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EVALUATION OF APPENDICITIS: TZANAKIS SCORING SYSTEM OR MODIFIED ALVARADO'S SCORING SYSTEM

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ABSTRACT

Introduction: The acute appendicitis is an important problem faced by surgeons and radiologist in daily routine. It can progress to perforation and have high mortality and morbidity. That's why the surgeons operate the cases rather than waiting or going for conservative treatment.[1] Clinical examination gives accuracy of 71% to 97%.[2] To increase the diagnostic accuracy of acute appendicitis now-a-days, USG, laparoscopy and even radioactive isotope imaging is done. **Aim and objectives:** To compare the sensitivity, specificity and diagnostic accuracy of Tzanakis and Modified Alvarado scoring system and to know which scoring system is better in the diagnosis of Acute Appendicitis. The objectives of our study, to compare, the diagnostic efficacy of Tzanakis and Modified Alvarado scoring system, to asses, the Sensitivity, specificity of symptoms, sign and laboratory Parameters, age wise incidence, gender wise incidence of acute appendicitis. **Results:** Comparison of results of both scoring systems Tzanakis test sensitivity, specificity, PPV, NPV, Accuracy is 82.02%,36.36%,91.25%,20%,77% and Modified Alvarado scoring system test sensitivity ,specificity , PPV, NPV, Accuracy is 97.75%,18.18%, 90.63%,50%,89%. **Conclusion:** Hence our final conclusion after comparing these studies, both studies show the positive correlation. But when we think which is best Modified Alvarado's scoring system is better than Tzanakis scoring system as in Tzanakis system there are chances of observer bias and we don't wait for total leucocyte count to go up to 12000/cmm if clinical suspicion is there.

KEYWORDS: Appendicitis; Modified Alvarado's scoring system; Tzanakis scoring System.

INTRODUCTION

Acute appendicitis is most often found clinically as an acute abdomen.[3] It is one of the most common causes of surgical emergency. The acute appendicitis is an important problem faced by surgeons and radiologist in daily routine. It can progress to perforation and have high mortality and morbidity. That's why the surgeons operate the cases rather than waiting or going for conservative treatment.[4] Clinical examination gives accuracy of 71% to 97%.[5] To increase the diagnostic accuracy of acute appendicitis now-a-days, USG, laparoscopy and even radioactive isotope imaging is done.[,6,7,8,9]

Due to multiple negative appendectomies with time researchers have devised various scoring systems to prevent it; one of them is Tzanaki's scoring system. Tzanakis scoring system was first conducted in Athens University, Medical School, Greece by Nicolaos E Tzanakis in 2005.[8] The Alvarado and modified Alvarado scores have been developed to aid diagnosis, but both scoring systems have poor sensitivity and specificity when applied in Middle Eastern and Asian populations.[10, 11]

Due to dilemma in clinical diagnostic accuracy and to know which scoring system is better in diagnosis of acute appendicitis, so we decided to undertake this comparative study at our institute.

Aim and objectives

Aim: To compare the sensitivity, specificity and diagnostic accuracy of Tzanakis and Modified Alvarado scoring system and to know which scoring system is better in the diagnosis of Acute Appendicitis.

Objectives: There were following objectives were also included in our study

(a) To compare, the diagnostic efficacy of Tzanakis and Modified Alvarado scoring system for diagnosis of acute appendicitis.

(b) To asses, the Sensitivity, specificity of symptoms, sign and laboratory Parameters of acute appendicitis.

(c) To know the age wise incidence of acute appendicitis.

(d) To know the gender wise incidence of acute appendicitis.

Compliance with Ethical Requirements

Our present study entitled "Comparative study between the Tzanakis and Modified Alvarado scoring system in the diagnosis of Acute Appendicitis." This case control, prospective study was carried out in the Department of General Surgery, Acharya Vinoba Bhave Rural Hospital, affiliated to Jawaharlal Nehru Medical College, Sawangi (meghe), Wardha, after due clearance from Institutional committee for Ethics. This study was conducted from July 2013 to September 2015. All the patients admitted to the surgery ward with right iliac fossa pain and those who had given consent for the above study were subjected for clinical assessment by applying the Tzanakis and Modified Alvarado scoring system and various clinical tests in consultation with senior surgeon for diagnosis of acute appendicitis. After admission toward, the patients were examined according to the Tzanakis and Modified Alvarado scoring system**.**

MATERIALS AND METHODS

A semi structured proforma was prepared including socio-demographic profile of patient, signs, symptoms, and laboratory investigations were noted. Histopathological reports were collected and the final diagnosis was noted.

Inclusion Criteria: Patients of any age group and both sexes presenting to emergency department with pain in the right iliac fossa having clinical suspicion of acute appendicitis were considered for study.

Exclusion Criteria: Patients having pain in the other quadrants of the abdomen, generalized peritonitis, appendicular lump and blunt trauma abdomen.

Statistical Analysis: Statistical analysis was done by using descriptive and inferential statistics using Chisquare test, Pearsons' correlation coefficient and binary classification (i.e. sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), accuracy and Odd's Ratio. The software used in the analysis was SPSS 17.0 version and Graph Pad Prism 5.0 and $p<0.05$ is considered as level of significance.

TZANAKIS SCORE

The Tzanakis score is based on following points

Presence of right lower abdominal tenderness=4 points

Presence of rebound tenderness=3 points

Laboratory findings-presence of white blood cells greater than 12000 in the blood=2 points

USG finding-presence of positive USG finding of appendicitis=6

If score 8 or more points, there is greater than 96% chance that appendicitis exist.

Modified Alvarado Scoring System (MASS)

Modified Alvarado Scoring System Is Based On Following Points

Symptoms

Migratory Right Iliac Fossa Pain (RIF) =1

Nausea /Vomiting=1

Anorexia=1

Signs

Tenderness in Right Iliac Fossa=2

Rebound Tenderness in Right Iliac Fossa=1

Elevated Temperature=1

Laboratory Findings

Leucocytosis=2

Total Score=9

Score 1-4-Acute Appendicitis Very Unlikely

Score 5-7-Acute Appendicitis Probable

Score 8-9 -Appendicitis Exist

We have compared both the scores in one patient to know which score is better for diagnosis of acute appendicitis. We compared the scores on two different scales to assess the comparative accuracy. The scores were compared on two different scales of accuracy. (Table 1).

All patients were subjected to ultrasound examination by a qualified radiologist to exclude any other associated pathology and also confirm the diagnosis in doubtful cases in Surgery in required cases was done under general anaesthesia or spinal anaesthesia. In emergency laproscopic appendectomy is not done at our hospital. Laproscopic appendectomy cases were not included in this study. However, since the mode of surgery was not relevant as it was only required for histopathological diagnosis, this factor did not affected. Abdomen was opened by McBurney's, Grid iron or right Para median incision. At surgery the position of the appendix was first identified before disturbing the structures. After completion of appendectomy the specimen was subjected to histopathological examination was done in Pathology department at our institute. The cases which were proved as appendicitis whether clinically or ultrasonographically were included in the study.

RESULTS

These observations are based on the study conducted at September 2015.

Table no. 2 shows the age group wise distribution of patients, 68% cases are from 11 to 30 year of age and 3% of cases were between the age group of 51 to 70 year age group the mean age group in our study is 24.81 year and standard deviation of 11.69year. Graph no1shows the gender wise distribution of patients with acute appendicitis in which 53% were male and 47% were female.

In our study 76% patients had rebound tenderness (Graph 2), 52% of patients had migratory right iliac fossa pain (Graph 3), 82% of patient had complaint of nausea and vomiting Graph 4), 82% of patient had anorexia on admission (Graph 5), all of our patients had pain in right iliac fossa (Graph 6), 69% patients had fever on admission (Graph 7).

The distribution of 100 patients according to the score total score acc to MASS is 9 if the score is more than 8 then appendix is exist, if score is more than 5 probably appendix exists, if the score is less than 5 then it is very unlikely that appendix exists. 16% cases shows score more than 8 and 80% of patients shows score more than 5 and only 4%patients showed score less than 5. (Table 3)

The distribution of patients according to leukocyte count, 30 % patients shows more than 12000 leucocyte count and remaning 70 %showed leucocyte count less than 12000 but towards higher side(Table 4).

The distribution of patient according to Ultrasonography finding, in our current study 80% patients had positive Ultrasonography finding and 20% patients had negative Ultrasonography finding for appendicitis (Table 5).

The distribution of patient according to Tzanakis score in our study 87% of patient had score more than 8 and 13% patient shows score less than 8 % (Table 6).

Both scoring systems show positive correlation. The mean value and standard variation of Tzanakis scoring system is 11.65 , 2.68 and Modified Alvarado Scoring Systems mean value and standard deviation is 6.38 and 1.12 Both scoring system shows correlation of 0.22 and p value is 0.027, which is a significant value statistically (Table 7).

The Odd's Ratio is 2.60(0.68-9.98) ,Sensitivity is 82.02%(72.45-89.36%),Specificity is 36.36(10.93-69.21%),Positive Predictive Value is 91.25%(82.80-96.41%),Negative Predictive Value is 20%(5.73-43.66%) and Accuracy is 77% In Tzanakis scoring system(Table 8).

The Odd's Ratio is 9.66(1.21-77.16) ,Sensitivity is 97.75%(92.12-99.73%),Specificity is 18.18%(2.28-51.78%),Positive Predictive Value is 90.63%(82.95-95.62%),Negative Predictive Value is 50.00%(6.75-93.24%) and Accuracy is 89% In Modified Alvarado scoring system (Table 9).

According to Tzanakis scoring system 100% of patients shows right iliac fossa tenderness,76%shows rebound tenderness, 30% shows total leucocyte count more than 12000, and 80% shows positive usg finding (Table 10) .

The symptoms present in modified Alvarado scoring system 76% patients shows rebound tenderness,52 % shows migratory right iliac pain,82% shows nausea/vomiting,88% anorexia,100%shows tenderness in right iliac fossa ,69% shows elevated temperature and 36% shows leucocytosis (Table 11).

Comparison of results of both scoring systems Tzanakis test sensitivity, specificity, PPV, NPV, Accuracy is 82.02%,36.36%,91.25%,20%,77% and Modified Alvarado scoring system test sensitivity ,specificity , PPV, NPV, Accuracy is 97.75%,18.18%, 90.63%,50%,89%(Table 12).

Histopathological finding of our study was, acute suppurative appendicitis was present in 19% cases, acute gangrenous appendicitis in 1% cases, acute appendicitis in 21% of cases, acute on chronic appendicitis in 3% cases, chronic appendicitis with lymphoid hyperplasia 1% cases, healed appendicitis in 2% cases, recurrent appendicitis in 2% cases, resolving appendicitis in 6% cases, resolving appendicitis with fecolith in 1% cases, acute appendicitis with fecolith in 1 % cases, chronic appendicitis in 32% cases and unremarkable appendicitis was present in11% cases no specific cause of inflammation present consider as negative appendectomy as discussed with pathologist (Table 13).

Table I Comparative Study of Both Scoring System

Modified Alvarado Score			**Tzanakis Score**		
Migratory RIF Pain	1		RIF Tenderness	4	
Nausea /Vomiting	1		Rebound Tenderness	3	
Anorexia	1		TLC More Than 12000	2	
Tenderness In RIF	2		Positive USG Finding	6	
Rebound Tenderness In Right iliac fossa	1				
Elevated Temperature	1				
Leucocytosis	2				
Total	9		Total	15	

Table II Age wise distribution of patients suspected with acute appendicitis

Age Group(yrs)	No of patients	Percentage (%)
1-10 yrs	8	8.0
11-20 yrs	36	36.0
21-30 yrs	32	32.0
31-40 yrs	13	13.0
41-50 yrs	8	8.0
51-60 yrs	2	2.0
61-70 yrs	1	1.0
Total	100	100.0
Mean Age ±SD	24.81±11.69 years	

Table III Distribution of patients according to Total of MASS

Total of MASS	No of patients	Percentage (%)
Very Unlikely(1-4)	4	4.0
Probable(5-7)	80	80.0
Exist(8-9)	16	16.0
Total	100	100.0
Mean ± SD	6.40±1.09	

Table IV Distribution of patients according to TLC >12000

TLC	No of patients	Percentage(%)
≤12000	70	70.0
>12000	30	30.0
Total	100	100.0
Mean ± SD	9892±2875.38	

Table V Distribution of patients according to USG findings

USG Findings	No of patients	Percentage(%)
Positive	80	80.0
Negative	20	20.0
Total	100	100.0

Table VI Distribution of patients according to total of Tzanakis Score

Tzanakis Score	No of patients	Percentage(%)
<8 No Existence	13	13.0
≥8 96% of Existence	87	87.0
Total	100	100.0
Mean ± SD	11.59±2.67	

Table VII Correlation of total of Tzanakis Score and total of MASS score

	Mean	Std. Deviation	N	Correlation 'r'	p-value
Tzanakis Score	11.65	2.68	100	0.22	0.027 S,p<0.05
MASS Score	6.38	1.12	100		

Table VIII Sensitivity and Specificity of USG finding and Histopathological Findings of Tzanakis score

USG Finding		Histopathological Findings		Total
		Positive	Negative	
	Positive	73	7	80
	Negative	16	4	20
Total		89	11	100
ϰ2-value		2.06, p-value=0.15,NS,p>0.05		

Table IX Sensitivity and Specificity of Total MASS Score and Histopathological Findings

Total MASS Score		Histopathological Findings		Total
		Positive	Negative	
	Positive	87	9	96
	Negative	2	2	4
Total		89	11	100
ϰ2-value		6.47, p-value=0.011,S,p<0.05		

Table X Percentage of symptoms present in Tzanakis Study

Symptoms	No of patients	Percentage (%)
Tenderness in RIF	100	100
Rebound Tenderness	76	76
TLC >12000	30	30
USG Findings	80	80

Table XI Percentage of symptoms present in MASS

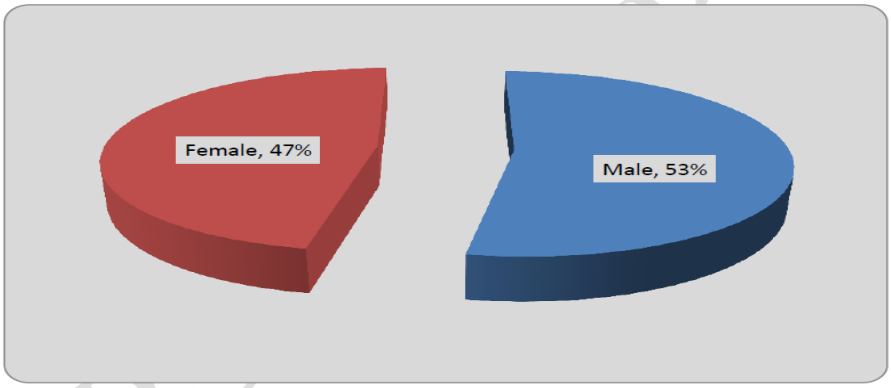
Symptoms	No of patients	Percentage (%)
Rebound Tenderness	76	76
Migratory RIF pain	52	52
Nausea/Vomiting	82	82
Anorexia	88	88
Tenderness in RIF	100	100
Elevated Temperature	69	69
Leucocytes	36	36

Table XII Diagnostic Accuracy of Tzanakis and MASS score

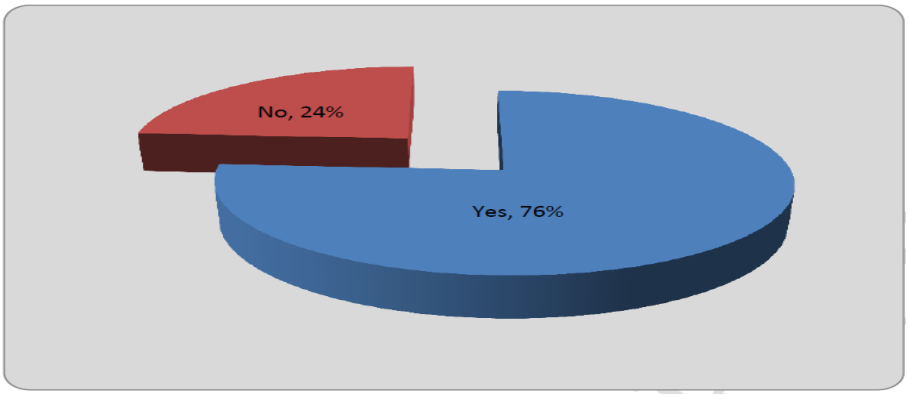
	Tzankis Score	95% CI	MASS Score	95% CI
Odd's Ratio	2.60	0.68-9.98	9.66	1.21-77.16
Sensitivity	82.02	72.45-89.36	97.75	92.12-99.73
Specificity	36.36	10.93-69.21	18.18	2.28-51.78
PPV	91.25	82.80-96.41	90.63	82.95-95.62
NPV	20	5.73-43.66	50	6.75-93.24
Accuracy	77		89	

Table VIII Distribution of patients according to histopathological findings

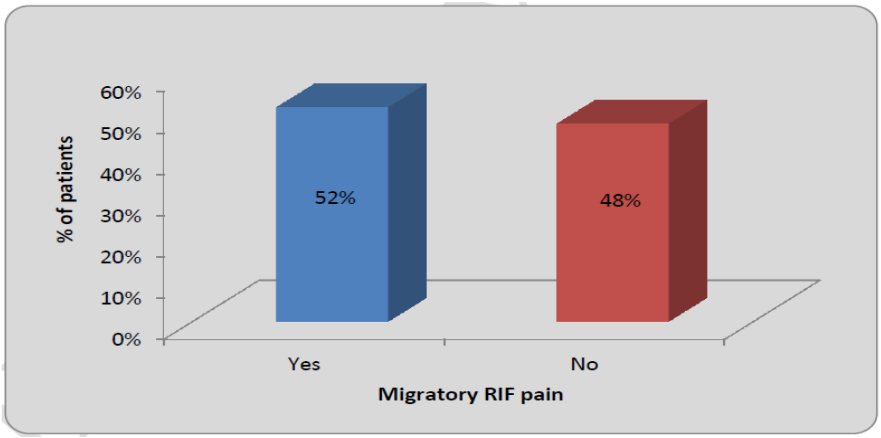
Histopathological Findings	No of patients	Percentage (%)
Acute Suppurative Appendicitis	19	19
Acute Appendicitis	21	21
Acute Gangrenous Appendicitis	1	1
Acute on Chronic Appendicitis	3	3
Chronic appendicitis with lymphoid hyperplasia	1	1
Healed Appendicitis	2	2
Unremarkable appendicitis	11	11
Recurrent Appendicitis	2	2
Resolving Appendicitis	6	6
Resolving Appendicitis with Fecolith	1	1
Acute Appendicitis with Fecolith	1	1
Chronic Appendicitis	32	32



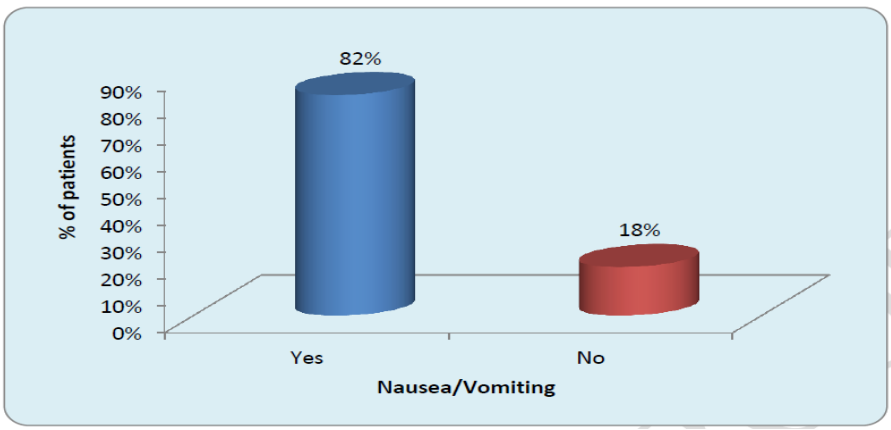
Graph I Gender wise distribution of patients suspected with acute appendicitis



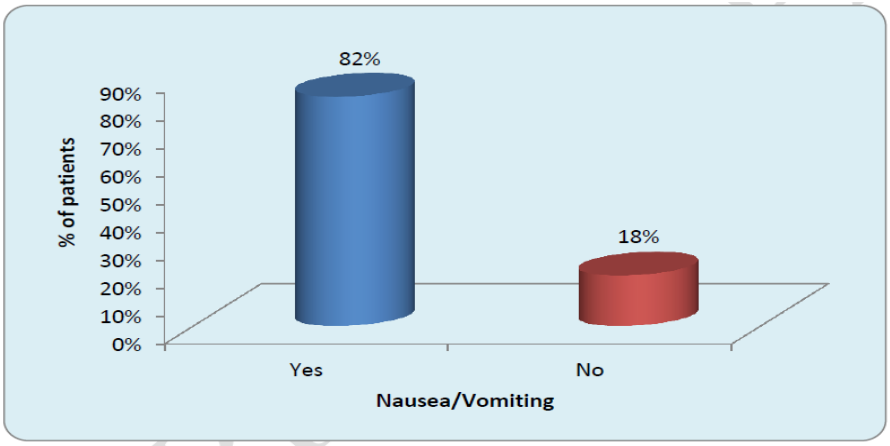
Graph II Distribution of patients according to rebound tenderness



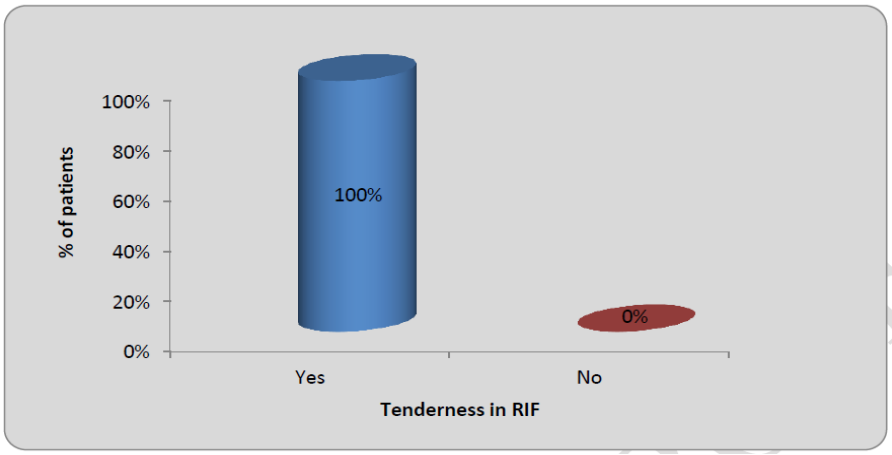
Graph III Distribution of patients according to migratory RIF pain



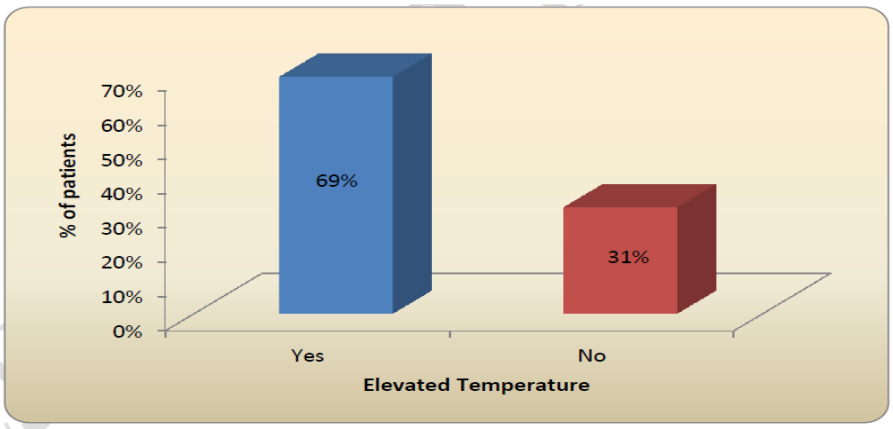
Graph IV Distribution of patients according to Nausea/Vomiting



Graph V Distribution of patients according to Anorexia



Graph VI Distribution of patients according to tenderness in RIF



Graph VII. Distribution of patients with reference to fever

Statement of Ethics

Our present study entitled "Comparative study between the Tzanakis and Modified Alvarado scoring system in the diagnosis of Acute Appendicitis." This case control, prospective study was carried out in the Department of General Surgery, Acharya Vinoba Bhave Rural Hospital, affiliated to Jawaharlal Nehru Medical College, Sawangi (meghe), Wardha, after due clearance from Institutional committee for Ethics. This study was conducted from July 2013 to September 2015. All the patients admitted to the surgery ward with right iliac fossa pain and those who had given consent for the above study were subjected for clinical assessment by applying the Tzanakis and Modified Alvarado scoring system and various clinical tests in consultation with senior surgeon for diagnosis of acute appendicitis. After admission toward, the patients were examined according to the Tzanakis and Modified Alvarado scoring system.

DISCUSSION

Acute appendicitis remains a common abdominal emergency throughout the world. Though there are lots

of advances in the diagnostic field, even with the invention of modern investigations, diagnosis of acute appendicitis remains an enigma for the attending surgeons. Multitudes of the investigations are neither 100% sensitive nor 100% specific. Even today a thorough clinical examination with basic investigation like WBC count remains cornerstone in the diagnosis of acute appendicitis.

Many surgeons and physicians are adopting different scoring systems for 100% diagnosis of acute appendicitis. However the accuracy rate of all scoring systems is not up to the mark.

In our present study the 100 cases of acute appendicitis were screened to compare the sensitivity, specificity and diagnostic accuracy of Tzanakis and Modified Alvarado scoring system and to know which scoring system is best in the diagnosis of Acute Appendicitis.

With reference to age, in studies done by Gallego G (1998)[13] and Chong CF (2011)[12] the incidence of appendicitis below the age of 40 years was 52% and 84.3% respectively. In these studies, appendicitis was most frequently seen in patients in their second and fourth decades of life, with a mean age of 31.3 years and a median age of 22 years. In our present study number of patients with age less than 40 years were 89%.The mean age of study population was 24.81±11.69 years, When male female ratio is considered in cases of acute appendicitis, in a study done by Addis DG (1990)[1], the male female ratio was 1.3:1, in a study done by Chong CF (2010)[7,9,14] the ratio was 1.4:1, and in study of Kanumba (2013)[15] the male female ratio was 1:2.4, In our present study there was male preponderance, 53% patients were males and 47% patients were female. There were 68% patients with appendicitis were seen in between 11 –30 years, with the male: female ratio of 1.33: 1.

In studies done by Gallego et al. (1998)[11], rebound tenderness was present in 56%, Bassem Abou Merhi (2014)[16] showed 97.4%, Tzanakis et al. (2005)8showed 65.6%. In our study 76% cases there was presence of rebound tenderness. In males 41 patients had rebound tenderness and in females 35 patients had rebound tenderness.

Migratory pain at right iliac fossa was present in 49% and 60.3% in studies done by Gallego G(1998)[11] and Tzanakis et al. (2005)8 respectively. In our present study, the migratory right iliac fossa pain was positive in 52% patients.

Where anorexia is concerned, in studies done by Kallan M et al(1994)[9] 85% patients had anorexia, in a study by Reddy GVB (2013)[17] et al it was in 60% cases, in a study done by Bassem Abou Merhi et al. (2014)[14] it was 79.3% , in Tzanakis et al (2005) 8it was present in68.7% and in our present study it was 82%.

We see for tenderness in right iliac fossa in cases of appendicitis as a clinical sign for acute appendicitis, in study done by George Mathews(2002)[18] et al. the tenderness in right iliac fossa was 99.1% and in a study done by Mahato IP(2011)[19] et al it was 99.4 %, in a study by Bassem Abou Merhi(2014)14 it was 93.1, in Tzanakis et al (2005)889.3% and in our present study right iliac fossa tenderness was present in all cases that is 100%.

Pain vomiting and fever are the basic clinical criteria for reaching the diagnosis of acute appendicitis, in a study done by George Mathews(2002)[16] et al fever was present in 74.03% patients and in a study by Reddy GVB(2013)[15] study it was present in 76% cases, in Bassem Abou Merhi's(2014)[14] study it was present in 89.2%, in Tzanakis study(2005)[8] it was present in 73.3%.In our present study the fever was present in 69% of cases.

The total leucocyte count is an important component in diagnosis of appendicitis, as far as normal value is considered it is between 4000-11000/cmm, in studies done by Peiper et al(1982)[20] it was elevated in 60%, in Gallego G (1998)[11] it was increased in 65%, and in a study by Doraiswamy (1979)[21] it was raised in 42%. In our present study it was raised in 36%.

Ultrasonography for diagnosis of acute appendicitis

Ultrasonography is again one of the important investigations done in cases of acute appendicitis, it also plays a big role in diagnosing any other pathology other than appendicitis. The study done by, Al-Ajerami[19] showed that the overall specificity and sensitivity for ultrasonography in cases of acute appendicitis was 84.8% and 83.3% respectively. In Obermaier et al (2003)[22] study in Germany performed a systemic review of 69 articles, and the results of single-center studies the sensitivity and specificity of his study was 81.6%, 89.8%. In a study by Terasawa et al (2004)[23] study reported that Ultrasonography had an overall sensitivity, specificity of 86% and 81%.

In Korea, a large meta-analysis was done by SH Yu et al. (2005)[24] on the role of graded compression USG in the diagnosis of acute appendicitis was carried out a few years ago, including 22 articles. The overall sensitivity and specificity were 86.7% and 90.0%, respectively. In particular, their study suggested that ultrasonography could be useful for the diagnosis of acute appendicitis, especially when patients are younger age and highly clinical suggestive.

In a study by Javidi Parsijani P et al. (2013)[25] to determine the accuracy of ultrasonography for the diagnosis of acute appendicitis, the ultrasonography is shown to have sensitivity and specificity of 75% and 69.2%, respectively.

Our study shows a marginally better sensitivity and specificity of ultrasonography for the diagnosis of acute appendicitis as 82.02% and 36.36% respectively.

After the introduction of the Alvarado score in 1986, it was modified by Kalan et al[9] in 1994. The study showed sensitivity of 82.75% and specificity of only 25 %. The sensitivity of modified Alvarado score in our study to diagnose the acute appendicitis was 97.75% while the specificity was 18.18%. The diagnostic accuracy of modified Alvarado score in our study was 89% and odd ratio is 9.66%.

The study by Hemant Nautiyal et al[26] shown to have Sensitivity of 40%; Specificity of 93.33%; Predictive value of positive test of 93.33%; Predictive value of negative test of 40%; Accuracy of 56% for modified Alvarado score . In our study sensitivity 97.75, specificity18.18 Predictive value of positive test of 90.63%; Predictive value of negative test of 50%;the diagnostic accuracy of modified Alvarado score was found to be better in our study, which was 89%.

In the study by Kanumba et al (2011)[13] the sensitivity and specificity of modified Alvarado scoring system were 94.1% and 90.4% respectively. The Positive Predictive Value and Negative Predictive Value were 95.2% and 88.4% respectively. The accuracy of modified Alvarado score was 92.9%. The data is comparable to our study in the terms of sensitivity and specificity which are 97.75% and 18.18% respectively. In our study the positive predictive value and negative predictive value of modified Alvarado score for diagnosis of acute appendicitis was found to be 90.63% and 50%.

In the study by Chong C F et al,[12] the sensitivity was 68.32%, specificity was 87.91%, positive predictive value was 86.25%, negative predictive value was 71.43% and accuracy was 86.51% for Modified Alvarado Scoring system. In our study the values are comparable for sensitivity, specificity, positive predictive value negative predictive value and diagnostic accuracy of modified Alvarado score which are 97.75%,18.18%,90.63, 50% and 89% respectively.

In the study by Maral F Thabit et al[27], the sensitivity was 93%, specificity was 50%, positive predictive value was 91%, negative predictive value was 14% and accuracy was 87% for Modified Alvarado Scoring system. In our study the values are comparable for sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of modified Alvarado score which are 97.75%, 18.18%, 90.63, 50% and 89% respectively.

Tzanakis

Tzanakis et al have reported that its scoring system had sensitivity and specificity of 95.4% and 97.4% respectively. As per our study, sensitivity of Tzanakis scoring system was 82.02% which is comparable to Tzanakis et al. Nikolas E.Tzanakis et al. in 2005[8] describes a scoring system, in their prospective study of 303 adults using a total score cut-off of ,8 points for Acute Appendicitis was used ,sensitivity, specificity , accuracy, and area under the curve of the proposed score were 95.4%,97.4%,96.5%and 93%, respectively, exceeding noticeably when compared to previous models for diagnosis of acute appendicitis. The Tzanakis scoring system is a combination of the clinical evaluation, Ultrasound imaging and total leucocyte count, which may enhance the diagnostic accuracy for subjects with suspected Acute Appendicitis especially where CT scanning is not readily available on routine basis.

Sigdel GS et.al(2010)[28] had done a study in Department of Surgery, Kathmandu Model Hospital, Nepal conducted a study comparing Tzanakis score and Alvarado score system ,and concluded : The sensitivity, specificity and overall diagnostic accuracy of Tzanakis score was 91.48% and 66.66% and 90% respectively. The sensitivity, specificity and overall diagnostic accuracy of Alvarado score was 81.91% and 66.66% and 81 % respectively. Negative appendectomy rate was 6%.

According to Tzanakis scoring system in our study Sensitivity is 82.02%(72.45-89.36%),Specificity is 36.36(10.93-69.21%),Positive Predictive Value is 91.25%(82.80-96.41%),Negative Predictive Value is 20%(5.73-43.66%) and Accuracy is 77% and Odds Ratio is 2.60(0.68-9.98) , In Tzanakis scoring system Negative appendectomy was 8.0% according to Malla BR et al,[27] it was 6% in a study by Singh K P et al.[28] and in our study it was 11%.

Modified Alvarado's Scoring System

In a study by Reddy GVB 15 analysis of the subjects based on the Alvarado score indicate that, 68% of the subjects exhibited a score more than 7, where as 22% of the subjects had a score between 5 and 7. Only 10% of the subjects had a score between 1 and 4. In our study 16% of the subject exhibited the score more than 7; where as 80% of the subject had a score between 5 and 7. Only 4% of the subjects had a score between 1 and 4 Later, we studied the correlation between Alvarado score in relation with histopathology of appendix specimen.

In a study by Singh K 9 14%patients were having a Alvarado score of 1-4, 26 patients had score of less than 7 and 60 patients had score of more than or equal to 7.

Total leucocyte count more than 12000 used as a diagnostic criteria in Tzanakis study 8 for the diagnosis of acute appendicitis. In his study leucocyte count more than 12000 was present in 60.3% and in our study 30% shows leucocute count more than 12000.

Nikolas E.Tzanakis et. Al(2005) 8 described a scoring system, which comprised of the clinical evaluation, laboratory parameters and Ultrasonography. There are 4 variables on total 15 points scale and a score of 8 or

more than 8 is taken as a cut off value for the diagnosis of Acute Appendicitis and needs surgery.

A study at Kathmandu Model Hospital, Kathmandu, Nepal done by Sigdel(2011)26 in Department of Surgery comparing Tzanakis score and Alvarado score system.

All the studies done for assessing Tzanakis scoring system are less, since 2005, it was first done at Athens, we could get only three studies done for evaluation of Tzanakis scoring system, no one had shown the results of more than 12000 counts per cmm, so we could not compare it with any other studies of Tzanakis.

CONCLUSION

We compared two systems for diagnosis of acute appendicitis. These two scoring systems were Modified Alvarado scoring system and Tzanakis scoring system. The Tzanakis scoring system is new one and it consists of Ultrasonography along with clinical evaluation and total leukocyte count. Hence, our final outcome after comparing these two studies is; both studies show the positive correlation. But when we think which is best Modified Alvarado's scoring system is better than Tzanakis scoring system as in Tzanakis system there are chances of observer bias and we don't wait for total leucocyte count to go up to 12000/cu mm if clinical suspicion is there.

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