Platelet-Lymphocyte Ratio (PLR) as an Early Predictor of Severity in Acute Biliary Pancreatitis

Muhammad Nafe Bin Tahir, Roshnik Ayub*, Hanya Awaba**, Shehzad Ahmed Abbasi, Muhammad Yousaf Shah***, Muhammad Ans****

Department of Surgery, Pakistan Air Force Hospital Mushaf, Sargodha Pakistan, *Department of Gynae & Obs, Pakistan Institute of Medical Sciences (PIMS), Islamabad Pakistan, **Department of Surgery, Fauji Foundation Hospital, Rawalpindi Pakistan, ***Department of Surgery, Combined Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan, ****Department of Surgery, 130 Medical Battalion (Minimarg), Pakistan

ABSTRACT

Objective: To establish diagnostic precision regarding platelet-lymphocyte ratio for prophesying the severity of acute biliary pancreatitis in the early diagnostic phase, taking the Computed Tomography Severity Index as the gold standard.
Study Design: Cross-sectional validation study.
Place and Duration of Study: Pakistan Air Force Hospital Mushaf Base, Sargodha Pakistan, Jan to Dec 2023.
Methodology: Two hundred and twenty-five (n=225) patients diagnosed with acute biliary pancreatitis lying within an age bracket of 18-70 years (male and female) were inculcated. Patients having chronic diseases such as chronic pancreatitis, diabetes mellitus, cardiovascular diseases, end-stage renal and hepatic diseases, and other causes, e.g., Trauma, Endoscopic Retrograde Cholangiopancreatography, (iatrogenic), hypertriglyceridemia, and alcohol, were excluded. All patients were treated for acute pancreatitis. Seventy-two hours after admission, all patients underwent a Computed Tomography scan for Computed Tomography Severity Index.
Results: Platelet-lymphocyte ratio supported the diagnosis of severe acute pancreatitis in 99(44.0%) patients. Computed Tomography Severity Index findings confirmed severe acute pancreatitis in 93(41.33%) cases. In patients having platelet-lymphocyte ratio positive, 83 were TP, and 16 were FP. In 126 platelet-lymphocyte ratio-negative patients, 10 were FN, and 116 were TN (*p*=0.0001). Overall sensitivity was 89.25%, specificity was 87.88%, Positive and negative predictive values were 83.84% and 92.06%. The diagnostic precision of platelet-lymphocyte ratio in calculating the severity of acute biliary pancreatitis during the early diagnostic stage, taking Computed Tomography Severity Index as the gold standard, was 88.44%.
Conclusion: The diagnostic precision of platelet-lymphocyte ratio in forecasting the extent of acute biliary pancreatitis during the early diagnostic stage is quite high.

Keywords: Acute Biliary Pancreatitis, Platelet to Lymphocyte Ratio, Sensitivity.

INTRODUCTION

Acute biliary pancreatitis is an inflammatory disease involving the pancreas that involves remote organs and surrounding tissues.[1] It results from the exudating fluid that activates proteolytic enzymes in the pancreatic interstitium.[2] These fluid collections can be categorized into pancreatic pseudocyst, walled-off pancreatic necrosis (WOPN), and pancreatic abscess. Its identification and management in the short and long term has been presenting a challenge to treating teams.[2] Severe acute biliary pancreatitis, being the most serious type, is associated with increased complications and has a biphasic course. In the initial 1-2 weeks, systemic inflammatory response syndrome occurs. If the systemic inflammatory response syndrome becomes severe, it may cause early multiorgan dysfunction.[3]

Despite diagnostic advancements, acute pancreatitis is still a burden in terms of cost and mortality.[3] Twenty-five out of a hundred patients can develop severe acute biliary pancreatitis, having complications like pancreatic necrosis leading to end-organ dysfunction.[4] Its prevalence is 25%.[2] A high % mortality rate of 50% necessitates using an effective laboratory tool to predict the extent at early presentation.[5,6] Multiple clinical and radiological scores to forecast the extent and prognosis have progressed over time. Authentication and comparison of these scores are dwindled by incompatible use of lexicon and classifications in terms of severity, complications, and prognosis of disease.[4]

Multiple extrapolative scores are used in inpatient hospital settings to check the extent of acute biliary pancreatitis, including Ranson Criteria, APACHE-II, and BISAP score.[5] However, no scoring

Correspondence: Dr Muhammad Nafe Bin Tahir, Department of Surgery, Pakistan Air Force Hospital Mushaf, Sargodha Pakistan
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system can be used in early phases to detect the extent of disease as they lack sensitivity, have a wide range of sub-parameters, and are time-consuming.[6] Therefore, a consensus among clinicians is needed to devise a simple, efficient, and cost-effective system to improve the mortality and morbidity of this disease.

Platelet-lymphocyte ratio (PLR) is extracted from the blood complete picture, a unique indicator showing inflammatory burden combining analytical values of the patient's platelets and lymphocytic count.[7] A study correlated peripheral lymphocytopenia with the extent of acute biliary pancreatitis.[8] Cho *et al.,* stated 229.1 as the optimal cut-off PLR value with sensitivity and specificity of 70.4% and 52.3%, respectively.[9]

In Pakistan, many hospitals routinely provide platelet and lymphocyte levels in blood complete picture (blood CP). Therefore, it is assumed that PLR is a practical and pragmatic index for assessing the extent of acute biliary pancreatitis at the initial period of diagnosis. It is easier to compute, cost-effective, and calculated from routinely ordered labs.

METHODOLOGY

The cross-sectional validation study was performed at the Surgery Department–PAF Hospital Mushaf Base, Sargodha Pakistan, from January 2023 to December 2023. The sample size was calculated using the "Calculator of Sensitivity and Specificity (CPSP)". Sensitivity and specificity were taken as 70.4% and 52.3%, respectively.[9] The sample methodology used was non-probability consecutive sampling.

Inclusion Criteria: All the people diagnosed with acute pancreatitis have evidence of gallstones on ultrasound abdomen, age 18 to 70 years, reporting within one day of onset of symptoms.

Exclusion Criteria: Encompassed patients diagnosed with chronic diseases such as chronic pancreatitis, diabetes mellitus, cardiovascular diseases, end-stage renal and hepatic diseases, pancreatitis due to other causes, e.g., trauma, ERCP (iatrogenic), hypertriglyceridemia and alcohol**.**[10] Patients on Meropenem and Imipenem, as these antibiotics are known to affect leukocyte counts and pregnancy. Patients who refused participation in this study were also excluded.

After PAF Hospital Mushaf Base Sargodha Ethics and Research Committee approved the study, patients were selected from the Emergency Department of PAF Hospital Mushaf Base Sargodha according to inclusion criteria. After complete history and examination, laboratory investigations were ordered upon admission, i.e., CBC, liver function tests (LFT), serum amylase, serum lipase, and ultrasound abdomen to confirm cholelithiasis. All labs and radiology were sent to the Pathology and Radiology Departments. Patients with levels of serum amylase or lipase (or both) greater than thrice the normal value and ultrasonographic proof of gallstones were reviewed by a surgical specialist to confirm the diagnosis of acute biliary pancreatitis. Patients were informed about their diagnosis and participation in research, for which written informed consent was obtained. Seventy-two hours after admission, all patients underwent a CT scan for severity index. A consultant radiologist performed a CT scan at PAF Hospital Mushaf Base Sargodha, where the severity of the scan was reported.

Data was compiled on a proforma during admission, which was subsequently transferred to statistical packages for social science version 23:00 for statistical analysis. Qualitative variables like gender and Computed Tomography Severity Index (CTSI) were measured by frequency or percentage. Quantitative variables like age, amylase, lipase, and PLR were presented as mean±SD. Sensitivity, specificity, PPV, and NPV were calculated using 2x2 table. Receiver Operating Characteristic Curve (ROC) and likelihood ratios were computed. The *p*-value of ≤0.05 was marked significant.

RESULTS

Out of 225 patients, 139(61.78%) were males, 86(38.22%) were females, and the male-to-female ratio was 1.6:1. Patients' age ranged from 18 to 70 years, with a mean of 48.32±10.61. The bulk of patients, 133(59.11%), were between 46 and 70 years.

Table: Diagnostic Accuracy of Platelet-Lymphocyte Ratio (PLR) in Forecasting Severity of Acute Biliary Pancreatitis during Early Diagnostic Phase Taking Computed Tomography Severity Index (CTSI) as Gold Standard (n=225)

Platelet-Lymphocyte Ratio (PLR)	Computed Tomography Severity INDEX (CTSI)	
	Positive	Negative
Positive	83 True Positive	16 False Positive
Negative	10 False Negative	116 True Negative

The mean PLR was 267.22±23.36. PLR supported the diagnosis of severe acute pancreatitis in 99(44.0%) patients. CTSI findings confirmed severe acute pancreatitis in 93(41.33%) cases. In PLR-positive subjects, 83 were TP, and 16 were FP. Out of 126 PLR-

negative patients, 10 were FN, and 116 were TN, as depicted in Table. Overall sensitivity, specificity, PPV, NPV, and diagnostic precision of PLR for prophesying severity of acute pancreatitis during the initial diagnostic phase, taking CTSI as the gold standard, were 89.25%, 87.88%, 83.84%, 92.06%, and 88.44%, respectively. The likelihood ratio of positive and negative test results is 7.36 and 0.122, respectively. The ROC curve is shown in Figure.
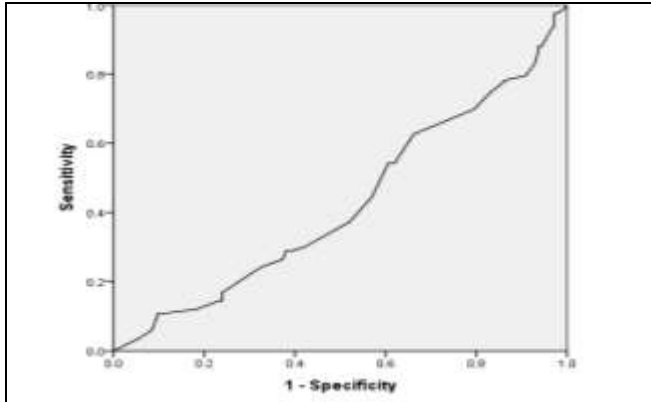

Figure: ROC curve (n=225)

DISCUSSION

PLR can be acquired from the complete blood picture, showing systemic inflammatory response and pool projecting standards for patients' thrombocyte and lymphocytic count.[11,12] PLR is entertained as an indicator of inflammation, and platelets are prominent troupers in defense against microbes, stimulating inflammation followed by tissue repair.[13,14] Many researchers have laid importance on hematological constituents, like NLR and PLR, to calculate the extent and prognosis of inflammation, diseases of the cardiovascular system, and states of neoplasia.[15] Heightened PLR ratio is highly concomitant with inflammatory states and modest prognosis in severe acute biliary pancreatitis.[16]

This study has been conducted to establish the diagnostic precision of PLR in prophesying the extent of acute biliary pancreatitis during the early diagnostic phase, with the CTSI as the gold standard. PLR supported the diagnosis of severe acute biliary pancreatitis in 99(44.0%) patients. CTSI findings confirmed severe acute pancreatitis in 93(41.33%) cases. In PLR-positive patients, 83 were TP, and 16 were FP. Among 126 PLR-negative patients, 10 were FN, whereas 116 were TN (p=0.0001). Total sensitivity was 89.25%, specificity was 87.88%, PPV was 83.84%, NPV was 92.06%, and diagnostic accuracy in terms of

PLR for estimating the extent of acute biliary pancreatitis through the initial diagnostic stage was 88.44%. A study correlated peripheral lymphocytopenia with the severity of acute pancreatitis.[17] One study stated 229.1 as the optimal cut-off PLR value with sensitivity and specificity to be 70.4% and 52.3%, respectively.[18]

PLR is an innovative inflammatory indicator that can predict different ailment progressions. Demir *et al.*, studied the connotation of boosted PLR and mortality among people with acute pulmonary edema of cardiogenic origin. His study showed that the increased PLR group holds more excellent mortality ratios.[19] Assorted findings indicated PLR to foresee outcomes in people with varied inflammatory, ischemic, and oncologic conditions. Platelets are imperative in hemostasis and immune-inflammatory response within the inflammation process.[20] Lymphocytes stay convoluted in adaptive immunological responses.[21] Another study showed a significant change in the evaluation of severity in acute biliary pancreatitis by 48 hours, with a cut-off value equal to or greater than 187.[22] Sensitivity was 73%, specificity was 66%, and accuracy was 70%.[22] Zhou *et al.*,[23] substantiated a cut-off value equal to or greater than 169.2. PLR predicts the sequelae in acute biliary pancreatitis. It is acquirable and cheap, and it can be expended with restricted resourcefulness. Determining PLR at the time of admission can intensify management.[24,25]

CONCLUSION

This study concluded that the diagnostic accuracy of Platelet to Lymphocyte Ratio in predicting the extent of acute biliary pancreatitis through the initial diagnostic stage is reasonably high, which has dramatically improved the ability to correct detection of the severity of acute biliary pancreatitis. It has also enhanced patient care by guiding proper management of patients. Therefore, it is acclaimed that Platelet-Lymphocyte Ratio (PLR) for severity in acute pancreatitis should be used routinely to accurately detect the severity of acute pancreatitis, which will result in appropriate provision for these patients to decrease morbidity and mortality.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MNBT & RA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

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