

A Comparative Study of Tzanakis Score versus Alvarado Score in Acute Appendicitis at a Rural Hospital

Bharath B.¹, Vankam Aseesh Varma², G. Sagar Reddy³

¹Assistant Professor, Department of General Surgery, PES Institute of Medical Sciences and Research, Kuppam, Chittoor, Andhra Pradesh, India. ²Resident, Department of General Surgery, PES Institute of Medical Sciences and Research, Kuppam, Chittoor, Andhra Pradesh, India. ³Resident, Department of General Surgery, PES Institute of Medical Sciences and Research, Kuppam, Chittoor, Andhra Pradesh, India.

ABSTRACT

BACKGROUND

Several scoring systems have been developed to aid clinicians in diagnosing acute appendicitis. Tzanakis scoring system is one of the modern scoring systems which uses clinical, USG, and laboratory markers. Alvarado score is one of the commonly used scoring systems. But the accuracy of diagnosing acute appendicitis has been low. This study compares the ability of Tzanakis scoring system with that of Alvarado score in predicting acute appendicitis.

METHODS

A prospective non-randomized study was conducted among 100 patients who were diagnosed to have acute appendicitis admitted in the Department of General Surgery, PESIMSR- KUPPAM, between December 2017 to August 2019. After complete clinical, radiological, and laboratory workup, Alvarado, and Tzanakis score was compiled, and patients underwent appendectomy based on the clinical acumen of the operating surgeon. Histopathology results were analysed postoperatively with preoperative scores.

RESULTS

Out of 100 patients, the sensitivity, specificity, positive predictive value, and negative predictive value of Tzanakis score was 52.7 %, 92.31 %, 97.78 %, and 21.82 % respectively.

CONCLUSIONS

The Tzanakis scoring system at a cut-off score of >8 is an effective scoring system than the Alvarado score for the diagnosis of acute appendicitis.

KEYWORDS

Acute Appendicitis, Appendectomy, Tzanakis Scoring System, Alvarado Score

Corresponding Author:

*Dr. Bharath B.,
S171, Dwarakavasa Road, 2nd Stage,
Bharathnagar, BEL Layout,
Herohalli, Near Anupama Hospital,
Bengaluru-560091, Karnataka, India.
E-mail: bharathbasavaraj@gmail.com*

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BACKGROUND

Acute appendicitis is one of the most prevalent causes of acute abdomen, leading to surgical emergencies. Several scoring systems are in routine use to aid clinicians in diagnosing Acute Appendicitis. The best-known scores are The Alvarado score, the modified Alvarado score, The RIPASA score, and the Tzanakis score. These tools not only can be used for diagnostic purposes but also risk stratification, separating those patients who require observation and workup from those who need surgery. The Tzanakis scoring system is a combination of clinical examination, USG, and laboratory markers of the inflammatory response used to diagnose it accurately. The objective of this study is to compare the sensitivity, specificity, positive predictive value, negative predictive value, the diagnostic accuracy of Tzanakis score vs. Alvarado score in predicting Acute Appendicitis.

METHODS

A prospective non-randomized study was conducted among 100 patients who were diagnosed to have acute appendicitis and willing to participate in the study admitted in the Department of General Surgery, PESIMSR-KUPPAM, between December 2017 to August 2019. The study was approved by the Institutional Ethics Committee. The study included all the patients who consented for the study, and those underwent appendicectomy. The initial evaluation of patients conducted upon admission, Alvarado, and Tzanakis score were tabulated. The Tzanakis scoring consists of four parameters, and the Alvarado score has eight parameters as below.

Tzanakis Scoring

1. Presence of right lower abdominal tenderness = 4 points
2. Rebound tenderness = 3 points
3. Laboratory findings: the presence of white blood cells greater than 12,000 in the blood = 2 points
4. Ultrasound finding: the presence of positive ultrasound scan findings of Appendicitis = 6 points.

Total-15 points; >8: Diagnostic of acute Appendicitis requiring surgery. Alvarado and Tzanakis scores were tabulated according to the clinical presentation of the patient. But medical/surgical line of treatment was solely based on the clinical accuracy of the surgeon. The intraoperative findings were noted, and the specimen was sent in a 10 % formalin container for histological examination. The histopathological diagnosis of acute Appendicitis was taken as gold standard diagnosis.

Statistical Analysis

Data was analysed using Microsoft excel 2016 and SPSS version 17. Frequencies, percentages, mean with standard

deviation and p values were calculated. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), diagnostic accuracy were calculated. The 'p' value of less than 0.05 was regarded as significant.

RESULTS

A total of 100 patients underwent emergency appendicectomy and were selected for study. The study group consisted of 77 males and 23 females. The mean age of patients was 31.88 ± 11.33 years with age ranging from 5 to 60 years. Majority of cases occurred in third decade of life. In this study, Tzanakis scores of the patients with 4-6 (27 %), 7-9 (28 %), 10-12 (23 %) and 13-15 (22 %) had histological evidence of Acute Appendicitis. None of the patient had acute appendicitis with score less than 3.

Histopathological reports who underwent surgery were reported as normal in 13 % of patients, acute appendicitis is 47 %, sub-acute appendicitis 7 %, Acute Suppurative appendicitis was 18 %, Acute Gangrenous appendicitis was 11 % and Recurrent appendicitis was 4 %. Tzanakis scores in co-relation with the histopathological diagnosis were tabulated in Table 1. The minimum and maximum Tzanakis scores observed were 4 and 15 respectively with a mean score of 10.24. The association of Tzanakis score and Histopathological outcome with significant p value is depicted in Table 2.

Tzanakis Score	AA	AGA	ASA	N	RA	SAA	Total	P Value
0 - 3	0	0	0	0	0	0	0	<0.005
4 - 6	3	4	4	10	1	5	27	
7 - 9	20	1	2	2	1	2	28	
10 - 12	15	1	5	1	1	0	23	
13 - 15	9	5	7	0	1	0	22	
Total	47	11	18	13	4	7	100	

Table 1. Comparison of Tzanakis Score According to Subtypes of HPE

N - Normal, AA - Acute Appendicitis, ASA - Acute Suppurative Appendicitis, AGA - Acute Gangrenous Appendicitis, RA - Recurrent Appendicitis, SAA - Sub Acute Appendicitis.

Tzanakis Score	Normal	SAA	AA	Total
<8	12	7	36	55
>8	1	0	44	45
Total	13	7	80	100

Table 2. HPE Wise Distribution of Tzanakis Score with Cut Off

Diagnostic Indices of Tzanakis Score

The sensitivity and specificity of Tzanakis score ≥ 8 in diagnosis of AA was 50.57 % and 92.31 % respectively. The overall diagnostic accuracy was 56 % with positive predictive value of 97.78 % and negative value of 21.82 % (Table 3)

Index	New Score (%)	95 % Confidence Interval
Sensitivity	50.57 %	39.64 % to 61.47 %
Specificity	92.31 %	63.97 % to 99.81 %
Positive Predictive Value	97.78 %	86.87 % to 99.66 %
Negative Predictive Value	21.82 %	17.65 % to 26.66 %
Diagnostic Accuracy	56.00 %	45.72 % to 65.92 %

Table 3. Diagnostic Indices for Tzanakis Score

DISCUSSION

Acute appendicitis is one of the most common surgical conditions encountered in clinical practice, and it is difficult to diagnose particularly in women and children. Negative appendectomy is not devoid of complications, though the mortality is low, it can be associated with increased morbidity and significant hospital stay. Hence, negative appendectomy should be lowered as low as possible.¹

A retrospective study by M lee et al.² Showed appendectomy done for 467 patients over two years had 30.6 % with a normal appendix. This study showed there was no significant difference statistically with complications of appendectomy for those who had normal appendix and an inflamed appendix. Similarly, there was no severity in the complications.

Even though there was no significant difference still negative appendectomy carries a risk of increased morbidity. Numerous scoring systems have been developed to aid in preoperative diagnosis of acute appendicitis like Alvarado, Modified Alvarado score, RIPASA scoring system is being used worldwide. The new Tzanakis scoring system found to be superior to the previously formulated scoring systems. This scoring system has the sensitivity, specificity, and diagnostic accuracy was 95.4 %, 97.4 %, and 96.5 %, respectively, according to the original study.

In our study, the Tzanakis score had a sensitivity of 50.57 %, and specificity of 92.3 %, 97.7 % positive predictive value, 21.8 % negative predictive value. These results resemble the study done by Tzanakis et al. have published that its scoring system had sensitivity and specificity of 95.4 % and 97.4 %, respectively.

Tzanakis score 8 was made cut off and correlated with histopathology, which showed a significant p-value of <0.005, which indicates that the Tzanakis score when taken as a cut off at 8 there is better sensitivity, specificity, PPV and NPV with improved diagnostic accuracy.

Comparison of the Present Study with Other Scoring Systems

Alvarado scoring system, which was introduced by Alvarado in the year 1986, gained popularity due to the ease of calculating the score and quick decision making regarding the need for surgery in case of Acute Appendicitis. Though the Alvarado score is a very effective scoring system followed, the absence of sonological component made the diagnosis difficult at times, especially when there are many differential diagnoses, particularly in women and children.

Various standard scoring systems were compared with the current study and tabulated as below (Table- 4)

Scoring System	Sensitivity	Specificity	PPV	NPV
Alvarado	73 - 90	80 - 87	90 - 95	22 - 30
RIPASA	95 - 98	67 - 72		
Tzanakis	89 - 97	75 - 90	97.5	33
Present Study	50.57 %	92.3 %	97.7 %	21.8 %

Table 4. Comparison of Present Study with Other Scoring Systems

Comparison of Present Study with Other Similar Studies

The original study done by Nikolas E. Tzanakis et al.³ Few other studies are currently available in the literature done by Sigdel GS et al.⁴ In the year 2010, for a sample size of 100 patients with sensitivity, specificity and overall diagnostic accuracy of 91.48 %, 66.66 %, and 90 % respectively. A study by Malla BR et al.⁵ For a sample size of 200 patients with sensitivity, specificity, positive predictive value and negative predictive value 86.9 %, 75.0 %, 97.5 % and 33 % respectively.

Similar studies by Sasikala v et al.⁶ In the year 2016 with sensitivity, specificity, PPV, and NPV 79.62 %, 83.3 %, 97.72 %, 31.25 %, respectively. Arun Kumar SL et al,⁷ in the year 2015 with sensitivity, specificity, PPV, and NPV of 85.49 %, 71.43 %, 98.80 %, and 15.15 %. A study by Atreya et al.⁸ In the year 2016 concluded the sensitivity, specificity, PPV, and NPV of their study being 93.83 %, 52.94 %, 90.48 %, and 64.29 % respectively. A similar study was done by R. Anupriya et al.⁹ In March 2019, the Tzanakis score is diagnostically accurate with sensitivity, specificity, PPV, and NPV of 65.52 %, 100 %, 100 %, and 37.50 % respectively.

Study	Sample Size	Sensitivity	Specificity	PPV	NPV
Original Tzanakis	504	95.4 %	97.4 %	-	-
Sigdel et al	100	91.48 %	66.6 %	-	81 %
Malla et al	200	86.9 %	75 %	97.5 %	33 %
Sasikala et al	50	79.62 %	83.3 %	97.72 %	31.25 %
Arun kumar et al	200	85.49 %	71.49 %	98.8 %	31.90 %
Atreya et al	98	93.83 %	52.94 %	90.48 %	64.29 %
Anupriya et al	70	65.52 %	100 %	100 %	17.78 %
Present study	100	50.57 %	92.3 %	97.7 %	21.8 %

Table 5. Comparison of Present Study with Other Similar Studies

The above table show that the present study is comparable in terms of sensitivity, specificity, PPV, NPV and diagnostic accuracy in diagnosing Acute Appendicitis.

CONCLUSIONS

Tzanakis scoring system is highly dependent on the clinician who diagnoses, the radiologist who performs the ultrasonography, and the pathologist who reports the histological report. With the advantages of easy tabulation, and use of ultrasonography, which no other scoring systems currently does, this scoring system is a better tool in evaluating patients suspected to have acute appendicitis, and thereby reduces the rates of negative appendectomy. The main disadvantage of this study is observer bias.

Financial or Other Competing Interests: None.

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