

DIAGNOSTIC SIGNIFICANCE OF PLATELET – TO – LYMPHOCYTE RATIO IN EVALUATION OF SEPSIS

¹Shahzad Ali Jiskani, Ghulam Abbas Soomro, ²Dolat Singh

¹Department of Pathology, Indus Medical College, Tando Muhammad Khan

²Department of Medicine, Indus Medical College, Tando Muhammad Khan

Corresponding Author:

Shahzad Ali Jiskani

Department of Pathology,
Indus Medical College Tando Muhammad
Khan

Co-Authors:

Ghulam Abbas Soomro

MBBS, M. Phil (Microbiology)
Senior Lecturer, Department of Pathology
Indus Medical College Tando Muhammad
Khan

Dolat Singh

MBBS, MD (Medicine)
Assist. Professor, Department of Medicine
Indus Medical College Tando Muhammad
Khan

Corresponding author email:

shahzadbaloach289@gmail.com

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Methodology: It was prospective cross sectional study performed on 415 patients. They were divided into patient/Group A (205), and healthy control/Group B (210). Patients above age of 18, admission time more than 24 hours and no co – morbid were included in the study. Demographic information was obtained from all patients. Blood sample was collected in EDTA tube and platelet count and lymphocyte were measured for PLR ratio. Data was analyzed using SPSS 21.0. P – value of <0.05 was considered as statistically significant.

Results: Out of 415 patients, 143 (69.75%) were male and 62 (30.25%) were female in Group A; while in Group B, male and female were 136 (64.76%) and 74 (35.23%). Platelet – to –

Abstract

Introduction: Sepsis is one the major cause of mortality and mortality in hospital settings. Many inflammatory markers have been proposed but their use is often limited due to unavailability and cost. Platelet – to – lymphocyte ratio (PLR) is now suggested as novel inflammatory marker in many conditions.

Objective: To see the role of platelet – to – lymphocyte ratio (PLR) as an indicator of inflammation in patients with sepsis.

lymphocyte ratio (PLR) in group A was 117.24 ± 38.43 and in group B was 82.76 ± 41.88 , with the p – value of <0.01.

Conclusion: PLR was higher in septic patients as compared to control group. It is suggested as novel marker of inflammatory response to sepsis.

Keywords: Platelet, Lymphocyte, Platelet – to – Lymphocyte Ratio, Sepsis, Inflammation, Infection.

INTRODUCTION: Sepsis is common and major cause of mortality and morbidity globally. It results from dysregulation of infection – induced systemic inflammatory response. A

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complex expression of systemic inflammatory and non – inflammatory response take part in pathophysiological process of sepsis. (1,2) Various biochemical and haematological tests are being performed in evaluation of infection/inflammation. Recently new ratios e.g. neutrophil – lymphocyte ratio (NLR), lymphocyte – monocyte ratio (LMR), platelet – lymphocyte ratio (PLR) and mean platelet volume (MPV), are being used for evaluation of infection/inflammation. These parameters can be used as prognostic factors in various diseases. (3–5) Platelets are first and basic supply for various inflammatory mediators. Continuous inflammation processes lead to increase production of platelets through megakaryocytic proliferation and finally presents with relative thrombocytosis. High number of platelets is associated with vascular events which play important role in inflammatory process. (6) Determination of platelet – to – lymphocyte ratio (PLR) suggests activation of platelets and clotting system, inflammation of local vessel wall and dysfunction of endothelium. (7,8)

Various inflammatory markers e.g. IL-6, CRP are useful in determination of prognosis of the disease but are expensive and have limited accessibility. (9) Therefore we used inexpensive and easy parameter platelet – to – lymphocyte ratio to correlate with the sepsis.

This study aims to see the diagnostic significance of platelet – to – lymphocyte ratio (PLR) in patients with sepsis.

METHODOLOGY: This was an cross – sectional prospective study performed at Department of Pathology, Indus Medical College Hospital Tando Muhammad Khan between the January 2018 to May 2018. A total of 205 patients (Group A) and 210 healthy control (Group B) were included in the study. Inclusion criteria for Group A were: 1) Age >18 and <65 years 2) Have spent >24 hours at hospital 3) Patients with no co-morbid 4) Hypertensive and diabetic patients. Exclusion criteria for Group A were: 1) Age <18 and >65 years 2) Patients with admission time <24 hours 3) Patients with co-morbid 4) Patients

on anti-coagulant or thrombolytic therapy. Demographic characteristics were collected from all patients and control group.

Blood sample of 3mL was collected through venous access from all patients and control group in tube containing EDTA using aseptic measures. Blood samples were transported to Pathology Laboratory and blood counts were evaluated using Automated Hematology Analyzer Mindray BC-5000. Platelet – to – lymphocyte ratio (PLR) was measured using absolute platelet count and absolute lymphocyte count.

All data was analyzed using SPSS version 21.0. Chi – square test was used to see the correlation of platelet to lymphocyte ratio between septic and non – septic patients. P – value of <0.05 was considered as statistically significant.

RESULTS: Out of total 415 patients, males were 143 (69.75%) and 136 (64.76%) in Group A and B respectively (Figure 1). While females were 62 (30.25%) and 74 (35.23%) in Group A and B respectively. There was no significant change in age ranges of both groups. Mean age of patients in Group A was 30.22 ± 6.53 years and 33.54 ± 8.53 years in Group B. Mean BMI in Group A was 25.43 ± 3.21 kg/m² and in Group B was 26.71 ± 4.91 kg/m². All these parameters showed no statistically significant difference as p – value was >0.05. Mean platelet count was different in both groups. In Group A, it was 305.26 ± 42 x10⁹/L and in Group B was 185.52 ± 55 x10⁹/L, with statistically significant difference as p – value was <0.001. Mean lymphocyte count in Group A was 3.01 ± 3.53 x10⁹/L and in Group B was 2.13 x10⁹/L, with p – value of <0.03 and hence statistically significant. Platelet – to – lymphocyte ratio (PLR) in Group A was 117.24 ± 38.43 and in Group B was 82.76 ± 41.88 with p – value of <0.01 (Figure 2 & 3) (Table 1).

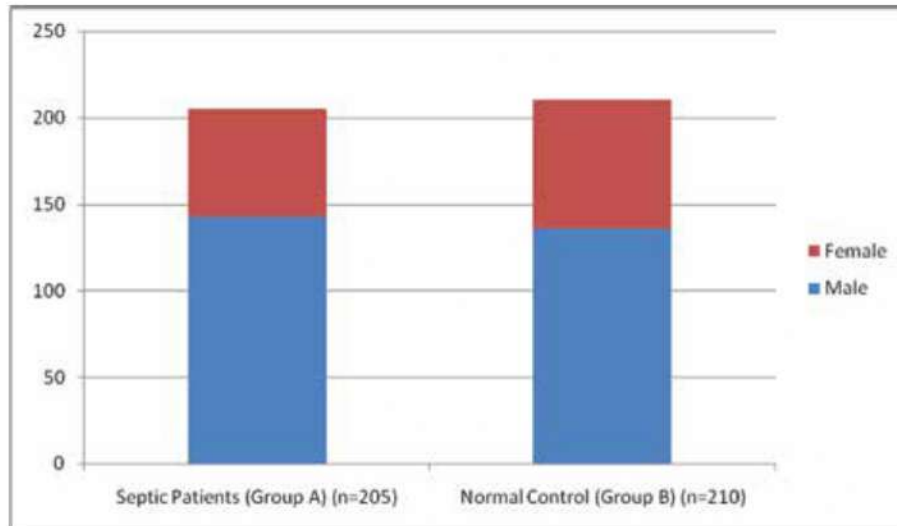


Figure 1: Male to Female Distribution (n=415)

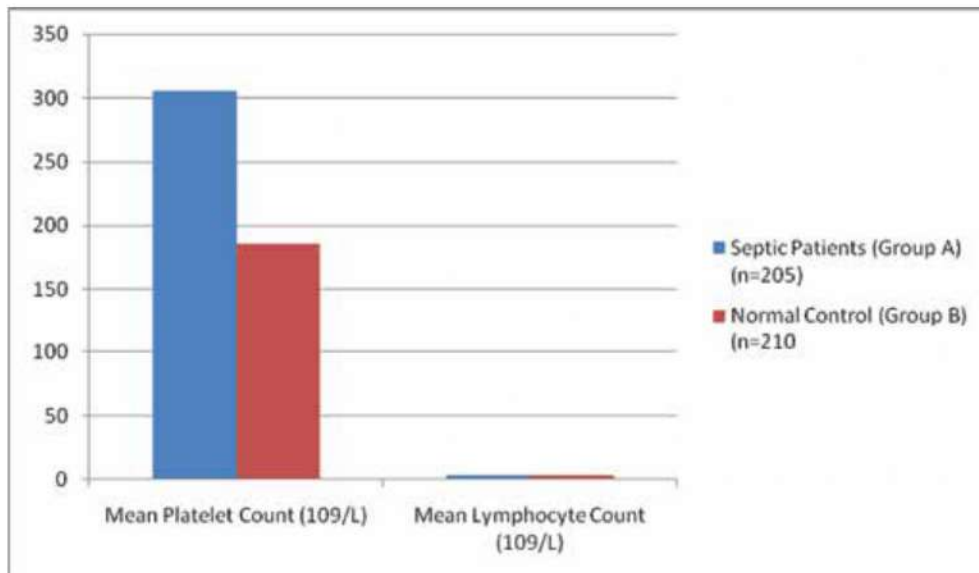


Figure 2: Mean Platelet Count and Mean Lymphocyte Count (n=415)

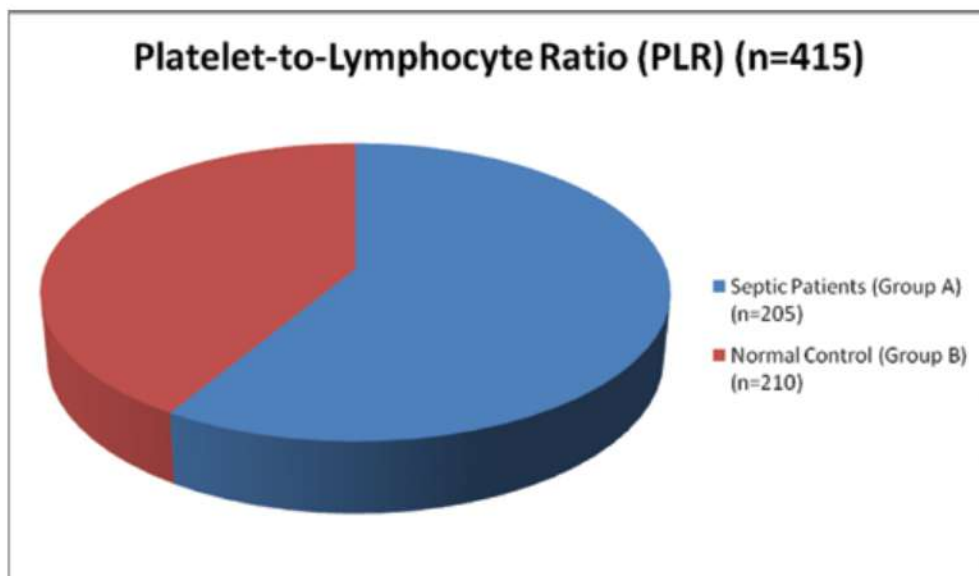


Figure 3: Platelet-to-Lymphocyte Ratio (PLR) (n=415)

Table 1: Demographic and Laboratory Data (n=415)

	Septic Patients (Group A) (n=205)	Control Group (Group B) (n=210)	P – value
Male (No/%)	143 (69.75%)	136 (64.76%)	0.8
Female (No/%)	62 (30.25%)	74 (35.23%)	1.02
Mean age (years)	30.22 ± 6.53	33.54 ± 8.53	0.07
Mean BMI (kg/m ²)	25.43 ± 3.21	26.71 ± 4.91	0.9
Mean platelet count (10 ⁹ /L)	305.26 ± 42	185.52 ± 55	<0.001
Mean lymphocyte count (10 ⁹ /L)	3.01 ± 3.53	2.13 ± 5.42	<0.03
Platelet – to – lymphocyte ratio (PLR)	117.24 ± 38.43	82.76 ± 41.88	<0.01

DISCUSSION: This was first kind of study performed in this area on septic patients. Sepsis is major is one the major reason for mortality and morbidity which results from dysregulation of inflammatory response of the system to the infection. It was recently introduced that dysregulation of immune system specially cellular immunity, including anti – inflammatory or pro-inflammatory responses during various stages. Platelets play crucial part in both inflammatory and immunomodulatory process, by induction of cytokine release and interacts with various types of bacteria and cells related to immunity. Platelet to lymphocyte ratio (PLR) is newly suggested as systemic inflammatory marker.(1,10–12) But still only few studies have been published to rectify this statement in septic patients. Though its significance have been shown in other diseases. Same kind of study was performed by Shen et al in patients with sepsis, which showed that patients with sepsis were associated with high PLR as compared to control group, and was also associated with high mortality. (1)Ye et al showed in his study on patients with acute heart failure that higher PLR was associated with poor clinical outcomes. (13) Kahramanca et al performed study on patients with acute appendicitis to see its positive and negative predictive values. He proved that high PLR was associated with patients with acute appendicitis due to inflammatory response. (14)Reda et al suggested in his study that PLR was a strong marker for predicting the severity of coronary atherosclerosis. (6) In another study by Augene et al, it was shown that the mortality

rate was high in patients with elevated PLR value. (15) Another study by Solmaz was performed to see significance of PLR in multiple myeloma. He observed that thrombocytopenia and decreased PLR were associated with poor survival in patients with multiple myeloma and it can be used as cost – effective prognostic marker. (16) Although another study by Prabawa et al showed the strong positive correlation between staging of cervical cancer and PLR. Advanced stage showed high PLR as compared to early stage disease. (17) Another analysis was done to evaluate the significance of PLR in children with acute stage of immunoglobulin A vasculitis and its assessment of stability for prediction of course of the disease. It clearly showed the association of high PLR in all IgAV children by systemic involvement. (9) Alagbe et al showed in his study that patients with sickle cell anemia at both steady state and vaso – occlusive crisis are associated with high PLR due to inflammatory process. (18)

In this study, platelet – to – lymphocyte ration was higher in septic patients as compared to non – septic group, suggestive of inflammatory response to increased stress of infection. It is suggested that dysregulation of immune system, specially cellular immunity, including anti – inflammatory or pro – inflammatory response occur in sepsis. Platelets play essential role in both inflammatory and immunomodulatory process, by the induction of cytokine release and interacting with various types of immune cells and bacteria. (19,20)

Immune cells such as neutrophils, lymphocytes, NK cells and macrophages etc, contribute to the exacerbation of inflammatory process. Based on this situation, PLR is suggested as novel systemic indicator of inflammation, and its use was basically seen in malignant disorders. Later it was also found to be the part of inflammatory response. (21)

CONCLUSION: Platelet – to – lymphocyte ratio was significantly associated with patients with sepsis. PLR can be considered as preliminary and cost – effective indicator in patients with sepsis.

References

1. Shen Y, Huang X, Zhang W. Platelet-to-lymphocyte ratio as a prognostic predictor of mortality for sepsis: interaction effect with disease severity — a retrospective study. *BMJ Open*. 2019;9:e022896.
2. Turcato G, Sanchis-Gomar F, Cervellin G, Zorzi E, Sivero V, Salvagno GL, et al. Evaluation of Neutrophil - Lymphocyte and Platelet - Lymphocyte Ratios as Predictors of 30 - Day Mortality in Patients Hospitalized for an Episode of Acute Decompensated Heart Failure. *J Med Biochem*. 2019;38(4):452–60.
3. Lee JS, Kim NY, Na SH, Youn YH, Shin CS. Reference values of neutrophil-lymphocyte ratio, lymphocyte-monocyte ratio, platelet-lymphocyte ratio, and mean platelet volume in healthy adults in South Korea. *Medicine (Baltimore)*. 2018;97:1–5.
4. Valga F, Monzón T, Henriquez F, Antón-pérez G. Neutrophil-to-lymphocyte and platelet-to-lymphocyte ratios as biological markers of interest in kidney disease. *Nefrologia*. 2019;9(3):243–9.
5. Zhu S, Yang J, Cui X, Zhao Y, Tao Z, Fan X, et al. Preoperative platelet-to- lymphocyte ratio and neutrophil- to-lymphocyte ratio as predictors of clinical outcome in patients with gallbladder cancer. *Sci Rep*. 2019;9:1–9.
6. Reda AA, Moharram MA, Elghareeb A. Platelet to lymphocyte ratio as a predictor of severity of coronary artery disease. *Menoufia Medi cal J*. 2019;32(1):167–71.
7. Mistry HA, Parmar DM. Study of Neutrophil to Lymphocyte Ratio and Platelet to Lymphocyte Ratio in Hypertensives and Normotensives. *Int J Clin Exp Physiol*. 2018;5(4):196–9.
8. Zhang W, Shen Y. Platelet-to-Lymphocyte Ratio as a New Predictive Index of Neurological Outcomes in Patients with Acute Intracranial Hemorrhage: A Retrospective Study. *Med Sci Monit*. 2018;24:4413–20.
9. Jaszczura M. Analysis of neutrophil to lymphocyte ratio, platelet to lymphocyte ratio and mean platelet volume to platelet count ratio in children with acute stage of immunoglobulin A vasculitis and assessment of their suitability for predicting the course of the disease. *Rheumatol Int*. 2019;39(5):869–78.
10. Lalosevic MS, Markovic AP, Stankovic S, Stojkovic M, Dimitrijevic I, Vujacic IR, et al. Combined Diagnostic Efficacy of Neutrophil-to-Lymphocyte Ratio (NLR), Platelet-to-Lymphocyte Ratio (PLR), and Mean Platelet Volume (MPV) as Biomarkers of Systemic Inflammation in the Diagnosis of Colorectal Cancer. *Dis Markers*. 2019;1–8.
11. Mathews S, Rajan A, Soans ST. Prognostic value of rise in neutrophil to lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) in predicting the mortality in paediatric intensive care. *Int J Contemp Pediatr*. 2019;6(3):1052–8.
12. Atak B, Aktas G, Duman TT, Erkus E, Kocak MZ, Savli H. Diabetes control could through platelet-to-lymphocyte ratio in hemograms. *Rev Assoc Bras*.

- 2019;65(1):38–42.
13. Ye G, Chen Q, Chen X, Liu Y, Yin T, Meng Q. The prognostic role of platelet-to-lymphocyte ratio in patients with acute heart failure : A cohort study. *Sci Rep.* 2019;9:1–8.
 14. Kahramanca S, Ozgehan G, Kaya O, Gokce IE, Kucukpinar TH, Kargici H, et al. Platelet to Lymphocyte Ratio and Acute Appendicitis. *Kalkas J Med Sci.* 2017;7(2):153–7.
 15. Aug E, Id FL, Chikande J, Guidi L, Ballaith A, Bossert J, et al. Platelet to lymphocyte ratio as a predictive factor of 30-day mortality in patients with acute mesenteric ischemia. *PLoS One.* 2019;14(7):1–10.
 16. Solmaz S, Uzun O, Acar C, Sevindik OG, Piskin O, Ozsan HG, et al. Is the Platelet - to - Lymphocyte Ratio a New Prognostic Marker in Multiple Myeloma? *J Lab Physicians.* 2018;10:363–9.
 17. Prabawa IPY, Bhargah A, Liwang F, Ayuningtyas D, Tandio AL, Agung A, et al. Pretreatment Neutrophil-to-Lymphocyte ratio (NLR) and Platelet-to-Lymphocyte Ratio (PLR) as a Predictive Value of Hematological Markers in Cervical Cancer. *Asian Pacific J Cancer Prev.* 2019;20:863–8.
 18. Alagbe AE, Olaniyi JA. Pattern of Neutrophil - lymphocyte Ratio and Platelet - lymphocyte Ratio in Sickle Cell Anemia Patients at Steady State and Vaso - occlusive Crisis. *J Appl Hematol.* 2019;10:45–50.
 19. Mcnamara G, Al-mubarak M, Vera-badillo FE, Templeton AJ, Ace O, Oca A, et al. Prognostic Role of Platelet to Lymphocyte Ratio in Solid Tumors : A Systematic Review and Meta-Analysis. *Cancer Epidemiol Biomarkers Prev.* 2014;23(7):1204–13.
 20. Faria SS, César P, Jr F, José M, Silva B, Lima VC, et al. The neutrophil-to-lymphocyte ratio : a narrative review. *ecancer.* 2016;10:1–12.
 21. Al-bairmany YS, Aqabi AS, Al-hasnawi FH, Al-aawad AS. Usefulness of neutrophil-lymphocyte ratio and platelet-lymphocyte ratio as a predictor of disease-free survival in breast cancer : A cross-sectional study. *F1000 Res.* 2019;8:1–12.