION

When hospitals are handling acute surgical emergencies, the most common differential diagnosis that they see is acute appendicitis. The inflammatory organ is still surgically removed as the standard of care. While the practice of relying on clinical expertise to diagnose and opt for an appendectomy is well-established, there are also several diagnostic strategies proposed to lower the frequency of nonessential appendectomy procedures.<sup>[10]</sup>

To determine which clinical scoring system is more sensitive, specific, and accurate in diagnosing acute appendicitis, a number of research studies and investigations have been carried out in addition to the development of numerous clinical scoring systems.<sup>[11-13]</sup>

When the Alvarado scoring system was examined with the Tzanakis scoring system it contained more characteristics, but an imaging study not present, which is now an essential element of diagnosis. Tzanaki scoring system is enhanced by the superior insights gained from ultrasound (USG) findings, which have contributed an additional six points.

In our investigation, we discovered that the ALVARADO scoring system (43.93%) specificity was lower than the TZANAKI scoring system (73.07%) specificity, while the TZANAKI scoring system (86.36%) sensitivity was higher. The TZANAKI scoring system demonstrates higher sensitivity, indicating its ability to correctly identify more true positive cases. However, the TZANAKI scoring system has higher specificity, meaning it is better at correctly identifying true negative cases.

The PPV of ALVARADO scoring system (93.54%) was higher than TZANAKI scoring system (89.06%). The NPV of TZANAKI scoring system (67.85%) was higher than ALVARADO scoring system (39.34%). The ALVARADO scoring system has a slightly higher PPV, indicating its reliability in correctly predicting true positive cases when the score is positive. However, the TZANAKI scoring system has a better NPV, correctly predicting true negative cases when the score is negative.

The diagnostic accuracy of TZANAKI scoring system (82.60%) was higher than ALVARADO scoring system (57.60%). The TZANAKI scoring system overall demonstrates better diagnostic accuracy, considering both sensitivity and specificity. It strikes a balance between correctly identifying positive and negative cases.

A study by Shashikala V et al revealed that the TZANAKI scoring systems sensitivity stands at 79.62%, its specificity at 83.3%, while the PPV is 97.72% & the NPV is 31.25%. The ALVARADO scoring system has a 61.9% sensitivity, a 50% specificity, 86% PPV, & a 15% NPV.<sup>[14]</sup>

A study done by Murugesan et al demonstrated that the TZANAKI scoring systems sensitivity stands at 89.6%, its specificity at 75%, while the PPV is 97.5% & the NPV is 33.3%. The sensitivity and specificity of the ALVARADO scoring system are 76% and 75%, respectively, and the PPV and NPV are 97.2% and 21.4%, respectively.<sup>[15]</sup>

The selection of an appropriate scoring system in clinical practice depends on individual patient characteristics and the desired trade-offs between sensitivity and specificity. Both scoring systems have their advantages and limitations, and doctors must consider these factors when making a diagnosis.

## CONCLUSION

Compared to the Alvarado scoring system, the Tzanaki scoring system provides a better diagnostic method for determining acute appendicitis. It surpasses the latter in terms of \*sensitivity,

specificity, positive predictive value, and negative predictive value\*. Employing the Tzanaki scoring system for determining the necessity of an appendectomy could potentially reduce the incidence of unnecessary appendectomies.

## REFERENCES

1. Bailey & love's short practice of surgery, 25th edition, chapter-67,p. 1204-1218:2008
2. Sabiston textbook of surgery, 19th edition,chapter -51,p. 1279-1293:2012
3. Schwartz's principles of surgery, 10th edition, chapter-30,p.1241-1262:2014
4. Bolívar-Rodríguez, Martín, Osuna-Wong, Et Al.: Comparative Analysis Of Diagnostic Scales Of Acute Appendicitis: Alvarado, RIPASA And AIR. Cirugía Y Cirujanos (English Edition). 86. 10.24875/CIRUE.M18000024
5. Alvarado, A (May 1986). "A practical score for the early diagnosis of acute appendicitis". *Annals of Emergency Medicine*. 15 (5): 557-64. doi:10.1016/S0196-0644(86)80993-3. PMID 3963537
6. Martinez JP (2007). "Evaluation and Management of the Patient with Abdominal Pain". In Mattu A, Goyal D (eds.). *Emergency Medicine*. Malden, Massachusetts: Blackwell (BMJ Books). p. 28. ISBN 978-1-4051-4166-6 Retrieved 2022-04-15
7. Douglas, CD (14 October 2000). "Randomised controlled trial of ultrasonography in diagnosis of acute appendicitis, incorporating the Alvarado score". *BMJ*. 321 (7266): 919-22. doi:10.1136/bmj.321.7266.919. PMC 27498. PMID 11030676.
8. Tzanakis NE, Efstathiou SP, Danulidis K, Rallis GE, Tsioulos DI, Chatzivasiliou A, et al. A new approach to accurate diagnosis of acute appendicitis. *World J Surg*. 2005;29(9):1151-6.
9. Rohitash Singh, Nemi Chandra, Vivek Belsariya, Sri Saran Manivasagam, Dhananjay Khera, Abhinav Kumar IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 22, Issue 11 Ser.4 (November. 2023), PP 04-11
10. Pal, K. M., Khan, A. (1998). Appendicitis: a continuing challenge. *Journal of Pakistan Medical Association*, 48(7), 189-192
11. Hsiao KH, Lin LH, Chen DF. Application of the MANTRELS scoring system in the diagnosis of acute appendicitis in children. *Acta Paediatr Taiwan*. 2005;46(3):128-31.
12. Saverio S, Podda M, Simone B, Ceresoli M, Augustin G, Gori A, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World J Emerg Surg*. 2020;15(1):27.
13. Macco S, Vrouenraets BC, Castro SM. Evaluation of scoring systems in predicting acute appendicitis in children. *Surgery*. 2016;160(6):1599-604.
14. Shashikala V, Hegde H, Victor AJ, Hegde H. Comparative study of Tzanakis score vs Alvarado score in the effective diagnosis of acute appendicitis \* Correspondence Info:2016;7(9):418-20
15. Study AC, Efficacy OF, Tzanakis OF, With S, In S, Acute D. International journal of scientific research a comparative study of efficacy of tzanakis score with alvarado score in diagnosing acute appendicitis surgery r pachiappan abstract keywords : 2017;(5):628-9.