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The relationship between platelet-lymphocyte ratio (plr) and mortality of sepsis patients in the intensive care unit of Waled Regional General Hospital in 2020-2023

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ABSTRACT

Background: Sepsis is one of the leading causes of mortality worldwide, especially in patients treated in intensive care units. This condition is characterized by organ dysfunction due to a systemic inflammatory response to infection that can lead to death if not treated promptly. Platelet-Lymphocyte Ratio (PLR) is a simple inflammatory marker that can provide information about sepsis mortality. PLR is calculated by dividing the platelet count by the absolute lymphocyte count. Objective: This study aims to analyze the relationship between PLR and mortality of sepsis patients in the Intensive Care Unit of Waled Regional General Hospital (RSUD Waled) in 2020-2023. Methods: This study used an analytical method with a cross-sectional design. Data were obtained through medical records with a sample size of 65 people and the data collection method was total sampling. Data analysis used the Fisher Exact Test. Results: Most sepsis patients had high PLR values, with 52 patients dying, and sepsis patients with low PLR values, with 10 patients surviving and 3 patients dying. The results of data analysis using the Fisher's Exact test showed a p-value of <0.001. Conclusion: There is a significant relationship between PLR and mortality of sepsis patients in the Intensive Care Unit of Waled Regional Hospital.

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INTRODUCTION

Sepsis is a disruption of organ function due to the body's response to a life-threatening infection (Irvan, Febyan, & Suparto, 2018). Sepsis remains one of the leading causes of admission to the Intensive Care Unit (ICU) (Merry, Hartawan, Aryabiantara, & Dewi, 2021). Sepsis is closely associated with high mortality rates (Hatman, Semedi, & Budiono, 2021). Globally, the incidence of sepsis was recorded at 31.5 million cases, 19.4 million of which were severe sepsis, and 5.3 million were declared dead (AISYAH PUTRI, 2025)(Hasanah, 2019).

The prevalence in the United States is approximately 750,000 patients suffering from sepsis each year. In developing countries like Brazil, the incidence of sepsis is 36.3 per 1,000 patients per day, with a mortality rate of 439 (55.7%) per 788 patients. Due to this high mortality rate, sepsis is referred to as the silent killer (Firmansyah, 2022)(Daniels, 2018).

Patients treated in the ICU have a mortality rate of 46%, which increases by 1.5% per year. The latest data from the UK concludes that sepsis is the biggest cause of death (Nasif, Sari, & Astuti, 2026). The incidence of sepsis in Indonesia ranges from 15% to 37.2%, with the mortality rate increasing from 37% to 80%. Data from Waled Regional Hospital shows that 91 sepsis patients were treated in the ICU of Waled Regional Hospital between 2020 and 2023 (Sephia, 2024)(Wibowo & Wijaya, 2024). Early identification and appropriate treatment of sepsis patients has been shown to reduce mortality. (2) One of the identifications used to predict the prognosis of sepsis patients is the SOFA score. In addition to the SOFA score, according to Yanfei Shen et al. in 2019, the Platelet-Lymphocyte Ratio (PLR) can be used to predict the prognosis of sepsis patients (Lubis, Hasby, Putra, Yanni, & Amelia, 2021)(Shen, Huang, & Zhang, 2019).

PLR is a new prognostic marker that can be used to predict inflammation. PLR is used as a marker for other inflammatory conditions such as malignancy and liver and kidney disease, which are associated with high mortality rates (Nilasari & Iskandar, 2021). Therefore, PLR is considered as a prognostic marker of mortality in sepsis patients, where multiorgan damage has occurred (Miharja, Lubis, & Solihat, 2024)(Arta, 2021).

The results of a study conducted by Yanfei Shen et al. in 2019 reported that in sepsis patients with a high PLR, it was significantly associated with mortality. Based on the above background, researchers were interested in conducting a study entitled "The Relationship Between Platelet-Lymphocyte Ratio and Mortality of Sepsis Patients in the Intensive Care Unit of Waled Regional Hospital in 2020-2023." The results of the study conducted by Yanfei Shen et al. in 2019 reported that in sepsis patients with a high PLR, it was significantly associated with mortality (NAPITU, nd)(Purwantini et al., 2025).

Although the Platelet-Lymphocyte Ratio (PLR) has been widely studied as an inflammatory marker and mortality predictor in various countries, there is still a research gap in its application to the ICU patient population in Indonesia. Most previous studies were conducted abroad with different patient characteristics and healthcare systems. Therefore, this study is important to fill the knowledge gap regarding the validity of PLR as a mortality predictor in sepsis patients in ICUs of Indonesian hospitals.

RESEARCH METHOD

Scope of Research

The scope of this research is the science of anesthesia and intensive therapy as well as clinical pathology.

Place and Time of Research

The study was conducted at Waled Regional Hospital, observing sepsis patients in the Intensive Care Unit (ICU). Data collected included sepsis patients from 2020 to 2023.

Types and Design of Research

The data used was secondary data obtained from the medical records of patients diagnosed with sepsis between 2020 and 2023. This study was an analytical study with a cross-sectional design, meaning the study was conducted over a single period.

Population and Sample

a. Target Population, the target population used in this study were patients with a diagnosis of sepsis who were treated in the Intensive Care Unit (ICU) of Waled Regional Hospital.

b. Exclusion Criteria, the accessible population used in this study were patients with a diagnosis of sepsis who were treated in the Intensive Care Unit (ICU) of Waled Regional Hospital in 2020-2023.

Research Sample

a. Inclusion Criteria, patients diagnosed with sepsis treated in the ICU at Waled Regional Hospital between 2020 and 2023. Aged 18-60 years. Complete blood count data including lymphocytes and platelets are available.
b. Exclusion Criteria, sepsis patients who experience platelet disorders such as Idiopathic Thrombocytopenic Purpura (ITP).

Data Collection Method

Sampling in this study used total sampling, namely a sampling method where the size is equal to the number of accessible populations.

Research Instruments

The instruments used in this study were medical record data and complete blood test results.

Research Procedures

Determination of research objectives and titles. Consult with your supervisor regarding the title, research variables, and research methods. Prepare research instruments. Look afterpermit letter and coordinate with the head of the relevant agency. Determine the activity schedule.

Data analysis

Data analysis was carried out in two stages, namely univariate and bivariate analysis: a) Univariate Analysis was used to describe the frequency distribution of the independent variable, namely the platelet-lymphocyte ratio (PLR), and the dependent variable, namely the mortality of sepsis patients; b) Bivariate Analysis was used to examine the possible relationship between the independent variable, the platelet-lymphocyte ratio (PLR), and the dependent variable, sepsis patient mortality. Data were tested using the Fisher Exact Test.

Research Ethics

This research received ethical clearance from the Research Ethics Committee (KEPK) of Waled Regional Hospital on May 21, 2024, with the number 000.9.2/064/KEPK/V/2024. The research was then conducted with the guarantee of confidentiality of respondent data during data collection and research results.

RESULTS AND DISCUSSIONS

This study was conducted in the ICU of Waled Regional Hospital, Cirebon Regency, using secondary data collection. The study was conducted in July 2024 at Waled Regional Hospital, and samples were obtained through secondary data in the form of medical records. This study used total sampling, resulting in a sample of 65 patients who met the inclusion and exclusion criteria. The obtained samples were then analyzed as follows.

Univariate Analysis

Univariate analysis was used to see the frequency and percentage distribution of the research variables as follows:

Table 1. Respondent characteristics

Variables	Frequency	Percentage
Age:		
18-20 years old	3	4.6%
21-30 years old	3	4.6%

Variables	Frequency	Percentage
31-40 years	13	20%
41-50 years	13	20%
51-60 years	33	50.8%
Gender:		
Man	16	24.6%
Woman	49	75.4%

Based on table 1, it shows that the most sepsis patients were in the 51-60 year age group, totaling 33 people (50.8%) and based on gender, the most sepsis patients were in the female group, totaling 49 people (75.4%).

Table 2. Distribution of PLR frequency at Waled Regional Hospital 2020-2023

Variables	Frequency	Percentage
PLR(Platelet-Lymphocyte Ratio)		
Low (≤150)	13	20%
High (>150)	52	80%
Total	65	100%

Based on table 2, it can be seen that most of the sepsis patients in this study had high PLR values, namely 52 people or 80%.

Table 3. Distribution of mortality frequency at Waled Regional Hospital 2020-2023

Variables	Frequency	Percentage
Mortality		
Life	10	15.4%
Die	55	84.6%
Total	65	100%

Based on table 3 above, it shows that of the 65 sepsis patients, the majority experienced mortality, with 55 patients dying (84.6%) and 10 other patients surviving (15.4%).

Bivariate Analysis

Table 4. The relationship between PLR and mortality of sepsis patients

PLR		Mortality		Total	*P Value*	RP	CI 95%	
		Life	Die				Min	Max
Low (≤150)	N	10	3	13				
	%	12.3	4.6	16.9	< 0.001	0.231	0.086	0.623
Tall (>150)	N	0	52	52				
	%	3.1	80	83.1				
Total	N	10	55	65				
	%	15.4	84.6	100				

Based on table 4, 10 sepsis patients with low PLR values survived and 3 patients died. 52 sepsis patients with high PLR values died. The results of the bivariate analysis using the Fisher exact test showed a p value <0.001 because the p value <0.05, so there is a relationship between PLR and mortality of sepsis patients. The RP value is 0.231 (95%CI = 0.086-0.623) which means that sepsis patients with high PLR values have a 0.2-fold risk of experiencing mortality (death) compared to sepsis patients with low PLR values.

Discussion

a. PLR image of sepsis patient, based on the results of Table 6, the distribution of PLR frequency in the ICU of Waled Regional Hospital in 2020-2023, out of 65 patients, there were 13 patients with low PLR values (20%) and 52 patients with high PLR values (80%). PLR is a new inflammatory marker that can be easily used and calculated based on simple laboratory

results from a complete blood count. The PLR value was first introduced by Demirag, specifically during the systemic inflammatory response in patients who have undergone vascular surgery (Husain, 2021)(Rini, 2021).

This study demonstrated that high PLR values are closely associated with increased systemic inflammation, which can be used to predict a poor prognosis in sepsis. This is consistent with research conducted by Eka Setia Miharja et al. (2024) that PLR is a new prognostic marker that integrates risk prediction from two parameters, namely platelets and lymphocytes, into one. (Miharja et al., 2024)(Ersyaputri, 2023). Furthermore, research conducted by Yanfei Shen et al. (2019) showed that platelets and lymphocytes play a crucial role in the inflammatory process. Therefore, PLR is considered a prognostic predictor of mortality in sepsis patients.

b. Mortality profile of sepsis patients, based on the results of Table 7, the frequency distribution of mortality in the ICU of Waled Regional Hospital in 2020-2023 was obtained, out of 65 patients, there were 10 patients who survived (15.4%) and 55 patients who died (84.6%). This study is in line with research conducted by Rudd K et al. (2020) who stated that as many as 46.4% (approximately 5 million people) of the total sepsis patients worldwide experienced death, to be precise, around 148 deaths per 100,000 population. They also reported that 67.5% of sepsis patients treated in the ICU died (Salsabila Zaneta, 2025)(NOVALIN AGNESTI & NOVAYUNDA PRATIKA, 2024).
c. The relationship between Platelet-Lymphocyte Ratio (PLR) and mortality of sepsis patients, table 4 shows the results of the analysis using the Fisher exact test. This test is an alternative test if the chi-square test requirements are not met, namely that there is an expected value in the cell less than 5. The results of the bivariate analysis obtained a p-value <0.001, because a p-value <0.05 indicates a relationship between the Platelet-Lymphocyte Ratio (PLR) and the mortality of sepsis patients. These results are consistent with research conducted by Yanfei Shen et al. (2019), which stated that there is a significant relationship between a high PLR and the mortality of sepsis patients. A high PLR value indicates a more severe inflammatory process. More severe inflammation can lead to a worse prognosis and death (NORWANTO, 2025)(WULLUR, 2024).

This study is in line with the results of other studies conducted by Tiara Santi Rizal et al (2020), the results of the analysis showed that there was a significant relationship between PLR and mortality of sepsis patients with a p value = 0.00.(9) According to Gancheng Wang et al (2022) found that significantly higher PLR values occurred in people who did not survive/died compared to people who lived with a p value <0.001.(27). Platelets play a crucial role in immunomodulation and inflammation. They induce the release of inflammatory cytokines and directly interact with bacteria and other cells in the body, including neutrophils, T lymphocytes, natural killer (NK) cells, and macrophages. Meanwhile, low lymphocyte levels indicate a suppressed immune response and inflammation. This means that a high platelet count indicates severe inflammation, while a low lymphocyte count is associated with a low immune response to infection. Therefore, high PLR levels are associated with excessive systemic inflammation and can worsen certain diseases, including sepsis. This condition results in a poor prognosis.

Research Limitations

This research is cross-sectional, meaning it is only studied within a limited time. So it is necessary to conduct prospective research. This study focuses solely on the PLR value and does not include factors that can influence the PLR value, such as comorbidities, medications, and length of ICU stay. Discussion of these issues is beyond the scope of this study.

CONCLUSION

Based on the results of research and discussions conducted by researchers regarding the relationship between PLR and mortality of sepsis patients in the ICU of Waled Regional Hospital,

it can be concluded that:The description of the PLR value of sepsis patients in this study included 13 patients who had low PLR values (20%) and 52 patients who had high PLR values (80%).Mortality in sepsis patients in this study was mostly mortality, with 55 patients dying (84.6%) and 10 patients surviving (15.4%). There was a significant relationship between PLR and mortality in sepsis patients with a p value of <0.001.

The results of this study have important implications for the development of sepsis management protocols in Indonesia. PLR can be considered a simple prognostic indicator that is easily obtained from routine laboratory tests, thus assisting clinicians in risk stratification and therapeutic decision-making in the ICU. However, because this study is cross-sectional, future research directions need to focus on prospective studies to test the causal relationship between PLR and sepsis mortality, as well as exploring the integration of PLR with other biomarkers in a more comprehensive sepsis management protocol.

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