

Alvarado Score with Clinical Features in Patients Diagnosed with Acute Appendicitis

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Abstract

Objective: The aim of this study was to evaluate the Alvarado score with the common clinical features in patients with acute appendicitis.

Methodology: This was a descriptive cross-sectional study conducted at the department of Surgery, Ziauddin Hospital, Karachi by using non-probability consecutive sampling technique after getting approval from Ethical Committee. Duration of the study was about one year from 2018 till 2019. Patients suspected to have acute appendicitis, on the basis of clinical findings in both genders between the ages of 16 to 70 years were included in the study. Modified Alvarado Score of all patients were recorded and documented on a proforma. Statistical analysis was analyzed by using SPSS version 16.

Result: A total of 131 patients were studied. Out which 83 (63.4%) were males and 48 (36.6%) of them were females, with a mean age of 34.71 ± 14.20 years. The mean of Modified Alvarado Score was observed as 6.60 ± 1.64 . Frequency of clinical features that were observed in acute appendicitis patients showed migratory RIF pain in 98 (74.8%) patients, anorexia in 56 (42.7%), nausea/vomiting in 104 (79.4%), tenderness in Right Lower Quadrant in 128 (97.7%), Rebound Pain 109 (83.2%) and elevated Temperature were in 43 (32.8%) patients whereas laboratory findings such as leukocytosis in 82 (62.6%) patients and shift of White Blood Cell in 37 (28.2%) patients was observed.

Conclusion: This study concludes that prevalence of acute appendicitis was found more common in males than females. It was also revealed that patients with the Alvarado score < 7 need further imaging modalities for confirmation of diagnosis.

Keywords: Acute Appendicitis; Alvarado Score

Introduction

An obstruction of the hollow portion of the appendix causes Appendicitis. Generally, calcified "stone" that are composed of feces are responsible for its obstruction [1]. Additionally, swollen lymphoid tissue caused by a viral infection, parasites, stone in appendix or carcinomas may possibly lead to obstruction [1]. Due to this obstacle, pressure is raised in the appendix and reduces the flow of blood to the appendix tissues and augments the production of bacteria within the appendix resulting swelling and tenderness [2].

One of the most frequent reasons of pain in abdomen is acute appendicitis (AA), accounting for nearly 1/3 of patients reporting as critical condition in emergency with acute abdominal pain. In the United States, general practitioners carry out approximately 280,000 appendectomies annually [3,4].

In Western countries, appendicitis occurs in approximately 8% of populace throughout their life span, and likewise in UK, it is about 52 per 100,000 people. On the other hand, in South Africa, the occurrence is predictable to be < 9 per 100,000 people. The highest rate of prevalence of acute appendicitis exists in 10 - 30 years of age [5].

Acute appendicitis is diagnosed on the basis of clinical findings and typical or atypical sign and symptoms of acute appendicitis might be present. Classic presentation of acute appendicitis initiates with indistinct pain in periumbilical region that lasts for more than a few hours, afterward transfers to the right iliac fossa (RIF), related to anorexia, feeling of nausea, or vomiting. Atypical presentation of appendicitis may not have these classical symptoms and might comprise an onset of symptom as pain and tenderness in the right lower quadrant [6]. Ultrasound or CT scan along with clinical findings assists in identification of complicated cases of acute appendicitis [7]. Therefore, a statistical range was formed by Alvarado that was found on the basis of clinical information along with count of blood cells in order to recognize the possibility of suspected case of Acute Appendicitis [8].

Alvarado Score (AS) is the initial and most extensively recognized scoring system that has been clinically accepted with accurateness [9]. Principally, it is based on clinical findings and laboratory records (like migration pain, loss of appetite, feeling of nausea and/or vomiting, pain on touch in right lower quadrant, rebound pain, raised temperature $\geq 37.3^{\circ}\text{C}$, leukocytosis $\geq 10 \times 10^3/\text{mm}^3$ and polymorphonuclear increased counts of neutrophils $\geq 75\%$) to evaluate the existence of Acute Appendicitis [10]. It has been proved that AS supports the early and timely diagnosis with appropriate treatment of appendicitis and decreased the false appendectomy rate [11].

About 15% - 30% of the cases who had formerly undergone for surgical procedure with a detection of AA were presented to have had false appendectomy and 20% of cases had punctured [12,13]. Hence, accurate identification of acute appendicitis is prudent in order to avoid the damage and false appendectomy.

Numerous studies have revealed the reliability of AS and Modified Alvarado score (MAS) in assisting to recognize cases of appendicitis. In agreement with the available researches, a cut-off value on MAS is adequate in order to resolve and supervise the treatment of a patient, either for releasing the patient after giving treatment according to symptoms or condition of additional treatment like supervision with non-oral means of administration of antibiotics and fluids [14]. Furthermore, surgical treatment is mandatory as remedial choice for the patient, in cases with greater score on Modified Alvarado [15].

It is evident that MAS can easily diagnose acute appendicitis, but imaging techniques like CT scan along with scoring system are imperative to verify the findings of acute appendicitis [16].

Acute appendicitis may develop complication if left untreated, and leads to provocative mass, formation of abscess in appendix, or burst of appendix, with widespread inflammation of peritoneum [17].

Objective of the Study

The objective of the present study is to analyze the correlation between the Alvarado score and the clinical features associated with the patients suffering from acute appendicitis.

Methodology

This was a descriptive cross-sectional study which was conducted at the department of Surgery, Ziauddin Hospital, Karachi by using non-probability consecutive sampling technique after getting approval from the institutional ethical review committee of Ziauddin Hospital, Karachi. Duration of the study was about one year from 2018 till 2019.

A total of 131 patients were selected for this study. Suspected patients of acute appendicitis on basis of clinical findings of both the genders between ages from 16 - 70 years were included in the study while patients with past medical history of tuberculosis or pneumonia, pain in right iliac fossa because of gynecological causes such as ovarian cyst, ectopic pregnancy, torsion in ovary, pelvic inflammatory disease, tubo-ovarian abscess and urological reason of disease such as ureteral stones, infections of urinary tract, patients with past history of diabetes mellitus type II, HIV infection, congestive heart failure, chronic liver disease, chronic kidney disease, COPD and stroke were excluded from the study.

Detailed medical history along with thorough physical examination for acute appendicitis was recorded for each patient. Modified Alvarado score of all patients were evaluated and documented on a proforma that includes migrant pain in right iliac fossa, loss of appetite, nausea/vomiting, pain on touch in right iliac fossa, rebound tenderness, raised temperature and leukocytosis and a score of > 7 were utilized as a cut off signifying acute appendicitis.

Self-designed proforma or questionnaire was used to collect the data. Statistical analysis was achieved by using SPSS version 16. Mean and standard deviation were calculated for continuous variables like age and extent of symptoms. Frequency and percentages were calculated for gender and Modified Alvarado score.

Result

A total of 131 patients were studied. Out of these, 83 (63.4%) were males and 48 (36.6%) were females, with a mean age of 34.71 ± 14.20 years. The mean of Modified Alvarado Score was observed as 6.60 ± 1.64. Frequency of clinical features that were observed in acute appendicitis patients showed migratory RIF pain in 98 (74.8%) patients, anorexia in 56 (42.7%), nausea/vomiting in 104 (79.4%), tenderness in Right Lower Quadrant in 128 (97.7%), Rebound Pain 109 (83.2%) and elevated Temperature were in 43 (32.8%) patients whereas laboratory findings such as leukocytosis in 82 (62.6%) patients and shift of White Blood Cell in 37 (28.2%) patients were observed, as shown in table 1.

Variable		Mean ± SD n (%)
Age (years)		34.71 ± 14.20
Gender	Male	83 (63.4%)
	Female	48 (36.6%)
Modified Alvarado Score		6.60 ± 1.64
Clinical Features	Migratory RIF pain	98 (74.8%)
	Anorexia	56 (42.7%)
	Nausea/Vomiting	104 (79.4%)
	Tenderness in Right Lower Quadrant	128 (97.7%)
	Rebound Pain	109 (83.2%)
	Elevated Temperature	43 (32.8%)
	Leukocytosis	82 (62.6%)
	Shift of White Blood Cell	37 (28.2%)

Table 1: Demographic factor, Alvarado score and clinical features of patients (n = 131).

Taking into account the categorization made by Alvarado Score, the following records were achieved: Alvarado score (AS) 2 - 4; 15 (11.5%), AS 5 - 7; 76 (58.0%) and AS 8 - 10; 40 (30.5%), as shown in table 2.

Variable	n	(%)	
Total Score Category	2 - 4	15	11.5
	5 - 7	76	58.0
	8 - 10	40	30.5

Table 2: Frequency of various categories of Alvarado Score in patients.

Discussion

Acute Appendicitis is one of the most frequent incidents arising happening for medical challenges for urgent situation faced by the surgeons, due to its analytical purpose. Clinically, the appearance of Acute Appendicitis may differ extensively from mild symptoms, such as restrained pain in abdomen or pyrexia, to most severe conditions, like diffuse inflammation of peritoneum and sepsis [18].

Regarding gender and age group, studies reported that a mean age ranging from 27.82 ± 9.26 to 36 ± 17.78 years, with a preponderance of males (55.3 to 70.3%) and female patients differing among 29.7 and 44.7% of the samples estimated [19-21]. A another study, showed that 150 (62.5%) male patients and 90 (37.5%) female patients with their mean age of 28.67 years were studied [8]. Our study findings were not consistent with the above cited studies indicating that 83 (63.4%) males and 48 (36.6%) females having acute appendicitis with their mean age 34.71 ± 14.20 years but the point of consideration was that males were predominant over the females in all the studies as well as in our findings.

Another research analysis reported that the median age of 29 years elaborates the occurrence of acute appendicitis was most commonly observed in young people. Their data showed that pain and tenderness in right lower quadrant were the most commonly presented symptoms (91.2 and 69.6%), subsequent to vomiting, pyrexia, and disperse tenderness (42, 24.7 and 11.7%, correspondingly) [22]. Laboratory findings illustrated a high incidence of white blood count (WBC) > 10,000 cells/ml (80.2%) and additionally C-reactive protein (CRP) > 10 mg/L in 46.1% in suspected cases of Acute Appendicitis. As presented by numerous researches, CRP and WBC are the most important laboratory indicators to be carefully noticed in suspected case of AA [23]. Our study findings were consistent with the above mentioned study and reported that pain and tenderness in right lower quadrant was the most frequently reported symptom 128 (97.7%) subsequently vomiting 104 (79.4%), fever 43 (32.8%), and diffuse tenderness 98 (74.8%) were observed. Furthermore, these clinical features had been statistically significant with respect to Alvarado scoring system. Additionally, Laboratory findings showed a high frequency of white blood count (WBC) or leukocytosis > 10,000 cells/ml in 82 (62.6%) patients that was also a significant indicator to be considered in acute appendicitis.

Alvarado score assists in order to categorize the patients who should experience additional assessment, follow-up, or surgical maneuver [24]. Various studies recommended that patients with score of ≤ 4 on an AS can be released from the hospital while imaging modalities can be used for those patients with an AS of 5 - 7 and surgical intervention in emergency is required for those with an AS of > 7 [9,25,26]. Another researcher Yuksel, *et al.* explored the dependability of AS with accurate identification of AA. They concluded that patients with AS of ≤ 4 cannot be treated by operation but recommended for the follow-up [27]. Yildirim, *et al.* stated that those patients who had scored between 5 - 7 on AS should be inspected more and required more imaging techniques; on the other hand, just AS is not sufficient for the option of surgical procedure [9]. Similarly, McKay and Shepherd demonstrated that those patients who scored 5 - 7 on AS requires imaging modalities for accurate diagnosis and patients with ≥ 7 score on AS should directly go through operation without additional diagnostic methods. Alvarado itself supports and prefers the surgery for those patients who scored ≥ 7 [28]. In our study, the optimum mean value for AS in AA diagnosis was found to be 6.60 ± 1.64 . Most of the patients 76 (58.0%) was in 5 - 7 Alvarado score category that

show additional imaging modalities, are required for the verification of acute appendicitis while 40 (30.5%) patients had a score in 8 - 10 category indicating there is no need for further confirmation and ultimately leads to emergency operation.

According to the results of one more study, the main factor of AS demonstrated the difference was rebound pain. Among the scoring factors, fever greater than 37.3°C, rebound pain, anorexia, presence of migrating pain create encouraging contribution to the diagnosis [29]. Rafiq, *et al.* presented that taking leukocytosis count, raised fever, and elevated neutrophil count into explanation may decrease the false appendectomy rate in decision-making in the patients diagnosed with AA [30]. Our study supports the above mentioned studies revealed that clinical features such as fever, anorexia, vomiting, rebound pain and tenderness in right lower quadrant are components of AS, while laboratory findings such as leukocytosis and shift of White Blood Cell makes positive attribution to the diagnosis and reduces the rate of negative appendectomies.

It was analyzed after discussion that Alvarado score presents timely diagnosis of acute appendicitis. Those patients who scored < 5 were considered as low risk means and they are not in urgent situation and those patients with Alvarado score > 6 needs urgent hospitalization for emergency surgery or to undergo for additional imaging modalities and should be under surveillance. Those patients who scored between 4 - 6 were not precisely diagnosed acute appendicitis. Therefore, supplementary imaging techniques are necessary.

Conclusion

This study concludes that prevalence of acute appendicitis was more common in males than the females. It was also revealed that patients with the Alvarado score < 7 needs further imaging modalities for verification of diagnosis. Furthermore, the most common clinical feature in these patients was observed to be tenderness in right lower quadrant.

Conflict of Interest

The authors declare no conflict of interest.

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