

# Clinical Relevance of Modified Alvarado Score in Acute Appendicitis in Present Scenario

Kamal Bansal<sup>1</sup>, Deeksha Mehta<sup>2</sup>, Naresh Kumar Mangalhara<sup>3</sup>

## ABSTRACT

**Introduction:** Appendix is surely, the most commonly harvested organ of the body. On looking up the literature, we found, that the negative appendectomy rates have been consistently maintained all through these years. Negative appendectomy not only increases economic burden on health care facilities of a developing country like India, but also has a negative impact on the overall health of the patient. The following study was therefore, taken up to evaluate the diagnostic accuracy of the Modified Alvarado scoring system and its ultimate effect on mortality and morbidity of the patient. Though this is an old score, but we restudied it, to revalidate as well as to promote the use of this simple, economical and objective clinical score which actually uses established clinical methods, important for residents training program, to reach the diagnosis instead of the costly radiological methods.

**Material and methods:** 50 patients presenting with the lower quadrant abdominal pain and fulfilling the inclusion criteria were selected randomly and included in the study. Modified Alvarado Score was calculated for each one of them. Confirmation of the diagnosis was done after the histopathological examination of appendix.

**Results:** Modified Alvarado Score >7 was found in 80% (i.e. 82.75% of males and 76.19% of females) of patients with appendicitis. In addition to these findings, we also got exact information about the age and sex distribution along with the most common presenting complaint, the postoperative complications and the need for post operative stay in appendicitis patients.

**Conclusion:** Modified Alvarado Score is a fast, simple, noninvasive, repeatable and highly economical score. When applied purposefully and objectively, it can prevent delay in surgeries and hence complications as well as can reduce negative appendectomies.

**Keywords:** Modified Alvarado Score (MAS), Negative Appendectomy Rate (NAR), Acute Appendicitis, Old Alvarado Score, Migratory Right Iliac Fossa Pain, RIPASA Score.

## INTRODUCTION

Acute appendicitis is the most commonly done emergency surgery worldwide with a total incidence of approximately 1.17/1000 and this incidence being the highest in the adolescent and young adults.<sup>1</sup> Appendicitis, though was described way back in 1886, by Reginald Heber Fitz but even after so many years it is still considered a diagnostic challenge for treating surgeons.<sup>2</sup> Clinical examination, when used alone, can lead to negative appendectomy rate (NAR) of 15- 30% and this rate is even higher in the females of reproductive age group i.e. 15- 50%.<sup>3,4</sup> Although

preoperative evaluation with CECT abdomen has been reported to decrease this rate from 20% to as low as 5%,<sup>5</sup> but in a developing country like India, prescribing CECT abdomen for every suspected appendicitis patient, can cause a substantial economic burden on the health care facilities. So, a good clinical scoring system is the only viable option for the emergency setting in our country.

Alvarado Scoring System, most popularly used for diagnosing acute appendicitis, was first described in 1986. Since then, many other scoring systems have been reported from time to time like Modified Alvarado Score, Fenyo, Ohmann, IRA Teicher, RIPASA, Lindberg, AIRS etc. Out of these, Alvarado and its modification by Kalan et al in 1994 are the most widely used scoring systems.

Modified Alvarado Score (MAS) excludes the last criterion of Alvarado Score i.e. 'shift to left in WBC count' as it is not available in all the laboratories. Patients are thus scored out of 9 instead of 10 as in Alvarado Score.<sup>6</sup> MAS is the most easily reproducible score and hence the present study was taken up with the aim to evaluate its diagnostic accuracy and clinical relevance in present scenario when CECT abdomen is fast gaining acceptance in clinical practice and to study its effect on an overall outcome of acute appendicitis in terms of morbidity and mortality of the patients. Currently, the practicing surgeons have actually started to rely more on the radiological diagnosis rather than their own clinical diagnosis made after taking complete history and doing accurate clinical examination of the patient. Hence, though MAS is an old score, it was revisited and restudied to help us revalidate as well as to promote the use of this simple, economical and objective clinical score.

## MATERIAL AND METHODS

The present study was conducted for a period of two years and 50 patients were randomly selected out of all who presented with right lower quadrant abdominal pain. Patients selected belonged to the age group 15-70 years and an informed

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written consent was taken from all of them. Patients unfit for spinal anaesthesia, <15 years, >70 years, those with generalized peritonitis and females who were pregnant were excluded from the study. Modified Alvarado score was then calculated for each one of them after evaluating them by a comprehensive history and clinical examination and along with the routine blood investigations.

Those with scores between 5-6, were considered to have possible diagnosis of acute appendicitis<sup>7</sup>, but not convincing enough to warrant immediate surgery. These patients were monitored at 4 hourly intervals and if within 24 hours of observation, their score become >7 or their clinical features were convincing enough to warrant surgery, irrespective of their scores, appendectomy was performed.

All patients having score 7 to 9<sup>7</sup> were posted for an emergency open appendectomy. According to the intraoperative findings, appendectomy was done. Specimen was then sent for histopathological examination.

Patient were discharged on the next day after dressing and followed up after 7 days of discharge, for suture removal.

Confirmation of diagnosis of acute appendicitis was done by the histopathological examination of appendix in all the operated cases.

## RESULTS

In our study, from a total of 50 cases, age group having maximum number of patients was 21-30 years followed by age group 15-20 years and the least number of patients were found in the 61-70 years age group (figure-1).

In our study, out of 50 cases 29 (58%) were male patients and 21 (42%) were female patients (figure-2).

In our study, the most commonly presenting complaint of the patient was migratory pain (92%) followed by nausea in 88% of patients (figure-3).

Sex	No. of patients	Percentage
Male	24	82.75
Female	16	76.19
Total	40	80.00

**Table-1: Modified Alvarado Score (MAS) >7**

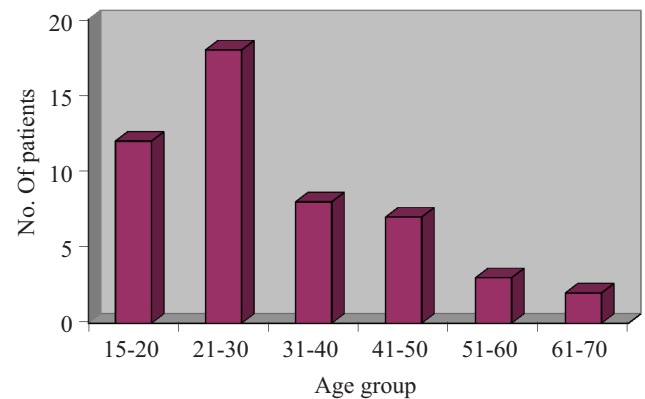
Post op complication	No of patients	%
Nil	35	87.5
Seroma	2	5
SSI	1	2.5
Fever	2	5

**Table-2: Postoperative complications**

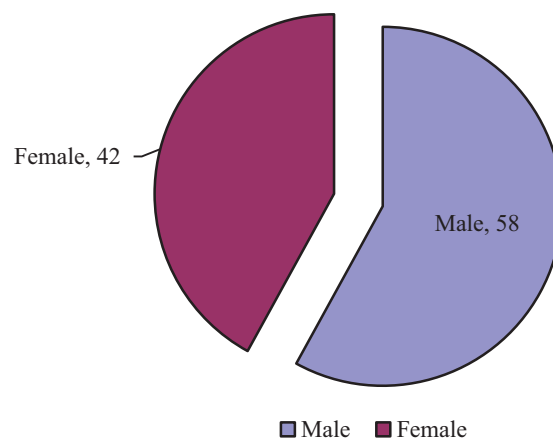
Sex	Kalan et al (first study) <sup>20</sup>	Suren-dranath et al (recent study) <sup>8</sup>	Present study
Male	93%	96.6%	82.75%
Female	67%	84.6%	76.19%
Total	83.7%	92.6%	80.00%

**Table-3: Comparison of sensitivity of Modified Alvarado Score >7**

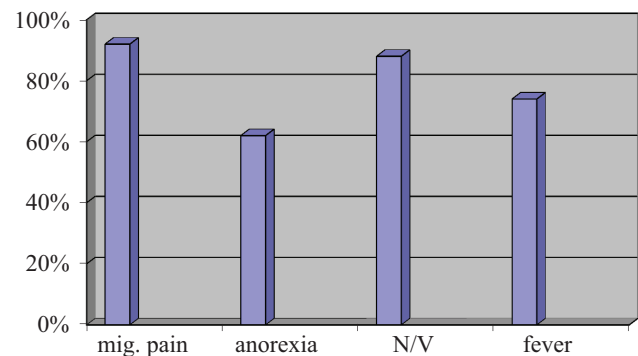
Maximum patients included in our study were discharged on 3<sup>rd</sup> day of admission i.e. postoperative day 2 (figure-4).



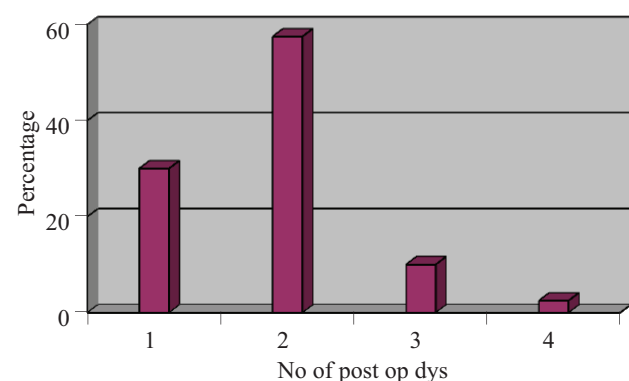
**Figure-1: Age distribution**



**Figure-2: Sex distribution**



**Figure-3: Symptomatology**



**Figure-4: Postoperative stay**

Maximum patients included in our study i.e. 87.5% recovered without any postoperative complications (table-2).

## DISCUSSION

Routine diagnosis of acute appendicitis still poses a challenge, specially in developing countries where advanced radiological investigations do not appear cost effective and clinical parameters remain the main stay of the diagnosis. In the present study, a total number of 50 patients with lower right quadrant pain were selected randomly, investigated, operated and followed up. On compilation of the results of our study, the disease was found to be most prevalent in the age group 21- 30 years with more of male predominance. This finding correlated well with other studies in literature.<sup>6,2,8</sup> In our study the most common symptom in the patients was migratory pain i.e. 92% of the patients. These findings could not be actually found to be replicated in any other study in literature. Nshuti R et al found migratory pain in only 31% of their patients while Kohla SM et al found this symptom in only 49% of their cases.<sup>9,10,11</sup> Nausea (88%) was the symptom whose values correlated with those of other studies i.e. 80% in the study by Nshuti R et al, 78% in study by Jain S et al. Rebound tenderness was found in 89% of our patients while elevated leucocyte count was found in 92%. Both these parameters have been well documented to hold strong correlation with appendicitis not only in the published literature but also in the standard surgery textbooks.<sup>12,13</sup>

Sensitivity of MAS at score > 7 was found to be 80% sensitive in our study, which was very near to that found by Jain S et al i.e. 86.1%, by Borra S et al i.e. 92.6% and by Memon ZA et al i.e. 94.1%. In all the studies reviewed, the sensitivity of MAS was always found lower in the female group.<sup>6,2,8,10,14</sup>

We also reviewed the results already published about the old Alvarado score containing 10 points instead of 9 points of MAS. We found that, the sensitivity of both the scores was quite comparable. At a cutoff point of 7, for ruling in appendicitis and progression to surgery, the old Alvarado score has moderate to high sensitivity i.e. 82% as documented by Ohle R et al whereas in our study at the same cut off point of 7, the MAS showed a sensitivity of 80%.<sup>15</sup>

Results of our study were found to be comparable to the study by Kalan et al in 1994, while the sensitivity was little less than that found by Surendernath et al in 2016 (table-3).<sup>8,20</sup>

Lastly, we also reviewed the literature to find out if there was a major difference in sensitivity of diagnosing appendicitis between MAS and the newer RIPASA score. Diaz- Barrientos et al, in their study, reported no advantage of RIPASA scoring over widely used MAS system.<sup>16</sup> Hence, MAS being a more economical and more easily reproducible score than RIPASA, thus holds good significance in accurate timely diagnosis of appendicitis and prevent complications like appendicular perforation, occurring due to delay in diagnosis. MAS system also helps to reduce the negative appendectomies which need to be avoided whenever possible, due to the risk of surgical complication and the financial burden associated with the unnecessary surgeries.<sup>17</sup>

The main limitation of our study is that it was conducted at a

single center and that too with a limited number of patients. Moreover it was an observational study and not a comparison study and popular statistical methods could not be applied to this study and P value could not be calculated.

## CONCLUSION

Commonest affected age group according to our study was 21-30 years with majority of patients being male. Most common presenting complaint was migratory right iliac fossa pain and nausea. In the diagnosis of acute appendicitis, clinical scoring is a fast, simple, reliable, non-invasive, repeatable and safe diagnostic modality without extra expense and complications. It can be very helpful for junior doctors provided it is applied purposefully and objectively in patients of abdominal emergencies. Patients with scores suggestive of acute appendicitis warrant early surgery, to avoid complications like perforation. Use of clinical scoring in diagnosis of acute appendicitis can lead to significant reduction in negative appendectomies.

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