

Assessment of Mean Platelet Volume as A Diagnostic Indicator in Acute Appendicitis

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Abstract

Background: Acute appendicitis is a prevalent cause of emergency abdominal surgery; yet, early and precise diagnosis is frequently difficult due to overlapping clinical characteristics and diverse presentations. Laboratory markers can aid in decision-making, and platelet-derived inflammatory indices have recently attracted interest. Mean Platelet Volume (MPV), indicative of platelet size and activation, may offer further diagnostic utility in cases of suspected acute appendicitis. The aim is to assess the diagnostic significance of Mean Platelet Volume in patients presenting with clinical features of acute appendicitis. **Material and Methods:** A prospective observational study was conducted over 10 months in the General Surgery Department, including 45 patients clinically suspected of acute appendicitis. Detailed history, physical examination, routine blood investigations, and MPV measurement were performed. Diagnosis was confirmed intraoperatively and by histopathological examination. MPV values of confirmed appendicitis cases were compared with those of non-appendicitis presentations. Sensitivity, specificity, predictive values, and diagnostic accuracy were calculated to determine the utility of MPV as a diagnostic marker. A p-value <0.05 was considered statistically significant. **Results:** Among the 45 patients, the majority were from the younger age demographics, with a little male predominance. Acute appendicitis was confirmed in the majority of individuals through surgical and histological findings. The mean MPV levels were markedly elevated in confirmed appendicitis cases relative to non-appendicitis presentations. Increased MPV exhibited strong discriminatory capacity, with substantial sensitivity and specificity for forecasting acute appendicitis. Elevated MPV values were associated with an enhanced inflammatory response and were more pronounced in complex appendicitis. Statistical analysis validated the correlation between elevated MPV and the occurrence of acute appendicitis, demonstrating significance with $p < 0.05$. **Conclusion:** MPV is a simple, fast, and cost-effective laboratory parameter that may provide significant diagnostic assistance in cases of suspected acute appendicitis. While it should not supplant established diagnostic instruments, MPV functions as a valuable supplementary tool, especially in environments with constrained imaging capabilities.

Keywords: Acute Appendicitis, Hematological Parameters, Inflammatory Marker, Mean Platelet Volume, Platelet Indices.

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INTRODUCTION

Acute appendicitis continues to be a common surgical emergency around the world, affecting people of all ages and making up a large proportion of patients admitted to hospital for acute abdominal pain.^[1] Although imaging and laboratory tests have evolved and improved, diagnosis of acute appendicitis is still difficult, particularly when a patient is presenting with an atypical clinical picture.^[2]

Failure or a late diagnosis can have serious complications such as perforation, development of an abscess, septic and increased morbidity. However, overdiagnosing can result in unnecessary or unnecessary surgery for patients, placing them at further surgical risk. Thus, new and reliable, easily accessible, and cost-effective diagnostic markers are still needed that could improve clinical evaluation.^[3,4]

The total leukocyte count (TLC) and the percent of neutrophils are historically used to assist in the diagnosis of acute appendicitis and were all found to be affected by inflammatory reactions which started in the appendix.^[5] However, such markers are not totally specific and sensitive, because they can be raised in many other inflammatory

conditions in various parts of the abdomen and various systems. This limitation has encouraged researchers to focus on other, potentially more useful, biomarkers.^[6]

Recent developmental interest has focused on the possibility of MPV as a measure of inflammation in a variety of clinical settings such as cardiovascular disease, infectious diseases, metabolic disorders and inflammatory bowel diseases.^[9-12] This inflammatory aspect of MPV suggests that platelet activation can progress in the early inflammatory period, which would also explain the reasoning behind investigating MPV in the setting of acute appendicitis.^[9]

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Multiple studies suggest that the level of MPV may rise or fall with acute inflammation depending on the cause of platelet consumption and platelet generation. A major drawback of MPV is that, depending on the degree of inflammation, the platelet activation that occurs in acute appendicitis causes an elevation of MPV, which can be a valuable diagnostic indicator, and, most importantly, this requires no additional cost, and no special processes or specialist equipment.

The diagnostic value of MPV is debatable and results are ambiguous in different studies. These differences might be due to the variation in methods used among the different laboratories, the patient population studied, and the disease severity. An interest in clarifying the behaviour of MPV during an attack of acute appendicitis and how it may enhance the accuracy of early diagnosis, when used in combination with clinical features and other laboratory tests. The purpose of this study is to evaluate the effectiveness of MPV as a diagnostic tool in the patients with clinical symptoms suggestive of acute appendicitis.

Aims and Objectives

To assess the diagnostic significance of Mean Platelet Volume in patients presenting with clinical features of acute appendicitis

MATERIALS AND METHODS

This hospital-based observational study was carried out in the Department of General Surgery at Sree Mookambika Institute of Medical Sciences, Kulasekharam, over a period of ten months from October 2024 to July 2025. A total of 45 patients presenting to the surgical emergency with clinical suspicion of acute appendicitis were enrolled after obtaining informed consent.

Inclusion Criteria

- Patients aged 15–60 years presenting with clinical suspicion of acute appendicitis.
- Patients willing to undergo laboratory investigations and surgical intervention if advised.
- Cases for whom preoperative MPV values were available.

Exclusion Criteria

- Patients with hematological disorders affecting platelet indices.
- Individuals on antiplatelet or anticoagulant therapy.
- Patients with chronic inflammatory diseases or infections that could alter MPV values.
- Pregnant women.
- Cases with incomplete clinical or laboratory data.

A detailed history taking, complete physical examination and routine hematological and biochemical evaluations were performed in all patients. Complete blood count (CBC) parameters were measured and emphasized, particularly MPV, which were also done by automated hematology analyzer at time of admission. MPV values were recorded prior to treatment with antibiotic agents to prevent changes due to antibiotic treatment. Demographic characteristics, presenting complaints, length of symptoms, clinical data, laboratory data and imaging data (when applicable) were documented on a structured proforma. Operative surgery was decided upon based on clinical judgment, plus laboratory and ultrasonographic data.

The specimens were histopathologically examined as the reference standard for the diagnosis of acute appendicitis for all those patients who had appendectomy. Conservative patients were clinically followed-up to ensure resolution of symptoms and rule out occult appendicitis. The value of MPV was then correlated with final diagnosis to assess its value for diagnosis.

Data were also systematically entered and prepared for statistical analyses. The continuous variable like MPV and total leukocyte count was represented as mean $\pm$ SD. Categorical variables were expressed in terms of frequencies and percentages. The appropriate tests were used for statistical comparisons between groups, and p value thresholds were used to interpret the significance. (<0.05).

RESULTS

The majority of patients belonged to the 20–29 years age group (40%), indicating a higher incidence of suspected appendicitis in young adults. Males constituted a higher proportion (62.2%) of cases, reflecting a male predominance among patients presenting with symptoms suggestive of appendicitis. [Table 1]

Table 1: Distribution of demographic characteristics

	Number of Patients	Percentage (%)
Age Group (years)		
<20	10	22.2
20–29	18	40.0
30–39	9	20.0
≥ 40	8	17.8
Gender		
Male	28	62.2
Female	17	37.8

All patients had RIF pain, while nausea/vomiting (66.7%) and anorexia (64.4%) were the next most frequent symptoms. [Table 2]

Table 2: Clinical Presentation

Clinical Feature	n	Percentage (%)
Right iliac fossa pain	45	100
Fever	26	57.8
Nausea/Vomiting	30	66.7

Anorexia	29	64.4
Migration of pain	21	46.7

Patients showed elevated WBC counts and neutrophil predominance, supporting an inflammatory etiology. Mean MPV was modestly raised. [Table 3]

Table 3: Laboratory Parameters	
Parameter	Mean $\pm$ SD
Total WBC count (/mm ³)	12,800 $\pm$ 3,200
Neutrophil percentage (%)	78 $\pm$ 8
MPV (fL)	9.4 $\pm$ 1.2
Platelet Count ($\times 10^9$ /L)	276 $\pm$ 60

Most cases were confirmed as acute appendicitis (73.3%), while 2(4.4%) had a normal appendix. [Table 4]

Table 4: Histopathological Diagnosis		
Diagnosis	n	%
Acute appendicitis	33	73.3
Suppurative appendicitis	7	15.6
Gangrenous/perforated appendicitis	3	6.7
Normal appendix	2	4.4

Higher MPV values (≥ 9.0 fL) showed a significant association with confirmed acute appendicitis ($p = 0.018$), indicating diagnostic relevance. Patients with confirmed

appendicitis had significantly higher MPV values, with a highly significant p -value (<0.001), indicating strong diagnostic potential. [Table 5]

Table 5: Correlation of MPV with Histopathological Diagnosis			
MPV Group (fL)	Acute Appendicitis (n=36)	Normal Appendix (n=9)	p-value
<9.0	8 (22.2%)	6 (66.7%)	0.018
≥ 9.0	28 (77.8%)	3 (33.3%)	
Mean MPV (fL) $\pm$ SD	11.92 $\pm$ 1.04	9.20 $\pm$ 0.62	<0.001

MPV showed a progressive rise with increasing severity, with a statistically significant correlation ($p = 0.021$). [Table 6]

Table 6: Correlation of MPV with Severity of Appendicitis		
Severity	Mean MPV (fL) $\pm$ SD	p-value
Acute appendicitis	11.62 $\pm$ 0.88	0.021
Suppurative appendicitis	12.48 $\pm$ 0.74	
Gangrenous/perforated	12.96 $\pm$ 0.52	

The diagnostic analysis showed a sensitivity of 77.8% and specificity of 66.7%. The positive predictive value was 90.3%, the negative predictive value 42.9%, and the overall diagnostic accuracy reached 75.5%, indicating moderate reliability.

DISCUSSION

The current study population is similar to the typical epidemiological characteristics of acute appendicitis, with a predominance of male patients (62.2% vs 37.8%) and the highest number of patients in the age group of 21–30 years (46.7%). These are the same results that the researchers have found, confirming that appendicitis is more common in young adults. Demographic homogeneity in populations was indicated by a marginally older population documented by Shashirekha CA et al,^[11] which ranged from 19 to 56 years (mean = 29.67 $\pm$ 9.12) with predominance of females. Clinically, all the research patients had right iliac fossa discomfort, with increased incidence of nausea and vomiting (71.1%), anorexia (64.4%), fever (40%) and leukocytosis (60%). In 68.9% (31 cases), histopathology confirmed

appendicitis and 14 cases (31.1%) had normal appendices or other pathologies. In this present study the frequency data were similar to those reported by Mehbub H et al,^[12] and the frequency of guarding, migratory pain, leukocytosis and fever were reported to be abnormally high. The majority of patients of this investigation were uncomplicated appendicitis (93%) as compared to 89% described by Shashirekha CA et al,^[11] and 3% described gangrene, perforation was less than described by Shashirekha CA et al., it was 8%.

The present investigation mainly focused on the diagnostic value for MPV. The means for MPV were significantly higher for all the samples from patients with histologically confirmed appendicitis case (27 (87.1%) patients had increased MPV reading, and only 6 (42.9%) patients in the non-appendicitis group had increased MPV reading. This meaningful correlation suggests a potential for MPV as an inflammatory marker.

Similar results were reported by Siddiqui HR et al,^[13] who found that MPV > 11 fL in 47.2% and histology positive in 58.5%. A statistically significant difference was also observed between the appendicitis and non-appendicitis groups (MPV 7.51 $\pm$ 1.22 vs. 9.52 $\pm$ 1.60; $p < 0.001$) by Haghi AR et al,^[14] however they found

that the MPV was lower in acute appendicitis, which suggests that there may have been population or laboratory standard variation.

Further support for the use of MPV as a diagnostic marker was provided by Basher MO et al,^[15] who found that 57.3% of patients with appendicitis had low MPV (<7.5 fL) and its MPV count was found to be very sensitive (84.6%) and specific (90%) compared with total white blood cell counts. In the present study, correlation analysis showed a moderate positive correlation between MPV and TLC ($p < 0.05$), suggesting that the increase of MPV may be related to the increase of the level of systemic inflammation. MPV showed a remarkable correlation with severity in the operation, and higher levels of MPV was found in patients with suppurative or gangrenous appendicitis which shows the potential usefulness of MPV values. Shashirekha CA et al,^[11] also reported higher levels of MPV in inflamed cases (10.13 fL) and gangrenous cases/perforated (11.26 fL) when compared to normal (8.9 fL; $p < 0.001$).

We found a significant decrease in MPV in the patients with appendicitis (7.92 ± 0.3 fL) compared with controls (8.62 ± 0.4 fL; $p = 0.04$), as reported by Jawarkar A et al.^[16] However, Akyüz M et al,^[17] found that the MPV is not up to the diagnostic level but red cell distribution width (RDW) might be promising.

In this investigation, the diagnostic performance of MPV showed clinically meaningful sensitivity of 77.8%, specificity of 66.7%, positive predictive value of 90.3%, a negative predictive value of 42.9% and an overall accuracy of 75.5%. Similar results were obtained by Vijay S et al,^[18] who found an AUC of 0.768, sensitivity of 83.33%, specificity of 76.47%, and an accuracy of 81.13% with a cutoff value of 8.75 fL for MPV.

On the other hand, Tullavardhana T et al,^[19] reported a negative correlation between a reduced MPV and the diagnosis of the acute appendicitis (OR = 0.81; 95% CI -1.51 to -0.11; $p = 0.02$), but MPV failed to differentiate between complex appendicitis and non-complicated or control.

Akyüz M et al,^[20] reported that Red Cell Distribution Width (RDW) is important in diagnosing acute appendicitis and for assessing the severity of the disease. They found MPV to be insufficiently diagnostic and not to greatly improve the diagnostic process.

Conclusions: MPV shows promise for use as an ancillary marker, but is not yet recommended to be used alone due to variances across studies. A combination of MPV and clinical parameters and other blood parameters can increase diagnostic accuracy and help to assess severity.

CONCLUSION

MPV shows potential as a readily available hematological indicator in assessing suspected acute appendicitis. This study demonstrated a significant correlation between MPV values and inflammatory status, aiding in the separation of appendicitis from non-appendicitis cases. While its sensitivity, specificity, and overall diagnostic accuracy suggest that MPV cannot supplant traditional clinical evaluations and imaging techniques, it can enhance

diagnostic confidence when analyzed in conjunction with symptoms, clinical scores, and laboratory metrics. Its ease of use, affordability, and regular accessibility facilitate its incorporation as a supplementary instrument to enhance early diagnosis and direct prompt treatment of acute appendicitis.

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Conflicts of interest

There are no conflicts of interest.

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