

Relationship Between High Alvarado Score and Complications of Acute Appendicitis in A Provinsial Hospital

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ABSTRACT

Appendicitis is a common cause of abdominal pain requiring urgent surgery due to risks like gangrene, perforation, and peritonitis. While ultrasonography is the preferred diagnostic tool, limited access to skilled personnel and concerns about cost and radiation make alternatives necessary. The Alvarado score offers a simpler, non-invasive option. This study, conducted at RSUD Undata in Palu City, Central Sulawesi (2022–2023), examined the link between high Alvarado scores and complications of acute appendicitis using a cross-sectional design with 105 patients. This study used an analytical observational method with a cross-sectional approach that correlated high Alvarado score with complications of acute appendicitis. The number of samples was 105 samples using the total sampling technique and statistically tested with the chi-square test. Results from a chi-square test showed that 42 patients (71.2%) with high scores had complications, with a significant p-value of 0.021. Thus, a high Alvarado score is significantly associated with increased risk of complications in acute appendicitis cases.

KEYWORDS: Appendicitis, Alvarado Score, Surgery, Hospital, Scoring

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I. INTRODUCTION

Appendicitis is the inflammation of the appendix and is the most common cause of acute abdominal pain that requires immediate surgery. If not treated promptly, it can lead to serious complications such as gangrene, perforation, or even peritonitis. The condition often begins with a blockage in the appendix, which allows bacteria to accumulate and cause infection, possibly leading to abscess formation^I.

In Indonesia, the number of appendicitis cases has continued to rise each year. Research shows that people aged 15–25 are more likely to suffer from appendicitis, and an unhealthy diet may increase the risk. At hospitals like Anutapura Palu and Undata, hundreds of cases have been reported in recent years. Patients typically report pain in the lower right abdomen, nausea, vomiting, fever, and loss of appetite. However, because these symptoms can resemble other conditions like diverticulitis or Crohn's disease, misdiagnosis is common^{II-III}.

Delays in diagnosis—especially in elderly patients—can increase the risk of complications such as perforation or sepsis. These delays are often caused by communication

difficulties, overlapping symptoms with other illnesses, and limited access to timely medical evaluation^{VI-VIII}.

Ultrasonography is the recommended initial diagnostic tool for appendicitis, but it may not always be available due to a shortage of trained professionals and equipment. In such cases, economic factors and radiation concerns must also be considered. As an alternative, the Alvarado Score is a practical clinical method used to assess the likelihood of appendicitis based on signs, symptoms, and lab results^{IX-XI}.

The Alvarado Score uses eight indicators, including symptoms like pain shifting to the lower right side, loss of appetite, and vomiting, along with signs such as tenderness, fever, and lab findings like high white blood cell count. Scores range from 1 to 10, helping doctors determine whether further action is needed. Although the Alvarado Score is not always fully accurate, it is useful for assessing severity and prioritizing patients for surgery, especially when resources are limited^{IX-XI}.

II. METHODS

This research uses a quantitative method with a cross-sectional analytical observational design aimed at

identifying the correlation between high Alvarado scores and complications of acute appendicitis, based on medical record data from Undata Hospital, Palu City, during the period of January to December 2022–2023. The study was conducted between July and August 2024 at Undata Hospital, located in Palu, Central Sulawesi. The study population consisted of all 165 patients diagnosed with acute appendicitis at the hospital during the specified period. The sample size was determined using the Slovin formula, which is commonly applied to calculate the minimum required sample size with a 10% margin of error^{IV-VI}.

III.RESULTS AND DISCUSSIONS

In Table 1, the sample consists of 105 patients, with 67 diagnosed with complicated appendicitis and 38 with non-complicated appendicitis. Age distribution shows variations between the two groups across different age categories: late adolescence, early adulthood, late adulthood, early elderly, late elderly, and senior. Among the 67 patients with complications, 34 (50.7%) were in late adolescence, 8 (11.9%) in early adulthood, 9 (13.4%) in late adulthood, 7 (10.4%) in early elderly, 6 (8.9%) in late elderly, and 3 (4.4%) were seniors. Meanwhile, among the 38 non-complicated cases, 25 (65.7%) were in late adolescence, 5 (13.1%) in early adulthood, 4 (10.5%) in late adulthood, 2 (5.2%) in early elderly, and 1 each (2.6%) in late elderly and senior groups.

Tabel 1. Characteristics of research subjects based on diagnosis, age, gender, type of surgery and length of treatment of patients with complicated and non-complicated appendicitis

Diagnosis	With Complications	Without Complications
Acute Appendicitis	67 (63,8%)	38 (36,2%)
Age		
Late Adolescent	34 (50,7%)	25 (65,7%)
Early Adulthood	8 (11,9%)	5 (13,1%)
Late Adulthood	9 (13,4%)	4 (10,5%)
Early Elderly	7 (10,4%)	2 (5,2%)
Late Elderly	6 (8,9%)	1 (2,6%)
Seniors	3 (4,4%)	1 (2,6%)
Gender		
Female	29 (43,3%)	29 (76,3%)
Male	38 (56,7%)	9 (23,7%)
Types of Surgery		
Appendectomy	26 (38,8%)	32 (84,2%)
Exploratory Laparotomy	41 (61,2%)	6 (15,8%)
Length of Treatment		
< 7 days	38 (56%)	29 (76,3%)
> 7 days	29 (44%)	9 (23,7%)

Gender distribution also shows differences. In the complicated appendicitis group, there were 29 female patients (43.3%) and 38 male patients (56.7%). In contrast, among the non-complicated group, 29 were female (76.3%) and 9 were male (23.7%).

Regarding the type of surgery, complicated cases were more likely to undergo exploratory laparotomy, with 41 patients (61.2%), while 26 patients (38.8%) underwent appendectomy. For non-complicated cases, 32 patients (84.2%) had an appendectomy and only 6 (15.8%) underwent exploratory laparotomy.Length of treatment also differed between groups. In the complicated appendicitis group, 38 patients (56%) were hospitalized for less than 7 days, while 29 patients (44%) stayed more than 7 days. In the non-complicated group, 29 patients (76.3%) had treatment durations under 7 days, and 9 patients (23.7%) stayed over 7 days. These findings reflect variations in age, gender, surgical approach, and treatment duration between complicated and non-complicated appendicitis patients.

Tabel 2. Relationship between Alvarado Score and complications ofacute appendicitis at Undata Hospital

Alvarado Score	Acute Appendicitis		p
	With Complications	Without Complications	
	Low	8 (72,7%)	
	Medium	13 (37,1%)	
Skor	High	17 (28,8%)	0,021

Based on the data, 11 patients had low Alvarado scores, with 3 (27.3%) experiencing complicated appendicitis and 8 (72.7%) having non-complicated cases. Among the 35 patients with moderate Alvarado scores, 22 (62.9%) had complications, while 13 (37.1%) did not. For the 59 patients with high Alvarado scores, 42 (71.2%) had complications, and 17 (28.8%) had non-complicated appendicitis. Statistical analysis using the Chi-square test showed a p-value of 0.021 (p < 0.05), indicating a significant relationship between high Alvarado scores and appendicitis complications at Undata Hospital, Palu City, during the 2022–2023 period.

The study was conducted at Undata Regional General Hospital using secondary medical record data to analyze the characteristics of appendicitis patients based on age, gender, type of surgery, and treatment duration. From a total of 105 subjects, 67 had complicated and 38 had non-complicated appendicitis. The data was processed using SPSS for analysis.

Age was a key factor, with most patients in the 17–25 age group. Previous studies support this, noting that

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lymphoid tissue peaks between ages 12–20, increasing susceptibility to appendicitis. Poor diet and lack of a healthy lifestyle among this productive age group may also contribute. The results align with other research indicating that late adolescence and early adulthood are high-risk periods for developing appendicitis.

In terms of gender, more men had complicated appendicitis, while more women had non-complicated cases. Studies suggest men are more prone to complications, potentially due to higher lymphoid tissue levels, as well as lifestyle factors such as smoking, alcohol use, and outdoor work. However, in women, especially pre-menopausal, hormonal fluctuations may affect disease presentation.

Surgical treatment data showed that appendectomy was the most common procedure, performed in 58 cases (55.2%), while laparotomy was done in 47 cases (44.8%). Appendectomy is generally safe and widely used, but risk factors like age over 50, high preoperative white blood cell counts, and delayed surgery can increase the chance of complications. Timely surgery remains essential.

Laparotomy is typically required in more severe cases, such as when perforation, abscess, or peritonitis is suspected. Delayed treatment can significantly increase the risk of perforation, with each hour of delay raising the risk by about 2%. It may also be needed when diagnosis is unclear or in older patients where typical symptoms are absent^{XII}.

Regarding the length of hospital stay, 67 patients (63.8%) were treated for less than 7 days, while 38 (36.2%) stayed longer. Although complications often result in longer stays, this study showed many complicated cases were treated in under 7 days, which differs from other findings. Length of stay is influenced by many factors, including wound healing, type of surgery, patient age, diagnosis, and hospital policies^{XIII}.

The Chi-square test confirmed a significant relationship between high Alvarado scores and appendicitis complications. Similar findings from other studies also support the Alvarado score as a useful predictor of appendicitis severity. While effective in many cases, especially in high-risk patients, its accuracy may be lower in female patients due to overlapping symptoms with gynaecological conditions like pelvic inflammatory disease^{XIV}.

It's also important to note that in some cases, surgery was performed despite low Alvarado scores. This may occur because surgical decisions are not based solely on the score, but also on clinical judgment, ultrasound findings, and the patient's overall condition. Elderly patients, for example, may show few symptoms but still have serious complications, explaining low scores with severe outcomes.

CONCLUSIONS

In conclusion, a high Alvarado score and delayed diagnosis are significant risk factors for appendicitis complications.

While the score is a helpful tool, it should be used alongside clinical evaluation and diagnostic tests to ensure accurate diagnosis and timely treatment

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