

The Relationship Between Preoperative Alvarado Score And Postoperative Anatomical Pathology Results In Acute Appendicitis At Royal Prima Marelan General Hospital In 2024

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Abstract.

Background: Acute appendicitis is a common surgical emergency characterized by inflammation of the appendix, requiring timely diagnosis to prevent complications. The Alvarado score is a simple, inexpensive clinical tool designed to aid early diagnosis, while histopathological examination remains the diagnostic gold standard. This study explores the relationship between preoperative Alvarado scores and postoperative anatomical pathology results at Royal Prima Marelan Hospital in 2024. *Methods:* This cross-sectional analytic study analyzed medical records of 89 patients diagnosed with acute appendicitis who underwent appendectomy from January to December 2024. Data on demographic characteristics, Alvarado scores, and histopathological outcomes were extracted. Chi-square tests assessed correlation, while sensitivity and specificity analyzes evaluated the diagnostic performance of the Alvarado score. *Results:* Most patients were aged 15–24 years (55.1%) and female (56.2%). Alvarado scores ≥ 7 were observed in 85.4% of cases. Histopathology confirmed acute appendicitis in 95.5% of patients and chronic inflammation in 4.5%. A significant association was found between Alvarado scores and pathology results ($p=0.000$; $OR=24.485$). The Alvarado score demonstrated high predictive value for acute appendicitis. *Conclusion:* There is a strong correlation between preoperative Alvarado scores and postoperative pathological findings in acute appendicitis. The Alvarado score is a practical tool to improve diagnostic accuracy and reduce unnecessary surgeries. Future research should validate these findings with larger, prospective studies.

Keywords: Acute Appendicitis; Alvarado Score; Diagnostic Accuracy; Histopathology and Surgical Outcomes.

I. INTRODUCTION

Acute appendicitis remains one of the most prevalent causes of acute abdomen and continues to be a primary indication for emergency surgical intervention worldwide. The appendix, a slender organ measuring approximately 1–9 inches, is susceptible to inflammation, which can rapidly progress to severe complications if not diagnosed and treated (Febyan, 2020; Siregar et al., 2023a). Epidemiological data indicates that the incidence of acute appendicitis varies globally, with Indonesia reporting the highest rates in Southeast Asia, reaching 0.05% of the population, and local data from North Sumatra showing a prevalence of 27% (Ribka Febrianti Zebua et al., 2022). In 2024, Royal Prima Marelan Hospital documented 89 cases of acute appendicitis, underscoring the ongoing clinical significance of this condition. Despite its frequency, the diagnosis of acute appendicitis is often challenging, particularly in children, the elderly, and women of reproductive age, due to symptom overlap with other gastrointestinal disorders. Risk factors such as age, sex, dietary habits, and stool consistency contribute to disease variability, with men experiencing acute abdominal problems 2.5 times more frequently than women, potentially due to lower fiber intake (Cristie et al., nd; Siregar et al., 2022). The complexity of clinical presentation necessitates reliable diagnostic tools to minimize negative appendectomy rates and improve patient outcomes. The Alvarado score, introduced by Alfredo Alvarado in 1986, is a simple and cost-effective clinical tool designed to aid in the diagnosis of acute appendicitis by evaluating eight key indicators, including migratory right lower quadrant pain, anorexia, nausea or vomiting, tenderness, rebound tenderness, fever, leukocytosis, and neutrophilia.

While histopathological examination of the appendix remains the gold standard for confirming acute appendicitis, the Alvarado score has demonstrated significant correlation with histopathological findings, enhancing diagnostic accuracy and reducing unnecessary surgeries (Afiati-Fkik, nd; Roopmala M et al., 2019a). Recent studies have validated the utility of the Alvarado score, with scores ≥ 7 indicating a high probability of acute appendicitis and strong predictive value for positive histopathological results. The present study aims to investigate the relationship between preoperative Alvarado scores and postoperative

anatomical pathology outcomes in patients with acute appendicitis at Royal Prima Marelan Hospital during 2024. This research is urgent and novel, as it addresses the need for improved diagnostic precision in acute appendicitis, reducing potentially negative appendectomy rates and optimizing patient management. By employing a cross-sectional analytic design and total sampling of 89 cases, this study contributes new evidence to the growing body of literature supporting the integration of clinical scoring systems with histopathological validation, thereby advancing the standard of care in acute appendicitis diagnosis and treatment.

II. METHODS

This study used a quantitative analytic approach with a cross-sectional design to assess the correlation between preoperative Alvarado scores and postoperative anatomical pathology findings in acute appendicitis patients at Royal Prima Marelan Hospital during 2024. The cross-sectional design enables examination of variables and their relationships at a specific time, which suits retrospective data extraction from medical records as described by Creswell (2021) and Capili (2021). This approach is efficient for simultaneously analyzing clinical scoring and histopathological results without requiring longitudinal follow-up (Sugiyono, 2021; Sudaryono, 2022). Data collection employed a standardized data extraction instrument focusing on clinical parameters, including Alvarado scores, demographic information, and histopathology outcomes from appendectomy specimens. Data were obtained from 89 patient medical records through total sampling, ensuring inclusion of all cases during the study period, which improves representativeness and reduces selection bias as supported by Elfil and Negida (2017) and Sugiyono (2021). The use of clinical and pathology records as primary data sources ensures the reliability and validity of the findings (Emzir, 2023). Statistical analysis involved the Chi-square test to evaluate associations between categorical variables such as Alvarado score categories and histopathological diagnoses. Sensitivity and specificity analyzes further quantified the diagnostic accuracy of the Alvarado scoring system in predicting acute appendicitis pathology.

These methods follow standard analytical techniques in medical research for categorical data and diagnostic test evaluation as recommended by Sudaryono (2022) and Wang (2020). Data processing was performed using statistical software ensuring rigor in testing hypotheses and interpreting associations. The population comprised all patients diagnosed with acute appendicitis who underwent appendectomy in the hospital between January and December 2024, applying total sampling methodology that includes the entire accessible patient pool (Sugiyono, 2021). The sample size of 89 patients was sufficient for statistical examination and generalization within this clinical context, consistent with power analysis and sampling principles discussed by Creswell (2021). The research procedure involved systematic review and extraction of patient records, data coding, and subsequent statistical analysis while adhering to ethical standards regarding patient confidentiality and data management. This procedural rigor follows widely accepted clinical research practices, ensuring credible and reproducible results concerning the relationship between preoperative clinical scoring and postoperative anatomical pathology in acute appendicitis (Capili, 2021; Creswell, 2021).

III. RESULT AND DISCUSSION

Research result

Table 1. Distribution by Age

Age group	Amount	Presentation
5 - 14 years	14	15.7%
15 - 24 years	49	55.1%
25 – 44 years old	19	21.3%
45 - 65 years	7	7.9%

Based on table 1 above shows that the frequency based on medical record data observed by researchers is based on. Age groups at Royal Prima Marelan General Hospital for the 5-14 year age group with a total of 14 respondents with a percentage of 15.7%, the 15-24 year age group with a total of 49

respondents with a percentage of 55.1%, the 25-44 year age group with a total of 19 respondents with a percentage of 21.3%, then the 45-65 year age group totaled 7 respondents with a percentage of 7.9%.

Table 2. Distribution by Gender

Alvarado's scoring	number	Percentage
< 7	13	14.6%
≥ 7	76	85.4%
Total	89	100.0%

Based on table 2, researchers at Royal Prima Marelan General Hospital observed the frequency of 39 male respondents (43.8%) and 50 female respondents (56.2%) based on medical record data.

Table 3. Distribution Based on Alvarado Scoring

Anatomy	Number	Percentage
Acut	85	95.5%
KroNik	4	4.5%
Ttotal	89	100.0%

Based on table 3 above, it shows that the frequency based on medical record data observed by researchers based on the Alvarado scoring group at Royal Prima Marelan General Hospital for the scoring group <7 with a total of 13 respondents with a percentage of 14.6%, and for the scoring group ≥7 with a total of 76 respondents with a percentage of 85.4%.

Table 4. Distribution Based on Anatomical Pathology

Gender	Amount	Percentage
Man	39	43.8%
Woman	50	56.2%
Total	89	100.0%

Based on table 4 above, it shows that the frequency based on medical record data, researchers in the anatomical pathology group of Royal Prima Marelan General Hospital found 85 acute respondents with a percentage of 95.5% and 4 chronic respondents with a percentage of 4.5%.

Relationship of Alvarado Scoring with Anatomical Pathology

The scoring results showed that 9 respondents (10.6%) had an Alvarado score <7 with acute anatomical pathology results, and 4 respondents (100%) had chronic anatomical pathology results. Furthermore, 76 respondents (89.4%) had an Alvarado score ≥7 with acute anatomical pathology results, and 0 respondents (0%) had chronic anatomical pathology results. The statistical test results found a p-value (0.000) indicating that the preoperative Alvarado score and postoperative anatomical pathology results in acute appendicitis at Royal Prima Marelan Hospital from January to December 2024 were correlated.

Discussion

This study of 89 patients reported that 9 patients with an Alvarado score <7 had the most frequent acute pathology outcomes. Acute pathology was more prevalent in 76 patients with an Alvarado score ≥7. Statistical tests showed a correlation between preoperative Alvarado score and postoperative pathology for acute appendicitis at Royal Prima Marelan General Hospital from January to December 2024 ($p = 0.000$). A high correlation (r) of 24.485 was found between preoperative Alvarado score and postoperative pathology. This study demonstrated a strong correlation between preoperative Alvarado score and postoperative pathology. This suggests that the Alvarado score influences the pathological appearance of the surgically repaired appendix and may increase the likelihood of appendectomy. A negative appendectomy score indicates a higher percentage of normal appendiceal tissue than post-appendectomy pathology. A 2010 study from Mandeville Regional Hospital found that the Alvarado scoring system reduced the negative appendectomy rate from 35.8% to 30.2%. Because the pathological examination results were supportive of acute inflammation, an Alvarado score of 8-9 was considered accurate (Olakolu, 2010). Khan et al. (2003) studied the Khyber Teaching. Postoperative pathological examination of 54 patients with an Alvarado score ≥7 at Peshawar Hospital revealed appendiceal inflammation in 32 female patients and 20 male patients (Khan et al., 2003).

This implies that the Alvarado score is crucial for detecting acute appendicitis and determining surgical intervention. This is also in line with research conducted at Dr. H. Chasan Boesoirie Ternate Regional General Hospital in 2020-2023, which reported that acute appendicitis generally occurs in male patients aged 17-25 years. Most patients were found with an Alvarado score of 7-10 and surgical findings of perforation. Based on the chi-square test, a p-value of 0.001 ($p < 0.05$) was obtained, indicating a relationship between the Alvarado score and surgical findings. A study conducted by Al-Tarakji in 2022. Of 1,303 patients, grade 0 histopathological findings were found in 52 patients with a percentage of 51.9% males, grade I was found in 1,198 patients with a percentage of 76.8% males, grade II in 41 cases with 83.3% male patients, and grade III in 11 cases with a percentage of 63.6% males. This shows that more males are affected by acute appendicitis, which is statistically more significant ($p = 0.001$). A statistical correlation was also found between the Alvarado group and HP Grades ($p = 0.001$). The data showed that approximately 52 patients with negative results for acute appendicitis were distributed based on the Alvarado group, with a distribution of 9.9%, 7.4%, and 1.8% in groups I, II, and III, respectively. This indicates that the Alvarado stratification is highly significant in HP findings in diagnosing acute appendicitis. This means that the higher the Alvarado score, the lower the rate of appendicitis surgery.

IV. CONCLUSION

The main findings of this study reveal a significant correlation between preoperative Alvarado scores and postoperative anatomical pathology results among acute appendicitis patients at Royal Prima Marelan Hospital in 2024. Patients with Alvarado scores ≥ 7 predominantly presented with acute appendicitis confirmed by histopathology, accounting for 95.5% of cases, while scores < 7 were associated with both acute and chronic findings. Statistical analysis demonstrated a strong association with $p = 0.000$ and an odds ratio (OR) of 24.485, indicating high predictive value of the Alvarado score in estimating the pathological severity of appendicitis. This underscores the clinical utility of the Alvarado score as an effective diagnostic tool to improve accuracy and reduce unnecessary surgeries, consistent with findings from previous studies (Afiati-Fkik, nd; Roopmala et al., 2019a; Nugrohowati et al., 2022). However, the study has some limitations. Being a retrospective cross-sectional analysis, it is constrained by the inherent limitations of medical record data, such as incomplete records or documentation bias.

The sample size, although reflective of the hospital population in 2024, may limit generalizability to wider populations or different clinical settings. Additionally, while the Alvarado score showed strong correlation with histopathology, it is not a standalone diagnostic tool, and its predictive accuracy may be influenced by patient factors such as age and comorbidities. Future research should consider prospective multicenter studies with larger sample sizes and incorporate additional clinical and laboratory parameters to refine predictive models and validate the clinical applicability of the Alvarado score across diverse populations (Sugiyono, 2021; Creswell, 2021). Practically, the findings imply that integrating preoperative Alvarado score assessment with histopathological confirmation can enhance clinical decision-making, prioritize surgical interventions, and minimize negative appendectomies. The Alvarado scoring system, given its simplicity and cost-effectiveness, should be regularly employed in emergency surgical settings to stratify patient risk and optimize outcomes. Hospitals, especially in resource-limited settings, can benefit from protocols that integrate clinical scoring systems with pathological validation to improve diagnostic precision and patient care efficiency.

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