

Neutrophil To Lymphocyte Ratio And Red Cell Distribution Width As Prognostic Indicators In Acute Pancreatitis: A Prospective Observational Study

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Abstract:

Background: Acute pancreatitis (AP) exhibits variable severity, from mild self-limiting illness to life-threatening complications. Early identification of severe cases is vital. Hematologic markers like neutrophil-to-lymphocyte ratio (NLR) and red cell distribution width (RDW) offer promising prognostic potential.

Materials and Methods: This prospective observational study included 100 patients diagnosed with AP over 18 months. NLR and RDW values were assessed at admission and correlated with disease severity, complications, and mortality using appropriate statistical methods.

Results: Elevated NLR and RDW values were significantly associated with severe AP ($p < 0.001$). Both markers showed strong correlation with pancreatic necrosis, organ failure, and increased length of hospital stay. NLR > 4.7 and RDW $> 14.5\%$ were optimal cut-off values for predicting complications.

Conclusion: NLR and RDW are inexpensive, readily available markers that can aid early risk stratification in AP and may complement conventional scoring systems.

Key Word: Acute pancreatitis, Neutrophil-to-lymphocyte ratio, Red cell distribution width, Prognosis, Inflammation, Mortality predictors

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I. Introduction

Acute pancreatitis (AP) is a common gastrointestinal emergency with a wide spectrum of clinical presentations. While most cases are mild and self-limiting, approximately 20% can progress to severe disease with systemic complications and significant mortality. Early and accurate prediction of disease severity remains a cornerstone of management to guide triage, intervention, and monitoring. Traditional scoring systems such as Ranson's criteria, APACHE II, and the Balthazar CT index are widely used but are often limited by complexity, cost, and the need for imaging. Recent interest has focused on simpler hematologic markers derived from routine blood tests. NLR and RDW have emerged as potential indicators of systemic inflammation^{2,4} and severity in various medical conditions, including acute pancreatitis.

II. Material And Methods

This prospective observational study was conducted in the Department of General Surgery, Adichunchanagiri Institute of Medical Sciences, B G Nagara, Mandya (D), over a period of 18 months from October, 2023 to March, 2025. Ethical approval was obtained prior to patient enrollment. Inclusion criteria were adults > 18 years diagnosed with acute pancreatitis/ chronic pancreatitis/ recurrent pancreatitis, irrespective of etiology of pancreatitis, who possessed the mental capacity to provide consent and willingly consented to participate in the study. Patients < 18 years, patients unwilling to participate in the study and patients who were discharged against medical advice were excluded. Patients with hematological disorders or malignancy were excluded. Clinical data including demographics, etiology, and laboratory values were recorded on admission. Disease severity was classified according to modified Atlanta classification and CT severity index (CTSI). Outcomes assessed included local/systemic complications, ICU stay, and mortality. Statistical analysis was performed using SPSS software and Microsoft Excel with $p < 0.05$ considered significant.

III. Result

A total of 100 patients were included, with mean age 41.2 ± 13.6 years; 65% were male. Alcohol was the leading etiology (54%), followed by gallstones (26%). Based on Atlanta classification, 72% had mild acute pancreatitis and 28% had severe acute pancreatitis

Table no 1: Comparison of Hematological Parameters and Clinical Outcomes Between Mild and Severe Acute Pancreatitis

Parameter	Mild AP (n = 72)	Severe AP (n = 28)	p-value
Mean Neutrophil-to-Lymphocyte Ratio (NLR)	4.3 ± 1.7	10.4 ± 3.2	< 0.001 *
Mean Red Cell Distribution Width (RDW) (%)	14.1 ± 1.2	16.4 ± 1.8	< 0.001 *
ICU Admission (%)	5.5%	42.8%	< 0.001 *
Pancreatic Necrosis (%)	1.3%	35.7%	< 0.001 *
Mortality (%)	0%	10.7%	0.01 *

Mean NLR was significantly higher in severe AP (10.4±3.2) versus mild AP (4.3±1.7), p<0.001. Similarly, RDW was elevated in severe AP (16.4±1.8%) compared to mild cases (14.1±1.2%), p<0.001. Both markers showed significant correlation with complications such as necrosis, ICU admission, and prolonged hospitalization.

IV. Discussion

This study reinforces the prognostic relevance of NLR and RDW in acute pancreatitis. Elevated NLR reflects heightened neutrophil activity and lymphocyte suppression, both hallmarks of systemic inflammation. RDW elevation may indicate oxidative stress, inflammation-mediated erythropoietic dysfunction, or early sepsis. Previous studies^{1,2,3,4,5} have demonstrated similar findings, with NLR and RDW correlating with adverse outcomes in AP and other inflammatory conditions. Given their simplicity and accessibility, these markers can serve as valuable adjuncts to existing scoring systems, particularly in resource-constrained settings.

V. Conclusion

NLR and RDW are effective, low-cost hematological parameters that can predict severity and complications in acute pancreatitis. Their integration into early clinical assessment could improve triage and management strategies. N:L ratio showed trends toward association with disease severity (MODS, ICU admission, and mortality), but statistical significance was not consistently reached. Hospital stay length was weakly correlated with N:L, indicating a possible role in disease duration. Blood cell parameters (neutrophils and lymphocytes) showed stronger associations with disease severity, particularly in ICU-admitted and deceased patients. These findings suggest that inflammatory markers should be considered in patient assessments, but they should not be used in isolation for clinical decision-making. Future research with larger sample sizes and multivariable models is needed to validate these trends and assess the true predictive value of N:L and blood cell counts in critically ill patients.

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