

A Prospective Observational Study To Determine The Diagnostic Efficacy Of Tzanakis Score Versus Modified Alvarado Score In Clinically Diagnosed Acute Appendicitis Cases

Dr.Rahul C R¹, Dr.Faruk Khan², Dr.Prabha Om³, Dr.Deepak Ahlawat⁴,
Dr. Likhitha S⁵

¹(Department of General Surgery, Sawai Man Singh Medical College, Jaipur, Rajasthan, India)

²(Department of General Surgery, Sawai Man Singh Medical College, Jaipur, Rajasthan, India)

³(Department of General Surgery, Sawai Man Singh Medical College, Jaipur, Rajasthan, India)

⁴(Department of General Surgery, Sawai Man Singh Medical College, Jaipur, Rajasthan, India)

⁵(Department of Paediatrics, Sampurnanand Medical College, Jodhpur, Rajasthan, India)

Abstract:

BACKGROUND: Acute appendicitis is the most common cause of acute abdomen countered worldwide. Several scoring systems have been developed to aid clinicians in diagnosis. Alvarado score is one of the commonly used scoring systems which is based on clinical and laboratory investigations. Tzanakis scoring system uses clinical, USG and laboratory markers.

AIM: To compare the diagnostic efficacy of Modified Alvarado score and Tzanakis score with Histopathological diagnosis in clinically diagnosed appendicitis.

Methodology: Hospital based, single center, single blind, prospective observational study. 45 patients who are clinically and sonographically diagnosed of acute appendicitis who met the inclusion and exclusion criteria were taken. Samples from appendicectomies were submitted to histopathology, which was used the gold standard for the definitive diagnosis of acute appendicitis. The specificity, sensitivity, positive predictive value (PPV), negative predictive value (NPV), diagnostic accuracy of Alvarado and Tzanaki scoring system was calculated.

RESULTS: The sensitivity, specificity, positive predictive value and negative predictive value of Alvarado score was 53.66%, 100.0%, 100.0% and 17.39% respectively. The sensitivity, specificity positive predictive value and Negative predictive value of Tzanakis score was 90.24%, 75.0%, 97.37% and 42.86% respectively.

CONCLUSIONS: Tzanakis score is more effective than Alvarado score for the diagnosis of Acute appendicitis.

Date of Submission: 21-05-2023

Date of Acceptance: 01-06-2023

I. INTRODUCTION

Acute Appendicitis is one of the most common causes of an acute abdomen in young adults. The lifetime risk of acute appendicitis in the general population is 7%, and up to 10% of acute appendicitis occurs in the geriatric population [1,2]. Appendicitis tends to have a more complicated course with advancing age. To supplement the clinical diagnosis and to reduce the frequency of unnecessary appendicectomy, the importance of laboratory investigations like White Blood Cell counts and C-reactive protein etc values has been stressed. [3-5] The use of Ultrasonography as a diagnostic tool for appendicitis has been widely known and studied. [6-9] Various scores combining clinical features and laboratory investigations have also been developed and are good enough to reach the diagnosis. Naming a few are Alvarado score, Modified Alvarado score, Tzanakis score, Lintula score, RIPASA score etc. The objective of the study is to compare the diagnostic efficacy of Modified Alvarado score and Tzanakis score with Histopathological diagnosis in clinically diagnosed appendicitis.

II. MATERIALS AND METHODS

After obtaining approval from the Institutional Ethics Committee, the prospective observational study was conducted. Sample size of 41 cases was calculated at 95% confidence and 8% error to verify the expected sensitivity of 94.1% of Modified Alvarado score criteria. 45 Patients admitted in Department of General Surgery, SMS JAIPUR between August 2021 to December 2022 with symptoms and signs clinically suggestive of acute appendicitis; planned for elective laparoscopic or emergency open appendectomy were selected for the study. They were included after obtaining valid consent. At the time of admission, Modified Alvarado and Tzanakis score were tabulated.

Inclusion Criteria:

1. The patients clinically and sonographically diagnosed as acute appendicitis.
2. Patient undergoing open or laparoscopic appendicectomy.
3. Patients who have given valid written informed consent

Exclusion Criteria:

1. Patients not fit or not willing for surgery.
2. Appendicular perforation, Appendicular abscess, Appendicular mass.
3. Patient with Equivocal findings in ultrasonography.
4. Pregnant patients with appendicitis.
5. Patients undergoing interval appendicectomy.
- 6.Children below 10 years age.

Modified Alvarado Score

1. Migratory pain – 1 point
2. Anorexia – 1 point
3. Nausea – 1 point
4. Elevated temperature – 2 points
5. Rebound tenderness – 1 point
6. Nausea/Vomiting – 1 point
7. Leucocytosis – 2 points

Score <5 – Unlikely to be appendicitis
 5-6 – Low Probability to be appendicitis
 6-7 – High Probability to be appendicitis
 >8 – Definite appendicitis

Tzanakis Score

1. Presence of total leucocyte count greater than 12000 – 2 points
2. Rebound Tenderness– 3 points
3. Presence of right lower abdominal tenderness– 4 points
4. Ultrasound findings positive for Appendicitis– 6 points

Score>8 - indicating Acute Appendicitis requiring surgery

All patients underwent either Open or Laparoscopic Appendectomy. Correlation of both Alvarado and Tzanakis scores was done with the histopathological diagnosis of the specimen obtained.

III. RESULTS

TABLE 1: AGE DISTRIBUTION AMONG STUDY SUBJECTS

AGE IN YEARS	FREQUENCY	PERCENT
10-20	18	40.0
21-30	17	37.8
31-40	7	15.6
41-50	3	6.7
MEAN AGE	24.87+9.657	
TOTAL	45	100.0

Acute appendicitis is a disease of the young commonly seen in the age group of 10-20 years followed by 21-30 years.

TABLE 2: GENDER DISTRIBUTION AMONG STUDY SUBJECTS

GENDER	FREQUENCY	PERCENT
MALE	27	60.0
FEMALE	18	40.0

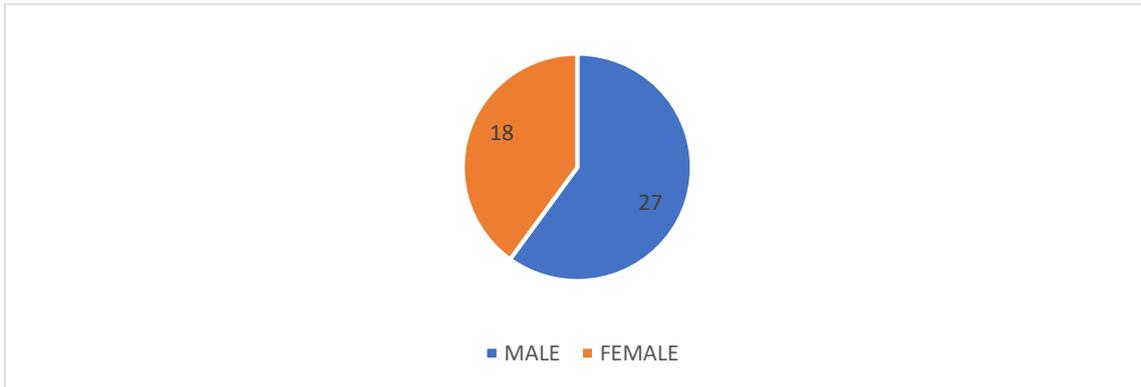


TABLE 3: ASSOCIATION OF ALVARADO SCORE WITH HISTOPATHOLOGICAL EXAMINATION(HPE)

ALVARADO SCORE		HPE		P VALUE
		POSITIVE	NEGATIVE	
POSITIVE	N	22 (TP)	0 (FP)	0.059
	%	53.7	0.0	
NEGATIVE	N	19 (FN)	4 (TN)	
	%	46.3	100.0	

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

Among total 45 cases, 22(53.7%) were positive on both Alvarado score and HPE, 4 were negative on both Alvarado score and HPE. 19 (46.3%) were negative on Alvarado score but positive on HPE and there were no cases which were positive on Alvarado score but negative on HPE. No significant association was found between Alvarado score and HPE.

TABLE 4: ASSOCIATION OF TZANAKIS SCORE WITH HPE

TZANAKIS SCORE		HPE		P VALUE
		POSITIVE	NEGATIVE	
POSITIVE	N	37 (TP)	1 (FP)	0.009*
	%	90.2	25.0	
NEGATIVE	N	4 (FN)	3 (TN)	
	%	9.8	75.0	

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

Among total 45 cases, 37(90.2%) were positive on both Tzanakis score and HPE, 3 were negative on both Tzanakis score and HPE. 4 (9.8%) were negative on Tzanakis score but positive on HPE and there was 1 case (25%) which was positive on Tzanakis score but negative on HPE. Significant association was found between Tzanakis score and HPE (P <0.05).

TABLE 5: ASSOCIATION OF ALVARADO AND TZANAKIS SCORE WITH HPE

HPE		MODIFIED ALVARADO SCORING	TZANSKI SCORE	P VALUE
POSITIVE (41)	Mean	6.29	10.73	0.000*
	SD	1.470	1.988	
NEGATIVE (4)	Mean	4.25	6.50	0.010
	SD	0.957	2.517	

Among HPE positive cases mean Alvarado score was 6.29+1.470 and mean Tzanakis score was 10.73+1.988. Tzanakis score was significantly higher compared to modified Alvarado score (P<0.05). Among Histopathological Examination negative cases mean alavardo score was 4.25+0.957 and mean Tzanakis score was 6.50+2.517 Tzanakis score was higher compared to modified Alvarado score (P<0.05).

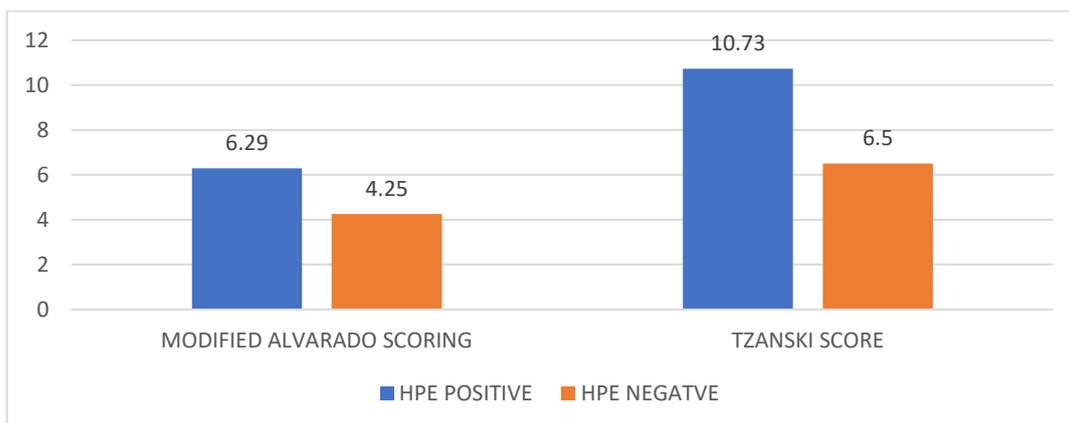


TABLE 6: COMPARISON OF ALAVARDO SCORE AND TZANAKIS SCORE

	ALAVARDO SCORE	TZANAKIS SCORE
SENSITIVITY	53.66	90.24
SPECIFICITY	100.0	75.0
POSITIVE PREDICTIVE VALUE	100.0	97.37
NEGATIVE PREDICTIVE VALUE	17.39	42.86

Alvarado score showed Sensitivity-53.66%, Specificity-100.0%, Positive Predictive Value-100.0% and Negative predictive Value-17.39%.

Tzanakis score showed Sensitivity-90.24%, Specificity-75.0%, Positive Predictive Value-97.37% And Negative Predictive Value-42.86%.

IV. DISCUSSION

Total 45 subjects were included in the study. Among these 45, majority i.e., 18 (40%) were in 10-20 years age group, followed by 17 (37.8%) were in 21-30 years age group, 7 (15.6%) were in 31-40 years age group and only 3 (6.7%) were in 41-50 years age group. In a study by Choudhary et al.¹⁰ Dutta et al.¹¹ and J. A. H. Lee et al.¹² majority of the subjects belonged to 21-30 years age group similar to this study. Mean age in the study was 24.87+9.657 years similar to a study by Dar et al.¹³ in which it was 25 years. Appendix is common in the younger age because of the larger proportion of lymphoid tissue which was consistent with this study¹².

Among 45 subjects, 27 (60%) were males and 18 (40.0%) were females. This was similar to studies by Dutta et al.¹¹ Roger Luckmann et al.¹⁴ and Gideon et al.¹⁵ in which male predominance was seen.

Among total 45 cases, 22(53.7%) were positive on both Alvarado score and HPE, 4 were negative on both Alvarado score and HPE. 19 (46.3%) were negative on Alvarado score but positive on HPE and there were no cases which were positive on Alvarado score but negative on HPE. Hence 53.7% were true positive, 100% were true negative, 46.3% were false negative and 0 cases were false positive. Alvarado score showed Sensitivity-53.66%, Specificity-100.0%, Positive Predictive Value-100.0% and Negative Predictive Value-17.39%. In a study by Dar et al.¹³ 93.75% were true positive, 85% were true negative, 6.25% were false negative and 15% were false positive. The results of this previous study were different from the present study; however Sensitivity and NPV was more comparable. In this study, no significant association was found between Alvarado score and HPE contrary to a study by Dar et al.¹³

Among total 45 cases, 37(90.2%) were positive on both Tzanakis score and HPE, 3 (75%) were negative on both Tzanakis score and HPE. 4 (9.8%) were negative on Tzanakis score but positive on HPE and there was 1 case (25%) which was positive on Tzanakis score but negative on HPE. Hence in this study, 90.2% were true positive, 75% were true negative, 9.8% were false negative and 25% were false positive on Tzanakis score. Tzanakis score showed Sensitivity-90.24%, Specificity-75.0%, Positive Predictive Value-97.37% And Negative Predictive Value-42.86%. In a study by Dar et al.¹³ 79.5% were true positive, 86.5% were true negative, 20.5% were false negative, 13.5% were false positive, positive predictive value was 97.5 and negative predictive value was 86.4 on Tzanakis score which was similar to this study. In this study, significant association was found between Tzanakis score and HPE (P <0.05) similar to a study by Dar et al.¹³

In a study by Choudhary et al.¹⁰ sensitivity, specificity, positive predictive value and negative predictive value of Alvarado scoring system to be 65.11%, 35.71%, 86.1% and 14.28% respectively. The results of the present study were similar to the previous one except that specificity of the previous study was much less compared to this study. Sensitivity, specificity, positive predictive value and negative predictive value of Tzanakis

scoring system in study by Choudhary et al.¹⁰ was 83.72%, 78.57%, 96% and 44% respectively similar to this study.

Mean Tzanakis score was significantly higher than mean Alvarado score among HPE positive cases and was significantly lower than Alvarado score among HPE negative cases. Tzanakis score was significantly associated with HPE and Alvarado score was not.

V. CONCLUSION

The most common symptom in the study was lower abdominal tenderness followed by nausea/vomiting. On Alvarado scoring system sensitivity of 53.66%, specificity of 100.0%, positive predictive value of 100.0% and negative predictive value of 17.39%. On Tzanakis scoring system, a sensitivity of 90.24%, specificity of 75.0%, positive predictive value of 97.37% and Negative predictive value of 42.86%. Hence, we conclude that Tzanakis score is more effective than Alvarado score for the diagnosis of Acute appendicitis.

REFERENCES:

- [1]. Williams NS, O'Connell PR, McCaskie AW, editors. Bailey & Love's short practice of surgery. 27th edition. Boca Raton, FL: CRC Press; 2017.
- [2]. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol.* 1990 Nov;132(5):910–25.
- [3]. Grönroos JM, Grönroos P. Diagnosis of acute appendicitis. *Radiology.* 2001 Apr;219(1):297–8.
- [4]. Grönroos JM, Grönroos P. Leucocyte count and C-reactive protein in the diagnosis of acute appendicitis. *Br J Surg.* 1999 Apr;86(4):501–4.
- [5]. Grönroos JM, Grönroos P. A fertile-aged woman with right lower abdominal pain but unelevated leukocyte count and C-reactive protein. Acute appendicitis is very unlikely. *Langenbecks Arch Surg.* 1999 Oct;384(5):437–40.
- [6]. Jeffrey RB, Laing FC, Lewis FR. Acute appendicitis: high-resolution real-time US findings. *Radiology.* 1987 Apr;163(1):11–4.
- [7]. Puylaert JB, Rutgers PH, Lalisang RI, de Vries BC, van der Werf SD, Dörr JP, et al. A prospective study of ultrasonography in the diagnosis of appendicitis. *N Engl J Med.* 1987 Sep 10;317(11):666–9.
- [8]. Rioux M. Sonographic detection of the normal and abnormal appendix. *AJR Am J Roentgenol.* 1992 Apr;158(4):773–8.
- [9]. Lim HK, Lee WJ, Lee SJ, Namgung S, Lim JH. Focal appendicitis confined to the tip: diagnosis at US. *Radiology.* 1996 Sep;200(3):799–801.
- [10]. Choudhary S, Sharma B, Paul N. A Comparative Study of Tzanakis Score Vs Alvarado Score in the diagnosis of Acute Appendicitis. *Paripeh Indian J Res.* 2020; 9(11):39-41.
- [11]. Dutta SK, Mohan RC, Teja PL. Comparative Study of Tzanakis Score Vs Alvarado Score in the Effective Diagnosis of Acute Appendicitis. *Int. J of Dent and Med Sci Res.* 2022;4(1):792-811
- [12]. Lee JH, Jeong YK, Hwang JC, Ham SY, Yang SO. Graded compression sonography with adjuvant use of a posterior manual compression technique in the sonographic diagnosis of acute appendicitis. *American Journal of Roentgenology.* 2002 Apr;178(4):863-8.
- [13]. Tantray MA, Raina AW. Tzanaki's Score Vs Modified Alvarado's Score in diagnosing acute appendicitis: A Comparative study in a tertiary care hospital.
- [14]. Luckmann R, Davis P. The epidemiology of acute appendicitis in California: racial, gender, and seasonal variation. *Epidemiology.* 1991 Sep 1:323-30.
- [15]. Stein GY, Rath-Wolfson L, Zeidman A, Atar E, Marcus O, Joubran S, Ram E. Sex differences in the epidemiology, seasonal variation, and trends in the management of patients with acute appendicitis. *Langenbeck's archives of surgery.* 2012 Oct;397(7):1087-92.