

Tzanakis score as a diagnostic tool for an acute appendicitis: An institution-based retrospective study

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ABSTRACT

Introduction: Acute appendicitis is the most common pathology encountered among the patients with acute abdominal pain. Nowadays, different scoring systems are used to diagnose acute appendicitis. One of them is Tzanakis scoring, which is a combination of clinical examination, ultrasonography, and laboratory markers of inflammatory markers. Hence, this study was done to assess the diagnostic accuracy of Tzanakis scoring system in diagnosing acute appendicitis and compare its accuracy with histopathological examination. **Methods:** A retrospective observational study of all cases of acute appendicitis was conducted from July 2018 to June 2019 at the Department of Surgery, Western Regional Hospital. Out of 403 patients who had undergone appendicectomy during the period of one year, the necessary documents of 83 patients could not be collected. Hence, 320 patients were included in our study. The ethical approval was taken from the Institutional Review Committee (Ref. No. 14. 2077/078). Total Tzanakis score of all patients who underwent appendicectomy during this period was calculated and compared with histopathology report. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated. **Results:** The sensitivity, specificity of Tzanakis score of all 320 patients who underwent appendicectomy was 84% and 71% respectively. The diagnostic accuracy was 84% with positive predictive value 98% and negative predictive value 17%. **Conclusions:** The Tzanakis scoring system is simple, effective and easy to be applicable for the diagnosis of acute appendicitis.

Keywords: Acute appendicitis, diagnostic accuracy, sensitivity, specificity, Tzanakis score.

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Submitted: February 8, 2023

Accepted: May 15, 2023

To cite: Shrestha D, Baral D. Tzanakis score as a diagnostic tool for an acute appendicitis: An institution-based retrospective study. JGMC Nepal. 2023;16(1): 41-4.
DOI: 10.3126/jgmcn.v16i1.50566

INTRODUCTION

Amongst several causes of acute abdomen, acute appendicitis is the most common.¹ A life table model suggests that the lifetime risk of appendicitis is 16.33% for males and 16.34% for females, and that the lifetime risk of appendicectomy is 9.89% for males and 9.61% for females.² A history of migrating abdominal pain, classically beginning in the periumbilical region and shifting to McBurney's point, combined with leukocytosis and other associated symptoms such as anorexia remains the best diagnostic clue.³ The symptoms of acute appendicitis often overlap with the symptoms of many other acute abdominal conditions making its diagnosis very difficult.¹ Clinical examination is helpful in diagnosis of acute appendicitis in only 70 to 87% of the cases.⁴ About 20% to 33% of patients with suspected acute appendicitis have atypical findings making clinical diagnosis difficult which requires plasma markers and imaging techniques.^{5,6} Due to this overlap of symptoms, the rate of negative appendectomy has been reported to range from 20% to 40%.⁷

Different scoring systems are in use for diagnosis of acute appendicitis. Tzanakis scoring system is a combination of clinical examination, ultrasonography (USG) and inflammatory markers. This scoring system has been reported to be 95.4% sensitive, 97.4% specific and 96.5% accurate in diagnosing acute appendicitis.⁸

This study was done to assess the diagnostic accuracy of the Tzanakis scoring system in diagnosing acute appendicitis and compare its accuracy with histopathological examination (HPE).

METHODS

A retrospective observational study was conducted on all the patients who were admitted with the clinical diagnosis of acute appendicitis and underwent laparoscopic or open appendicectomy at Department of Surgery, Western Regional Hospital, Pokhara Academy of Health Sciences. The study was conducted from July 2018 to June 2019. Ethical approval from the Institutional Review Committee (Ref. No. 14. 2077/078) was taken prior to the study.

Total 403 patients had undergone appendicectomy during the period of one year at our department. All needful documents could not be collected for 83 patients. Hence, 320 patients were included in our study. Tzanakis scoring system is a combination of clinical examination, ultrasonography (USG) and inflammatory markers. There are only four variables with a total of 15 points: these are presence of right lower abdominal tenderness (4 points), rebound tenderness (3 points), presence of white blood cells greater than 12000/mm³ in the complete blood count (2 points), and positive ultrasound scan finding for appendicitis (6 points). A score of either eight or more is considered acute appendicitis requiring surgical treatment. The demographic data, clinical findings, laboratory data, ultrasound findings and histopathology reports of those patients who underwent appendicectomy were collected from the record department of Western Regional Hospital, Pokhara Academy of Health Sciences and entered into a structured proforma. Those patients with incomplete documents were excluded.

All the data collected were tabulated on Microsoft excel. All the data were analyzed, calculated and evaluated. All the patients were divided according to the age group and gender. Total Tzanakis score was calculated in each patient and divided into different groups. Number of patients positive for each variable of Tzanakis score was calculated. Comparison between the score and histopathological diagnosis was done. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated.

RESULTS

Out of 320 patients included in the study, 184(57.5%) were male and 136(42.5%) were female, with ages ranging from 5 to 78 years and a mean age of 31.77±15.6. The

most common age group suffering from acute appendicitis was from the second decade (n=86), followed by the third decade (n=78), as shown in Figure 1.

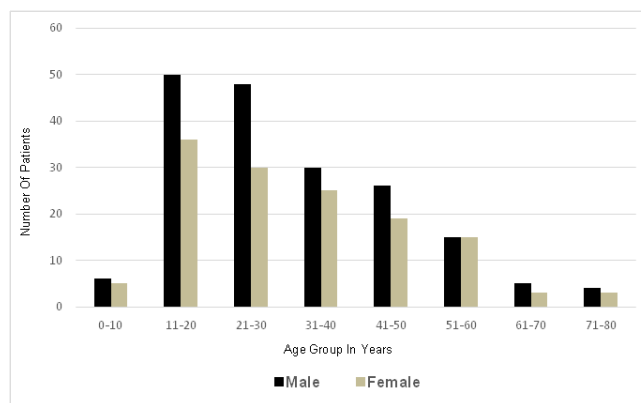


Figure 1: Total number of patients according to age group and gender

Clinically, 292(82.5%) patients had tenderness and 240(75%) had rebound tenderness at the right lower quadrant. Total Leukocytosis (TLC) >12000/mm³ was present in 236(73.75%) patients and ultrasound finding positive was present in 164(51.25%) patients. Two sixty-four (82.5%) patients had Tzanakis score ≥8, 56(17.5%) had <8 with a mean score 10.09±2.99; none of the patients had a score less than 3 (Table 1).

Table 1: Tzanakis score-wise distribution of patients

Tzanakis score	Frequency	Percentage (%)
0-3	0	0
4-6	24	7.5
7-9	152	47.5
10-12	44	13.75
13-15	100	31.25

Histopathologically, 306(95.62%) patients had acute appendicitis and 14(4.37%) came out to be negative. Among 264 patients who had Tzanakis score more than eight, four patients had HPE report negative. And out of 56 patients who had Tzanakis score less than eight, 46 patients had positive histopathological reports (Table 2).

Table 2: Cross tabulation of HPE and Tzanakis score

Tzanakis score	HPE diagnosis		Total
	Positive	Negative	
Positive	260	4	264
Negative	46	10	56
Total	306	14	320

The sensitivity and specificity of Tzanakis score in our study are 84% and 71% respectively. Overall diagnostic accuracy is 84% with positive predictive value of 98% and negative predictive value of 17% (Table 3).

Table 3: Diagnostic indices for Tzanakis score

Index	Score (%)
Sensitivity	84
Specificity	71
Positive predictive value	98
Negative predictive value	17
Diagnostic accuracy	84

DISCUSSION

Even though acute appendicitis is one of the most common surgical conditions encountered in clinical practice, sometimes it is a challenging task for the surgeon to diagnose it.⁹ Radiological investigations, including USG, computed tomography (CT), and magnetic resonance imaging (MRI) help in the diagnosis of acute appendicitis but alone are not confirmatory.¹⁰ To solve this issue many surgeons and physicians try different scoring systems to make diagnosis more accurate. Different scoring systems e.g., The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA), Alvarado, Ohman, Tzanakis score are established to help decision making in uncertain cases.¹ Fear of negative appendicectomy and appendicular perforation always exist if diagnosis is delayed and so the morbidity and mortality.⁹ A higher negative appendectomy rate of 15% to 25% has been accepted in the past in the cost of preventing appendicular perforation.¹¹ Negative appendicectomy is not devoid of complications, though the mortality is low, it can be associated with the mortality of 10 to 15%. Negative appendicectomy is associated with significant hospital stay. Hence, negative appendicectomy should be lowered as low as possible.¹¹

Gallego et al. reported that the incidence of appendicitis in the second and fourth decade of life was 52%.¹² In our study, the highest incidence 86(26.87%) was present in the second decade followed by third decade 78(24.37%). Male predominance was found, with a male to female ratio in our study of 1.37:1 with a mean age of 31.77±15.6, which is comparable to other studies, but the ratio ranges from 1.2:1 to 2.6:1, like Sigdel et al. reported a ratio of 2.6:1.¹³⁻¹⁵

Along with clinical examination, various laboratory parameters of inflammation (TLC, C-reactive protein), USG, CT and laparoscopy are used to establish an accurate diagnosis of acute appendicitis. Numerous scoring systems have been developed to aid in preoperative diagnosis of acute appendicitis viz. Alvarado and modified Alvarado score is being used worldwide. The Tzanakis scoring system has been found to be superior to the previously formulated scoring systems.^{9,15,17} The sensitivity, specificity, positive predictive value and negative predictive value in

our study are 84%, 71%, 98% and 17% while the overall diagnostic accuracy is 84% which are almost comparable to the study by Lakshminarasimhaiah et al.⁹ However, some variations in the values could be attributed to the fact that the calculation of Tzanakis scoring system is operator and machine dependent. Therefore, there could be the intra-examiner variability. Similarly, USG, in experienced hands has a high accuracy in diagnosing appendicitis and hence reducing negative appendectomy rate

Out of 320 patients, 264(82.5%) patients had Tzanakis score ≥ 8 , and 56(17.5%) patients had score < 8 . Among 264 patients, four had negative histopathology reports for acute appendicitis and out of 56 patients who had score < 8 , 46 patients had positive histopathology reports for acute appendicitis. Negative appendicectomy in our study is 4.37% which is slightly less than the study done by Sigdel et al.¹⁵ which is 6% and significant less than many other studies.^{7,13,16}

This study has evaluated retrospectively the strength of the Tzanakis scoring system for the diagnosis of acute appendicitis. However, further prospective and comparative studies with other scoring systems would help to further evaluate and compare strength of various scoring systems in preoperative diagnosis of acute appendicitis and hence help clinicians to choose the most reliable scoring system.

CONCLUSIONS

Tzanakis scoring system can be considered as one of the simple, and easy to be applicable systems to diagnose acute appendicitis as it is a combination of clinical examination, ultrasonography and laboratory marker of inflammatory markers with relatively high sensitivity, specificity and diagnostic accuracy.

ACKNOWLEDGEMENTS

We would like to acknowledge Dr. Rebicca Ranjit, Dr. Richa Ranjit, Mr. Bhim Poudel for their help during the study.

CONFLICTS OF INTEREST: None declared

SOURCE OF FUNDING: None

AUTHORS' CONTRIBUTION

DS designed the research, performed statistical analysis, and prepared the first draft of the manuscript, DB collected data, and contributed to prepare the first draft, explained and interpreted the data and contributed to prepare the draft of the manuscript. All authors have read and approved the manuscript.

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