ORIGINAL ARTICLE

Comparative Study Between Karaman Score and Modified Alvarado Score for Predictability in Avoiding Negative Appendectomy in the Suspected Cases of Acute Appendicitis

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ABSTRACT

Objective: To compare the diagnostic accuracy between the Karaman score and the Modified Alvarado score for predictability in avoiding a negative appendectomy in suspected cases of acute appendicitis.

Material and methods: This comparative study was done at the general surgery department of JPMC Karachi, from February 2022 to August 2022. All the patients diagnosed as the cases of acute appendicitis undergoing surgical treatment, aged more than 14 years and of either gender, were included. Both the Karaman and the Alvarado scoring systems were implemented in order to assign points to each of the study subjects. The Alvarado score is comprised of eight different parameters, while the Karama score only makes use of six different parameters. After evaluating the patient on both scores, the decision to perform surgery was primarily based on the surgeon's clinical judgement after considering all clinical, laboratory, and radiological findings. Postoperative histopathology reports were collected, and the scores of both Alvarado and Karaman score were compared. Patients were operated and monitored throughout the stay in hospital up to discharge. Afterwards, for each score, sensitivity, specificity, and positive and negative predictive values were determined. All the data was collected via a study proforma, and SPSS version 26 was used for the data analysis.

Results: In this study, 180 cases of appendicitis undergoing surgical treatment were studied, their mean age was 27.03 ± 10.12 years, and their mean BMI was 19.88 ± 3.43 kg/m^2. Males accounted for 80.0% of all study participants. As per histological findings, acute appendicitis was found in 78.9% of the cases, 14.4% of the patients had gangrenous appendicitis, while 6.5% of the cases had a normal appendix. Histopathological evaluation was statistically significant according to the appendicitis identification by Karaman scoring system and Alvarado scoring system (p-0.001). Although both scoring systems showed almost similar diagnostic accuracy, the Karaman scoring system showed sensitivity (98%), specificity (75%), PPV (98%), NPV (75%), and accuracy (96%), while the Alvarado scoring system showed sensitivity (97%), specificity (58%), PPV (97%), NPV (63%), and accuracy (95%).

Conclusion: In the study conclusion, the Karaman score and Alvarado scoring systems both were observed to be the good predictive to distinguishing acute appendicitis in avoiding the negative appendectomy. Both showed almost similar and high sensitivity and accuracy by taking histopathology is gold standard.

Keywords: Appendicitis, Karaman score, Alvarado score, Accuracy

INTRODUCTION

The most frequent reason for immediate surgical intervention is the acute appendicitis.[1] Appendectomy seems to be the preferred course of treatment for the diagnostic basis on clinical assessments, laboratory, and radiographic assessment.[1] In spite of advances in diagnosis, there has been a widely reported rise in the prevalence of negative appendectomy outcomes.[2] Individuals who presenting with abnormal symptoms, which lead to negative appendectomies, create complications in the diagnostic process.[3] An appendectomy which resulted in a normal histological specimen is considered to be negative, and this type of appendectomy is conducted for the purpose of making an identification of appendicitis before the surgery.[3] There is a wide range of rates for negative appendectomies, ranging from 8% to 35%, with higher rates (approximately 45%) being observed in women females who are in the reproductive age groups.[3] Diagnosis of the acute appendicitis before the surgery is still remains a concern of complexity, particularly in patients of extreme age ranges and females those having gynaecological or urinary issues. It depends primarily on an accurate and definitive history as well as a skillful clinical examination to prevent being revealed to negative appendectomies.[4] In accordance with recent guidelines, the clinical diagnosis, imaging examinations, and certain biomarkers, such as white blood cell count (WBC) and C-reactive protein (CRP) levels, are all required to assess the diagnosis of acute appendicitis.[5,6] There have been fewer cases of negative appendectomies as a result of recent developments in the imaging diagnosis and the early application of computed tomography (CT).[7,8] On other hand reported that, since more than twenty years ago, magnetic resonance imaging (MRI) has been utilized for the assessment of acute appendicitis.[9,10] However, because of its high cost and restricted availability, its use has been severely limited, especially in low-income source developing nations.[4] There have been many different scoring methods established to facilitate in the identification of acute appendicitis and to decrease the chances of negative appendectomies.[4] One of the scoring systems that is utilized the most frequently is the Alvarado system. It is clinical scoring system for the diagnosis of acute appendicitis. The Modified Alvarado Score is an easy-to-use system that is quick, dependable, relatively inexpensive, and easily repeatable. It can also be applied in the absence of costly and laborious supplementary measures.[11] It is basis on signs, symptoms, and diagnostic procedures that were performed on individuals who presented as a suspected case of acute appendicitis. There has been a wide range of research, with varying findings regarding the sensitivity and specificity of the score. In general, males have a greater capacity for specificity and sensitivity than females do with regard to this score.[11,12] On the other hand, it was reported that the Karaman score is an innovative diagnostic scoring system that consists of six parameters that are basis on the participant's signs and symptoms that have been represented by laboratory investigation. This scoring system is simple to perform and more responsive for men as compared to women.[13] Although it is important to make a prompt and proper diagnosis in order to reduce the risk of complications and mortality associated with appendicitis and also prevent the unnecessary surgeries. Therefore, this study has been done to observed the more accurate scoring system by comparing the diagnostic accuracy between the Karaman score and the Modified Alvarado Score for predictability in avoiding a negative appendectomy in the suspected cases of acute appendicitis.

MATERIALS AND METHODS

This comparative study was done at the general surgery department of JPMC Karachi after taking ethical approval from the ethical review board committee of JPMC Karachi. The research was carried out over a six-month period, from February 2022 to August 2022.All the patients diagnosed as the cases of acute appendicitis, aged more than 14 years and of either gender, were included. All the patients diagnosed as the cases of perforated appendicitis and those who did not agree to take part in the study were excluded. Both the Karaman and the Alvarado scoring systems were implemented in order to assign points to each of the study subjects. The Alvarado score is comprised of eight different parameters, while the Karama score only makes use of six different parameters. According to the Alvarado scoring system, there are 9 parameters to check with each parameter has score divided from 1 to 2 and aggregated score will be 10 while 7 or greater will be considered significant of these parameters' anorexia, migratory right iliac fossa pain, nausea/vomiting, rebound tenderness in right iliac fossa, elevation of body temperature and neutrophil shift to left has 1 point while tenderness in right iliac fossa and leukocyte count >10000/mm^3.

On the other hand, there are six different characteristics that make up the Karaman scoring system. Anorexia and the pain migration to the right iliac fossa (RIF) seem to be the two of the characteristics that fall into this category. There are two positive signs: one is a rebound tenderness at (RIF), and the other is an aggravation of peritoneal irritation at RIF brought on by heavy coughing. In addition, the positive labs variables include a leukocyte count that is greater than 10,000/mm3 and the neutrophil count that is greater than 70%. Every positive measurement in the Karaman scoring system results in the generation of 2 points, whereas each negative parameter results in the removal of 1 point. The least number of scores necessary to make a diagnosis is -6, while the maximum possible is 12.[13] After assessing the patient on both score the decision for operation was mainly base on clinical judgement of surgeon after taking into consideration all of the clinical, laboratory and radiological findings. After obtaining the informed and written consent, the patients were operated on and monitored throughout their stay in the hospital up to discharge. Postoperative histopathology reports were collected, and the scores of both Alvarado and Karaman score were compared. Afterwards, for each score, sensitivity, specificity, and positive and negative predictive values were determined. Hence, after comparing conclusion were drawn which score is more sensitive in avoiding negative appendectomy. All the data was collected via a study proforma, and SPSS version 26 was used for the data analysis.

RESULTS

In this study, there are 180 cases of appendicitis undergoing surgical treatment were studied, and their mean age was 27.03 ± 10.12 years, and their mean BMI was 19.88 ± 3.43 kg/m^2. Out of all study subjects' males were in majority 80.0% and females were 20.0%. Most of the cases 68.3% had presenting complaints of pain at right iliac fossa, para umbilical pain, vomiting/ Nausea, rebound tenderness, Anorexia, 30.0% had complaint of Pain at right iliac fossa, para umbilical pain, Vomiting/ Nausea, rebound tenderness, Fever, Anorexia, while 1.7% cases had complaints of pain at right iliac fossa, para umbilical pain, Rebound tenderness, Anorexia. Furthermore, as per histological findings, acute appendicitis was found in 78.9% of the cases, 14.4% of the patients had gangrenous appendicitis, while 6.5% of the cases had a normal appendix. Table.1

Histopathological evaluation was statistically significant according to the appendicitis identification by Karaman scoring system and Alvarado scoring system (p-0.001). Although both scoring systems showed almost similar diagnostic accuracy, as Karaman scoring system showed sensitivity = 98%, specificity = 75%, PPV = 98%, NPV = 75%, and accuracy = 96%, while the Alvarado scoring system showed sensitivity = 97%, specificity = 58%, PPV = 97%, NPV = 63%, and accuracy 0.95%. Table.2

Table 1: Descriptive statistics of demographic and histological findings n= 180

Variables		Statistics	
Age		27.03 ± 10.12 years	
Body mass index (BMI)		19.88 ± 3.43 kg/m^2	
Duration of		49.58+11.25 days	
Average of Alvarado scoring		7.86 + 0.82	
Average of Karaman scoring		9.53 + 1.77	
Gender	Males	144	80.0%
	Females	36	20.0%
Presenting complaints	Pain at right iliac fossa, para umbilical pain, Vomiting/ Nausea, Rebound tenderness, Fever, Anorexia	54	30.0%
	Pain at right iliac fossa, para umbilical pain, Vomiting/ Nausea, Rebound tenderness, Anorexia	123	68.3%
	Pain at right iliac fossa, para umbilical pain, Rebound tenderness, Anorexia	03	01.7%
Histological assessment	Acute appendicitis	142	78.9%
	Suppurative/gangrenous	26	14.4%
	Normal appendix	12	06.7%

Table 2: Histopathological findings appendicitis according scoring systems n=180

Scoring systems		Appendicitis on histopathology (gold standard)		Total	p-value
		Positive	Negative		
Appendicitis according to Karaman scoring system	Positive	165	3	168	0.001
	Negative	3	9	12	
Total		168	12	180	
Appendicitis according to Alvarado scoring system	Positive	164	5	169	0.001
	Negative	4	7	11	
Total		168	12	180	

DISCUSSION

The acute appendicitis, is one of the commonest reasons for severe abdominal pain.[14] Its diagnosis still remains challenging, and there are ongoing debates about the best way to treat the condition in a wide range of settings and practice patterns across the world.[14] Current study has been done to compare the diagnostic accuracy between Karaman score and Modified Alvarado Score for predictability in avoiding negative appendectomy in the suspected cases of acute appendicitis. In this study, there are 180 cases of appendicitis undergoing surgical treatment were studied, their mean age was 27.03 ± 10.12 years, mean BMI was 19.88 ± 3.43 kg/m^2 and males were in majority 80.0%. Similarly, Albahadili MA et al[15] reported that the mean age of the patients of acute appendicitis was 27.44 years, males were 56% and females were 44%. Inconsistently Capoglu R et al[16] reported that females were in majority 52.6% and males were 47.4%. On the other hand, Memon SN et al[17] demonstrated that the average age of the patients was 21.25±9.12 years and males were in majority 62%, while females were 38%. In the favours of this study JAVED MA et al[18] also reported the mean age of patients as 27.8±7.5 years, 57.3% males and 42.7% females, while they found higher BMI average 26.9±3.4 Kg/m^2 as compared to this study.

In this study pain at right iliac fossa, para umbilical pain, Vomiting/ Nausea, rebound tenderness and Anorexia were found to be the most common presenting complaints. In the comparison of this study Nshuti R et al[19] reported that the pain in RIF was in 95% of patients, vomiting occurred in 73% of patients, 31% of patients exhibited a presentation that is typical of acute appendicitis, and 80% of patients felt nausea. Tan PH et al[20]

demonstrated that the abdominal pian was in all cases, followed by RIF pain was in 53.0%, vomiting was in 74.0% of the cases, 27.9% of the patients had diarrhea, 8.4% cases had dysuria and upper respiratory tract infection was in 16.3% of the patients. There is some difference in the symptoms with other studies and this difference may because of study selection criteria, severity of disease and comorbidities.

In this study as per histological findings, acute appendicitis was in 78.9% of the cases, 14.4% of the patients had gangrenous appendicitis, while 6.5% of the cases had normal appendix. Consistently Memon SN et al[17] reported that, on the basis of histopathology, it was determined that 92% of the individuals had acute appendicitis, whereas 8% of the cases did not have appendicitis. Although we found negative appendectomies 6.5%. In another study by Nshuti R et al[19] demonstrated that the histopathologically normal appendix rate was 10.9%, while out of remaining cases, 28.7% had perforated appendix, 26% had inflamed appendix, 6.6% of the cases had gangrenous appendix, while 28.7% were missing cases. Moreover, in decreasing the number of appendectomies that are performed in discrepancy, it is standard practice to admit and observe the individuals whose diagnoses are uncertain and to postpone the surgical treatment of these patients until the diagnosis can be established with sufficient confidence.[19]

In this study histopathological evaluation was statistically significant according to the appendicitis identification by Karaman scoring system and Alvarado scoring system (p-0.001). Although both scoring systems showed almost similar diagnostic accuracy as Karaman scoring system showed sensitivity = 98%, specificity = 75%, PPV = 98%, NPV = 75% and accuracy = 96%, while Alvarado scoring system showed sensitivity = 97%, specificity = 58%, PPV = 97%, NPV = 63% and accuracy 0.95%. However, Karaman K et al[13] observed that, in order to identify between acute appendicitis and the negative appendectomies, the Karaman score seems to be the more accurate in contrast to the Alvarado score. In the study by Gonullu E et al[21] observed that the Alvarado and Fenyo-Lindberg CSS were shown to be the most reliable scoring systems in this investigation for the differential diagnosis of appendicitis compared to the Karaman scoring system, particularly in the age groups of 18 to 45 years and 46 to 65 years respectively. According to the predictive values of the several grading systems for acute appendicitis, there are still significant disparities. This discrepancy suggests that when selecting a predictive scoring system to diagnose of acute appendicitis, those whose accuracy and validity have been shown by numerous well-designed trials should be selected. Since the Alvarado score is the first created for acute appendicitis and also has repeatedly been proved to be appropriate, almost several newer clinical scoring systems are evaluated against it.[21-23]

CONCLUSION

In the study conclusion, the Karaman score and Alvarado scoring systems both were observed to be the good predictive in distinguishing acute appendicitis to avoiding the negative appendectomy. Both showed almost similar and high sensitivity and accuracy by taking histopathology is gold standard. The prognostic outcomes of the various grading systems for acute appendicitis demonstrate that there are still significant disparities in the literature. In addition to several limitations of the study, especially the limited sample size, the findings cannot be recommended for final implementation. However, more comprehensive studies on such subject, are recommended.

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