Original Research Article

Role of platelet to lymphocyte ratio in assessing prognosis in acute pancreatitis

Challapalli Srikanth Reddy, Keerthinmayee Karimaddela*, Peddavenkatagari Theja, Gandikota Venkata Prakash, Pustela Mahesh Kumar

Department of General Surgery, Sri Venkateswara Medical College, Tirupati, Andhra Pradesh, India

*Correspondence:
Dr. Keerthinmayee Karimaddela,
E-mail: doctorkeerthi.k@gmail.com

ABSTRACT

Background: Acute pancreatitis is a common condition associated with morbidity and mortality. The incidence of acute pancreatitis (AP) has been increasing worldwide. Recent advances in diagnostic and therapeutic management in acute pancreatitis (AP) remarkably decreased the mortality rate. Assessing severity of acute pancreatitis at an early stage will further decrease the mortality rate and will help to initiate appropriate treatment as early as possible to prevent mortality. Many clinical, laboratory, and radiological factors and scoring systems are used to predict severity and prognosis of AP, but none is ideal. In low resource setting, costly laboratory tests are not readily available. Platelet to lymphocyte ratio (PLR) is an easily derivable, cost effective and applicable blood test. Platelet to lymphocyte ratio (PLR) is a relatively novel inflammatory marker and can predict severity in various diseases. In this study, we evaluated the value of PLR as prognostic factor in acute pancreatitis (AP).
Methods: This prospective study was conducted on 256 patients admitted to S.V.R.R.G.G. Hospital, with the diagnosis of acute pancreatitis, from April 2017 to September 2018. Patients with Acute Pancreatitis were divided into tertiles based on the values of PLR at admission, a PLR of less than 150 as 1st tertile, a PLR of 150-300 as 2nd tertile and a PLR of more than 300 as 3rd tertile. The outcomes assessed were intensive care unit (ICU) admission, length of stay (LOS) in the hospital and death.
Results: According to PLR tertiles, patients in the 3rd tertile (PLR>300) had significantly more ICU admissions, 59 (71%) and longer average Length of Hospital Stay (LOS) of survivors,18+/-5 days and higher mortality, 24 (28.9%), compared with those in the 1st tertile (PLR<150).
Conclusions: PLR is an easily derivable, cost effective prognostic factor which can predict the outcome of acute pancreatitis. In this study, we established that high PLR value is associated with very bad prognosis and poor outcome or death in Acute pancreatitis.

Keywords: Acute pancreatitis, Platelet to lymphocyte ratio, Prognosis

INTRODUCTION

Acute Pancreatitis (AP) is defined as an acute condition presenting with abdominal pain, a threefold or greater rise in the serum levels of the pancreatic enzymes amylase or lipase, and/or characteristic findings of pancreatic inflammation on contrast enhanced CT.[1] It is an inflammatory process in which local pancreatic injury leads to systemic inflammation through activation of cytokine cascades.[2] The clinical extent of acute pancreatiits varies widely from no symptoms to systemic inflammatory response syndrome (SIRS), persistent organ failure (POF), and death.[3] The clinical signs of acute pancreatitis may be nonspecific and they exhibit a low sensitivity (40%) for the prediction of an adverse outcome.[4] Various severity scoring systems has been

designed to assess the severity and predict prognosis. The Ranson score, the Acute Physiologic Assessment and Chronic Health Evaluation II (APACHE II) score, the Bedside Index for Severity in Acute Pancreatitis (BISAP) score, and the Glasgow-Imrie criteria are currently in wide use.[5] These scoring systems are time consuming and use many variables which are difficult to obtain in low resource settings. Inflammatory markers such as C-reactive protein (CRP), procalcitonin, interleukin-6, and interleukin-8 have been shown to predict early diagnosis of Systemic Inflammatory response syndrome (SIRS), but they are expensive and not readily available.[6]

Platelet to lymphocyte ratio (PLR) which can be derived from the complete blood count, is a novel index reflecting a systemic inflammatory burden that combines prognostic values of an individual's platelet and lymphocyte count.[7] PLR has been shown to be an inflammatory marker and platelets are shown to be as active players in antimicrobial host defense and the induction of inflammation and tissue repair.[8-10] Many research groups have studied the value of hematological components, such as the neutrophil to lymphocyte ratio (NLR) and the platelet to lymphocyte ratio (PLR), in predicting disease severity and outcomes across a variety of diseases, including inflammation, cardiovascular disease, and neoplastic states.[2] Increased NLR and PLR ratios have been associated with inflammatory conditions, and poor outcomes in severe AP.[2] Although a few studies have considered NLR and its prognostic value in AP, there are no studies that have examined the prognostic value of PLR alone in AP.[4] As PLR is easily derivable value, in the present study we evaluated the PLR value as a prognostic factor for the outcome of Acute pancreatitis.

METHODS

This prospective study included patients presenting with acute pancreatitis in department of general surgery, S.V.R.R. Govt. General Hospital, Tirupati between April 2017 to September 2018. This study explored the value of PLR as a predictor of defined adverse outcomes among patients participating in the study.

The study inclusion criteria required the clinical diagnosis of acute pancreatitis with an elevated serum amylase and lipase and/or positive CT scan findings of acute pancreatitis.

The exclusion criteria included any of the following: age greater than 80 years, patients with hematological disorders, diagnosis of cancers, patients under chemotherapy and patients not willing to participate in the study.

During the study period, a total of 368 patients were diagnosed with acute pancreatitis, of whom 112 were excluded due to the above factors and the rest of the 256 patients were included in the study. Patients were stratified into tertile models according to Platelet to lymphocyte ratio at admission, a PLR of less than 150 as 1st tertile, a PLR of 150-300 as 2nd tertile and a PLR of more than 300 as 3rd tertile.

The primary outcomes studied during this study were, the length of stay (LOS), the need for admission to the ICU and mortality. The primary objective was to determine the value of admission PLR as a predictor of adverse outcomes of acute pancreatitis, at the time of presentation of the patient to the hospital. The study protocol was approved by our institutional ethical committee.

Statistical analysis

The distributions of continuous variables were presented as means and standard deviations; the distributions of categorical variables were presented as frequencies and percentages. All analyses were carried out using SPSS software.

RESULTS

The study was conducted on 256 patients, who met with all the inclusion criteria and were devoid of exclusion criteria and were stratified into tertiles according to the PLR value at admission.

Table 1: Incidence in tertile models of PLR.

PLR	PLR<150	150≤PLR<300	PLR≥300
Number of patients (N=256)	85 (33.2%)	88 (34.4%)	83 (32.4%)

As shown in Table 1, 85(33.2%) patients had a PLR of less than or equal to 150 (1st tertile), 88 (34.4%) patients had a PLR between 150-300 (2nd tertile) and 83 (32.4%) patients had a PLR greater than or equal to 300 (3rd tertile). According to the above Table 1, the incidence among the three groups was identical, with no statistical difference.

Table 2: Study population characteristics, in relation to tertile models of PLR.

PLR	PLR<150 N=85	150≤PLR<300 N=88	PLR≥300 N=83
Age (yrs)	46.2±10.2	48.6±13.5	49.9±14.6
Male (Sex)	49(57.6)	50(56.8)	51(61.4)

As shown in Table 2, the mean of the age group in the 1st tertile was 46.2, which was lesser than the mean age of 2nd tertile, which was 48.6 and the mean age group of the 3rd tertile was higher when compared to the other two tertile of the group. Greater PLR value was associated with a higher age group of the patients.

As shown in Table 3, the risk factors of alcohol abuse, smoking and diabetes mellitus had a greater incidence in

the patients presenting with the 2nd tertile value of PLR, showing an incidence of 80.6%, 65% and 30% respectively. Whereas, hypertension was more prevalent in the 3rd tertile, with an incidence of 44.5%.

Table 3: Risk factors, in relation to tertile models of PLR.

PLR	PLR<150, N=85	150≤PLR<300, N=88	PLR≥300, N=83
Alcohol abuse	60(70.5%)	71(80.6%)	69(83.1%)
Smoking	52(61.1%)	65(73.8%)	59(71%)
Hypertension	29(34%)	35(39.7%)	37(44.5%)
Diabetes	24(28.2%)	30(34%)	28(33.7%)

Table 4: Outcome in tertile models of PLR.

PLR	PLR<150, N=85	150≤PLR<300, N=88	PLR≥300, N=83	p value
Length of hospital stay in survivors (days)	5±2	11±3	18±5	0.04
ICU admission	06(7.0)	26(29.5)	59(71)	0.02
Mortality	1(1.1%)	8(9.1%)	24(28.9%)	0.02

As shown in Table 4, the mean length of the hospital stay was found to be 5 days in first tertile, 11 days in the second tertile and 18 days in the third tertile, suggesting a more longer stay in the third tertile group, which was statistically significant. The necessity of ICU admission was found in six patients(7% of patients) in the first tertile, in 26 patients (29.5% of patients) in the second tertile and in 59 patients (71% of patients) in the third tertile, suggesting a greater incidence of ICU admissions in the third tertile, i.e. 71% of the total patients in the third tertile, when compared to the other two groups. The mortality rate was found to be 1.1% (1 patient) in the first tertile, 9.1% (8 patients) in the second tertile and 28.9% (24 patients) in the third tertile, suggesting a great incidence of mortality in the third tertile, i.e. 28.9% of the total patients in the third tertile, when compared to the other two groups.

Statistically, higher PLR was associated with significant change in the outcomes, that is greater length of hospital stay, greater requirement of ICU admission and increased incidence of mortality.

DISCUSSION

In the present study, we evaluated the prognostic significance of PLR in acute pancreatitis. We found that elevated PLR values were associated with increased frequency of ICU admissions, increased duration of hospital stay in survivors and a higher mortality. Therefore, higher PLR values are associated with poor prognosis in acute pancreatitis. In this study, we were able to establish PLR as an independent prognostic factor in acute pancreatitis (AP).

Acute pancreatitis (AP) is an inflammation of the pancreas caused by various stimuli including excessive alcohol consumption, gallstone disease and certain viral infections. Managing specifically the severe form of AP is limited due to lack of an understanding of the complex immune events that occur during AP involving immune cells and inflammatory molecules.[11] Activation and modulation of neutrophils and platelets play a core role in establishing host defences in settings of systemic inflammation.[2]

Platelet to lymphocyte ratio (PLR) is a relatively novel inflammatory marker that can be utilized for prognosis in various disease processes. Demir et al, investigated the association between high PLR and mortality in patients with acute cardiogenic pulmonary edema and found out that high PLR group had significantly higher mortality rate than other groups.[12] Various studies have shown PLR to predict the prognosis in patients with various inflammatory, ischaemic and oncological disorders.[13]

Many research groups have studied the value of hematological components, such as the neutrophil to lymphocyte ratio (NLR) and the platelet to lymphocyte ratio (PLR), in predicting disease severity and outcomes across a variety of diseases, including inflammation, cardiovascular disease, and neoplastic states.[2]

Cho SK et al, investigated the relationship between NLR and PLR in the outcome in patients with Acute pancreatitis. Azab et al, found that NLR was a better predictor of ICU admission or prolonged hospitalization in AP than was total WBC count and suggested a cutoff value of <4.7 as a predictor of a poor outcome.

To date, there are no previous studies which investigated the predictive value of PLR at the time of admission on outcomes in patients with AP. We investigated the role of PLR as a prognostic factor in outcome of acute pancreatitis. This Study was able to establish PLR, to be an independent prognostic factor, in acute pancreatitis.

The limitations of this study were smaller size of the number of patients and assessment of a single value, at the time of admission.

CONCLUSION

In conclusion, PLR is a significant predictor of outcome in Acute pancreatitis. It is easily derivable and cost effective. It can be used in a limited resource setting. By knowing PLR value at the time of admission and knowing the possible outcome, the management can be more focused. Patient attendants can be counselled appropriately. Further research and studies including large number of patients needs to be carried out to further prove the efficacy of PLR as a prognostic factor in acute pancreatitis.

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