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ACGH ANNALS OF CLINICAL GASTROENTEROLOGY AND HEPATOLOGY
ISSN 2640-2750

Research Article

Study of Platelet Parameters in the Assessment of Disease Severity in IBD: Ulcerative Colitis

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Abstract

Background: Platelets are increasingly recognized as important inflammatory markers. This study explores the association between platelet indices and disease severity in ulcerative colitis (UC).

Objective: To evaluate platelet parameters in patients with newly diagnosed UC and assess their correlation with disease severity indices.

Methods: A cross-sectional observational study was conducted at IMS & SUM Hospital, Bhubaneswar, between October 2022 and September 2024. A total of 62 newly diagnosed UC patients aged over 18 years were included. Disease severity was evaluated using Truelove and Witts (TLW) criteria, Mayo Disease Activity Index (Mayo DAI), and Ulcerative Colitis Endoscopic Index of Severity (UCEIS). Platelet count, mean platelet volume (MPV), platelet distribution width (PDW), platelet mass index (PMI), and platelet large cell ratio (PLCR) were measured. Statistical analysis included Pearson correlation, ROC curves, and sensitivity/specificity assessment.

Results: The majority of patients were male (81%) with a mean age of 28.2 years. A significant positive correlation was observed between platelet count and disease severity by UCEIS (r = 0.32, p = 0.015) and Mayo DAI (r = 0.35, p = 0.009). PMI showed strong correlations with UCEIS (r = 0.45, p = 0.001) and Mayo DAI (r = 0.48, p < 0.001). MPV was inversely correlated but showed weak significance. PLCR also showed significant correlations. ROC analysis revealed platelet count (AUC = 0.815) and PLCR (AUC = 0.729) as good predictors of disease severity.

Conclusion: Platelet parameters, particularly PMI, PLCR, and platelet count, may serve as accessible, non-invasive biomarkers for assessing disease severity in UC. Further studies with larger cohorts are warranted.

More Information

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Submitted: May 28, 2025
Approved: August 07, 2025
Published: August 08, 2025

How to cite this article: Uddarraju R. Study of Platelet Parameters in the Assessment of Disease Severity in IBD: Ulcerative Colitis. Ann Clin Gastroenterol Hepatol. 2025; 9(1): 015-017. Available from: https://dx.doi.org/10.29328/journal.acgh.1001052

Keywords: Ulcerative colitis; Platelet parameters; Disease severity; Platelet mass index; PLCR; Inflammation markers

Introduction

Ulcerative colitis (UC) is a chronic, relapsing inflammatory condition of the colon, characterized by diffuse mucosal inflammation. Disease activity in UC varies widely and can be classified using clinical, endoscopic, and histopathological indices. Accurate assessment of disease severity is crucial for guiding treatment decisions and predicting prognosis.

Platelets are traditionally recognized for their role in hemostasis, but recent studies highlight their involvement in inflammation and immune modulation. In UC, platelet activation and changes in platelet indices may reflect systemic inflammation and correlate with disease activity.

Conventional markers such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are often used, but they lack specificity for mucosal inflammation. Hence, there is a growing interest in exploring hematological markers like mean platelet volume (MPV), platelet distribution width (PDW), platelet mass index (PMI), and platelet large cell ratio (PLCR) for their potential utility in disease monitoring.

This study investigates the association between various platelet parameters and the severity of UC, aiming to determine whether these indices can serve as reliable, non-invasive markers for assessing disease activity.

Materials and methods

Study design and setting

This was a hospital-based cross-sectional observational study conducted in the Department of Gastroenterology,

IMS & SUM Hospital, Bhubaneswar, India. The study period extended from October 2022 to September 2024.

Study population

A total of 62 patients diagnosed with ulcerative colitis for the first time were included in the study. All participants were evaluated in the outpatient and inpatient departments. Patients were enrolled consecutively after satisfying the inclusion and exclusion criteria.

Inclusion criteria

- Age greater than 18 years.
- Newly diagnosed cases of UC based on clinical presentation, colonoscopic/sigmoidoscopic findings, and histopathological confirmation.

Exclusion criteria

Patients under 18 years of age.

- Patients unwilling to participate or unable to provide informed consent.
- Patients with chronic comorbidities known to influence platelet parameters, such as chronic infections, hematological disorders, autoimmune diseases, chronic liver disease, and chronic kidney disease.
- Patients with recent surgeries or blood transfusions within the last 3 months.
- Pregnant women, smokers, diabetics, and patients on antiplatelet medication.
- Patients are already undergoing treatment for UC or presenting with disease flare-ups.

Data collection procedure

A structured proforma was used to collect demographic data, clinical history, including duration of symptoms, severity of abdominal pain, rectal bleeding, stool frequency, and systemic symptoms. Physical examination findings and anthropometric measurements were recorded.

Laboratory investigations

Blood samples were drawn from patients using standard venipuncture techniques. Samples for complete blood count (CBC) were collected in EDTA tubes and analyzed using an automated hematology analyzer.

Parameters evaluated included:

- Platelet count (PLT)
- Mean platelet volume (MPV)
- Platelet distribution width (PDW)
- Platelet mass index (PMI), calculated as Platelet count x MPV / 10,000
- Platelet large cell ratio (PLCR) or Immature platelet fraction (IPF)
- Hemoglobin (Hb), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP)

All laboratory assessments were performed in the central clinical laboratory, adhering to internal quality control standards.

Endoscopic assessment

Colonoscopy or flexible sigmoidoscopy was performed as clinically indicated. Findings were documented, and mucosal biopsies were obtained for histopathological analysis. Disease severity was graded using:

- Truelove and Witts (TLW) criteria (based on clinical features)
- Mayo Disease Activity Index (DAI)
- Ulcerative Colitis Endoscopic Index of Severity (UCEIS)

Results

The study included 62 patients with newly diagnosed UC, comprising 81% males and 19% females. The mean age was 28.2 years (SD: 4.7), with the majority falling in the 28–32 year age group. Disease severity stratification based on Truelove and Witts (TLW) criteria showed 46.8% with severe disease, 37.1% moderate, and 16.1% mild. Mayo DAI and UCEIS also revealed a high proportion of severe cases (35.4% and 43.5%, respectively).

Platelet parameters showed meaningful variations across severity levels. Platelet count was significantly higher in severe UC (median 495,000/µL) compared to the mild and moderate groups. MPV, inversely related to severity, was highest in mild cases (median 12.9 fL) and lowest in severe cases (median 7.8 fL). PMI and PLCR were also elevated in severe disease.

Pearson correlation analysis demonstrated that platelet count correlated significantly with UCEIS ($r = 0.32$, $p = 0.015$) and Mayo DAI ($r = 0.35$, $p = 0.009$). PMI showed the strongest correlation with Mayo DAI ($r = 0.48$, $p < 0.001$) and UCEIS ($r = 0.45$, $p = 0.001$). PLCR also correlated positively with disease indices (Mayo DAI: $r = 0.35$, $p = 0.009$).

ROC analysis revealed platelet count (AUC = 0.815), PLCR (AUC = 0.729), and PMI (AUC = 0.649) as potential predictive markers. Platelet count had the highest sensitivity (86.2%) and moderate specificity (57.6%) at a cutoff of 345,000/µL. PLCR had 81.5% sensitivity and 57.1% specificity at a cutoff of 22.6%. MPV showed low AUC (0.154), indicating poor predictive ability.

Discussion

Our findings support the use of platelet-based indices as useful adjuncts in assessing UC disease severity. Platelet count and PMI demonstrated significant correlations with clinical and endoscopic severity indices, corroborating studies that have identified elevated platelet counts as reflective of systemic inflammation and disease activity in UC [1,2].

PMI, which integrates platelet count and MPV, emerged as a robust marker in our study, showing strong correlations and acceptable predictive power. This aligns with previous studies highlighting PMI's superiority over isolated platelet indices in inflammatory conditions [1,3].

PLCR, a relatively novel parameter, also showed promising results. It had a good AUC and strong correlation with endoscopic severity, suggesting its potential utility in mucosal inflammation assessment, especially in settings lacking access to advanced imaging or colonoscopy. This is consistent with emerging evidence supporting large platelet fractions as indicators of inflammation severity [4].

MPV showed inverse trends with disease severity, though the correlation was not statistically strong. Its diagnostic utility has been debated, with some studies reporting conflicting results [5,6].

These results reinforce the potential clinical application of platelet indices as affordable, non-invasive biomarkers. However, platelet indices are influenced by a range of physiological and pathological variables, including infections, medications, and analyzer variability [7]. Hence, while they are useful adjuncts, they should not replace comprehensive clinical and endoscopic assessment.

Conclusion

Platelet parameters, particularly platelet count, PMI, and PLCR, demonstrate significant correlations with disease severity in UC. These markers may serve as non-invasive, cost-effective tools for clinical assessment and monitoring of disease activity. Further prospective studies with larger populations are recommended to validate these findings.

Ethical considerations

Approval was obtained from the Institutional Ethics Committee. Written informed consent was secured from all participants after a detailed explanation of the study's objectives and procedures. Patient confidentiality and data privacy were maintained throughout the study. The study adhered to the Declaration of Helsinki principles.

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