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RESEARCH ARTICLE

EVALUATION OF MODIFIED ALVARADO SCORING SYSTEM IN ADULTS IN DIAGNOSIS OF ACUTE APPENDICITIS

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ABSTRACT

Background and Objectives: Appendicitis is common surgical disease which continues to remain a diagnostic problem and can baffle best of the clinician. Delay in diagnosis definitely increases the morbidity, mortality and cost of treatment. In equivocal cases, however, aggressive surgical approach in spite of advancements in medical diagnostics, its diagnosis is mainly clinical one. Thus the objectives of this study are to evaluate the diagnostic efficacy of modified alvardo score in patients of acute appendicitis and to find out gender differences.

Methods: The study was prospective and conducted in a group of 100 cases admitted in department of general surgery with suspected appendicitis. The study involved application of modified Alvarado scoring system to all 100 cases before surgery and co related with histopathology reports.

Results: In our study number of male and female patient is 52% and 48% respectively. Highest incidence was seen in age group of 21-30 (29%). Distribution of the patients according to Modified Alvarado Score in >7 range is 45. Out of those 45 patients, 42 (93.3%) had acute appendicitis and 3(6.66%) patients were having normal appendix on histopathology. Negative appendisectomy rate is 6.6%. Distribution of the patients according to modified Alvarado score of <7 is 55%. Out of those 55%, 22(40%) had acute appendicitis, 33(60%) patients were having normal appendix on histopathology. Negative appendisectomy rate is 60%. With modified Alvarado score >7, 19(45.23%) male patients were histopathological positive and 23(54.76%) females patients were histopathological positive. With modified Alvarado score <7, 14(63.67%) male patients were histopathological positive and 8(36.36%) female patients were histopathological positive. The sensitivity, specificity, accuracy, positive predictive predictive value in males were 97%, 94.7%,75%,92.05% respectively, while in females were 96.8%, 94%, 88%, 99.56% respectively. The overall sensitivity =96.93% specificity=97.14%, accuracy= 95.2%, positive predictive=93.65%, negative appendisectomy rate is 6.67%.

Conclusion: Thus, applying Modified Alvarado scoring system preoperatively as a protocol in patients with suspected appendicitis is useful in reducing negative appendisectomy rates.

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INTRODUCTION

Acute appendicitis perhaps the most common surgically correctable cause of abdominal pain, approximately 6% of the population will suffer from this disease during their life time (Anonymous, 1987). It is rare in infancy and amongst the elderly, but common in childrens, teenagers, young adults (Balthazar *et al*., 1986). The diagnosis of acute appendicitis is essentially clinical, however a decision to operate based on clinical suspicion alone can lead to removal of a normal appendix in 15-30% cases. High negative appendectomy rate is due to early surgical intervention in order to avoid perforation. Delay in diagnosis leads to increased morbidity and costs.

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Imaging technique have been shown to add very little to diagnosis however attempts have been made to increase the diagnostic accuracy by computer aided diagnosis, imaging by ultrasonography, laparoscopy and even radioactive isotope imaging (Takada *et al*., 1986; Clarke *et al*., 1986). Despite of improvement in diagnostic methods, diagnosis of acute appendicitis is still challenging and based primarily on clinical history and physical examination. Various scoring systems have been devised to aid diagnosis, one of this is modified Alvarado score which is based on purely history, clinical examination and a lab tes. It is quick, cheap and very easy to apply (Alvarado, 1986). Therefore this study is conducted to evaluate use of modified Alvarado score in diagnosis and as a criterion for appendicectomy in acute appendicitis. The Alvarado score was described in 1986 (Alvarado, 1986) and has been validated in adult surgical practice. This consists of three symptoms, three signs and a laboratory finding as

described by Alvarado Later, was modified by Kalan *et al.* (1994). Score of 1-4 indicates acute appendicitis very unlikely, 5-6-acute appendicitis probable, more then 7-appendicitis definitive.

Aims and objectives

1) To compare and evaluate diagnostic accuracy of Modified Alvarado Scoring System in patient with suspeted acute appendicitis.
2) To study sensitivity, specificity, Positive and negative predictive values of Modified Alvarado Scoring System in patient with acute appendicitis.
3) To determine dimorphic differences in diagnostic value of Modified Alvarado Scoring System in patient with suspeted acute appendicitis.

MATERIAL AND METHODS

The study was conducted in a group of 100 cases admitted in department of general surgery in Al Ameen Medical College, Bijapur, with suspected appendicitis, which satisfied the inclusion and exclusion criteria. The study involved application of modified Alvarado scoring system to all 100 cases before surgery. The score had not been taken into consideration for management of patient. The diagnosis and decision of surgery were made based upon history and clinical presentation. Appendix samples were sent for histopathology reports. *Statistical Method applied for the study:* Data was collected using a pre-tested coded questionnaire and analyzed using SPSS satiated computer software.

RESULTS

Out of all 100 patients with clinical features suggestive of acute appendicitis, 52% were females and 48% were males. M:F ratio is 1.08:1. The mean age of patients was17.5 and highest incidence was seen in age group of 21-30 (29%). Commonest presentation was pain in right iliac fossa 83%.Other symptoms were nausea and vomiting 69%, fever 56%, anorexia 41%, rebound tenderness 48%. Right iliac fossa tenderness was 100%. Leucocyte count was increased in 60% of patients Fig.1.

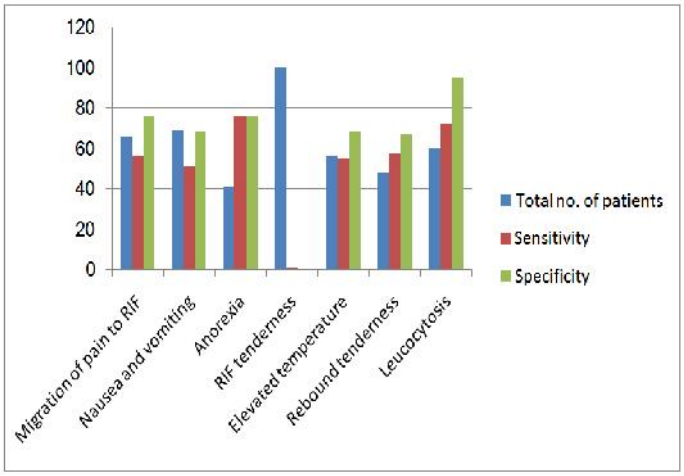
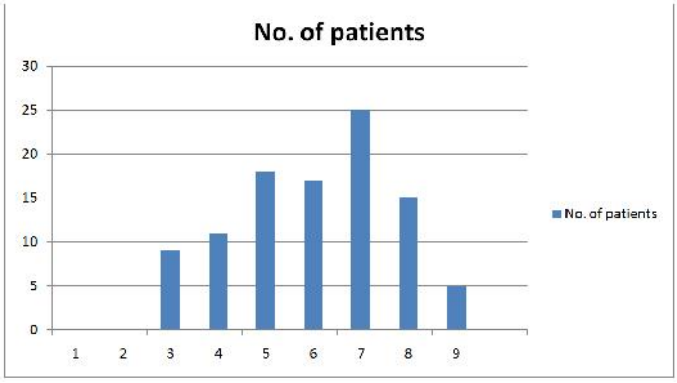


Fig.1. Distribution of patients according to parameters of modified alvardo score in acute appendicitis

The distribution of patients according to modified Alvarado Score in ≥7 range is 45 shows and ≤7 range is 55. As shown in Figure 2.



With the score of ≥7, 93.33% patients were histopathologically positive, 6.66% patientshad normal appendix. Appendisectomy rate is (6.67%) With the score of <7 patients, 40% were histopathologically positive, 60% patients had normal appendix. Appendisectomy rate is (60%). (Table-1)

Table 1. Histopathology Diagnosis Distribution with modified Alvarado scoring

Modified Alvarado Score	Histopathology positive	Histopathology negative	Negative appendecectomy rate
>7(45)	42(93.33%)	3(6.66%)	6.67%
< 7(55)	22(40%)	33(60%)	60%
	64	36	36%

Out of 42 patients with score≥7, 54.76% were female, while 45.23% patients were males. Negative histopathology was seen in 3 cases of these 2 were females i.e. (66.66%) and 1(33.33%) patient was male. (Table-2)

Table 2. Gender Distribution of results of Histopathology for patients with Modified Alvarado score ≥ 7

Gender	Histopathology Positive	Percentage	Histopathology negative	Percentage
Female N = 25	23	54.76%	2	66.67%
Male N = 20	19	45.23%	1	33.33%
Total N = 45	42	100%	3	100%

Table 3. Gender distribution of results of histopathology for patients with Modified Alvarado Score <7

Gender	Histopathology Positive	Percentage	Histopathology negative	Percentage
Female N =23	8	36.36%	15	45.45%
Male N =32	14	63.67%	18	54.55%
Total N =55	22	100%	33	100%

Out of 22 patients with score ≤ 7, 63.67 were male, while 36.36%patients were females. Patients having negative histopathology 33 of these 45.45% were females and 54.55% patient were male. (Table 3) Acute appendicitis was confirmed in 64%patients comprised of (42%) patients with score of ≥ 7

(true + ve) and (22%) patients with score of < 7 (false – ve), while normal appendix was found in (36%) patients, comprised of (3%) patients with score of ≥ 7 (false +ve) and (33%) patients with score of < 7 (true – ve).

Table 4. Gender distribution of results of histopathology for all patients

Gender	Histopathology Positive	Percentage	Histopathology negative	Percentage
Female N =48	31	48.44%	17	47.2%
Male N =52	33	51.56%	19	52.8%
Total N =100	64	100%	36	100%

In our study regardless of modified alvardo score 64 patients confirm appendicitis by histopathology, in which 31 patients (48.44%) were females and 33 (51.56%) were male. On other hand 36 patients with normal appendix, in which 17(47.2%) were females and 19 (52.8%) were males. (Table 4)

Table 5. Sensitivity and specificity of our diagnostic approach in males

Diagnostic approach result	Diagnosis		Total
	Appendicitis	Non appendicitis	
Positive	(32) 97%	(1)3%	33
Negative	(1) 3%	(18) 94.7%	19
Total	33	19	52

Table 6. Sensitivity and specificity of our diagnostic approach in females

Diagnostic approach result	Diagnosis		Total
	Appendicitis	Non appendicitis	
Positive	(31)96.8%	(1) 3.12%	(32)
Negative	(0)0%	(16) 94.1%	(16)
Total	(31)	(17)	(48)

Table 7. Overall Sensitivity and specificity of our diagnostic approach

Diagnostic approach result	Diagnosis		Total
	Appendicitis	Non appendicitis	
Positive	(63) 96.93%	(2) 3.07%	(65)
Negative	(1) 2.85%	(34) 97.14%	(35)
Total	(64)	(36)	(100)

The sensitivity, specificity, accuracy, positive predictive predictive value, negative predictive value, in males were 97%, 94.7%, 75%, 92.05% respectively, while in females were 96.8%, 94%, 80%, 99.56% respectively as shown in table 5 and 6. The overall sensitivity =96.93% specificity=97.14%, accuracy=95.2%, positive predictive=93.65% negative predictive value=91%, negative appendisectomy rate is 6.66% shown in Table 7.

DISCUSSION

At the end of the study, it was found that age group of patients in which Maximum number of cases presented was from 21-30 years of age. Male patients outnumbered female patients. In our study patients ranged in age from 15-50 years (The overall mean age being 17.5 yrs). The highest occurrence 51 patients (51%) was seen in age group of 21-30 years. The next age group affected was 15-20years that is 29 patients (29%). Similar study was done by Harsha *et al*. (2011) in his study maximum incidence of, acute appendicitis was found in the age group of 21 to 30 years. While Talukder *et al*. (2009) showed high incidence in third decade. In our study the total number of male patients are 52 (52%) and number of female patients are 48 (48%) and M:F Ratio is 1.08:1. Study done by Harsha *et al*. (2011) at al showed acute appendicitis was more in males than females. Male female ratio is 3:2. Our study contradicts with study done by Khan *et al*. (2005) and Maral *et al*. (2012), where female predominance was seen could be because acute appendicitis may be over diagnosed for right iliac fossa pain. In our study with score≥7, 42 patients had histopathology positive acute appendicitis while 3 patients had hitopathology normal appendix. Patients with positive histopathology, 23(54.76%) of them were female, while 19(45.23%) patients were males. Patients having negative histopathology were 3 among them 2(66.66%) were females and 1(33.33%) patient is female. Negative appendisectomy rate of patient with modified Alvarado score ≥7 was 6.66%. Study done by Maral F Thabit *et al* hows out of these (2012) patients with score ≥ 7, (80) patients had histopathologically proven acute appendicitis, while (7) patients had histologically normal appendix. Patients with positive histopathology, (45) (56.25%) of them were females, while (35) (43.75%) patients were males. Patients having negative histopathology, (5) (71.5%) were females while (2) (28.5%) patients were males, Negative appendectomy rate for patients with Modified Alvarado Score ≥ 7 were 8.1%. In our study with score ≤7 with modified Alvarado score <7, 22 patients had histopathological positive acute appendicitis while 33 patients had histopathological normal appendix. Out of 32 male patients, 14(63.67%) patients are Histopathological positive; while out of 23 female 8(36.36%) patients are histopathological positive. Negative appendisectomy rate was 60%. Study done by Maral *et al*. (2012) showed 13 patients with modified Alvarado score <7,6 patients had histopathologically proven acute appendicitis, while 7 patients had histopathalogically normal appendix, All 6 patients with positive histopathology were males, while in patients with normal appendix, all 7 patients were female. Negative appendisectomy rate was 53.9%.

Regardless of their modified Alvarado score appendicitis was confirmed by histopathology in 48.4% of females, and 51.56% of males. On the other hand, 47.2% females and 52.8% male showed negative histopathology. Accordingly the negative appendectomy rate in female patients was 3.12% while in male patients was 3.07%. Over all appendicectomy rate in our study is 6.07%. Study done by Maral *et al*. (2012) showed out of (86) patients, regardless of their Modified Alvarado Score, (52.4%) females and (47.6%) males had acute appendicitis confirmed by histopathology. On the other hand, out of (14) patients with non-appendicitis (85.7%) were females and (14.3%) were males. Accordingly the negative appendectomy rate is (4.65%) in males and 21.05% in females. Higher negative appendicectomy rate in their study could be because of misdiagnosis in females belonging to reproductive age group where pelvic disorders make diagnosis difficult. Over all appendicectomy rate in their study was 14%. Said *et al*. (Hemant Nautiyal *et al*., 2010) study shows the proportion of patients with Alvarado scores more than 7 was 40.7% and in them negative appendisectomy rate was 19.7% which was almost equal to overall negative appendisectomy rate of 18% based on clinical suspicion alone. Diagnostic accuracy in our study is more i.e. 95.2% as compared to studies done by Maral

et al. (2012) it is 87%. Diagnostic accuracy in females (80%) is slightly higher than males (75%) in our study. Sensitivity and Specificity of our study is 96.93% and 97.14% which is higher than Hemant *et al*. (2010) 88%, 86% and Maral *et al*. (2012) 93%and 50%. Our results showed that use of modified alvardo score provides higher diagnostic accuracy.

Acknowledgment: None

Conclusion

Sensitivity, specificity, accuracy and postive predictive values are more indicating that modified alvardo score is sensitive and specific parameter. Applying Modified Alvarado scoring system preoperatively as a protocol in patients in patients with suspected appendicitis is useful in reducing negative appendisectomy rates. Since slight difference in diagnostic accuracy in both gender, modified Alvarado scoring system is equally helpful in both gender. Thus we conclude that modified alvardo score is not only cheap but easy, simple and clinic based analysis which will add on to diagnosis of acute appendicitis.

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