

Correlation Between Neutrophil Lymfocyte Ratio (Nlr) And Platelets Values in Dengue Hemorrhagic Fever Patients at Private Hospital Jatiasih Bekasi Period 2019-2021

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Abstract

Introduction: Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by dengue virus infection. This disease can cause symptoms of thrombocytopenia due to the extensive use of platelets to prevent plasma leakage. Apart from that, predicting the critical period for plasma leakage can be seen from the results of the NLR examination. This study aimed to determine the relationship between the NLR value and the platelet value in DHF patients at one of the Jatiasih Bekasi Private Hospitals for the 2019-2021.

Method: This study uses a quantitative descriptive—retrieval of secondary data by purposive sampling and the Spearman correlation test analysis method. The research was conducted in February - March 2023 in one of the Jatiasih private hospitals—data collection for the period June 2019 to December 2021. The research data will be analyzed using SPSS with the Spearman correlation test method.

Results: The research results obtained data on 74 dengue fever patients. Male gender with an average age of 20-44 years. The results of the Spearman correlation test showed a significant p-value of 0.026, indicating a relationship between NLR and platelets in DHF infection. There is a positive relationship between the NLR test and platelets. This is thought to influence the active cellular immune response to DHF, characterized by an average platelet count.

Conclusion: There is a relationship between the neutrophil-lymphocyte ratio value and the platelet count in DHF patients with a weak correlation level.

Keywords: DHF, Jatiasih, Neutrophil, NLR and Platelets.

Introduction

Dengue virus infection is a common health problem in tropical and subtropical areas worldwide, including in Indonesia. Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by the dengue virus. This virus can be spread through the mosquito vector of *Aedes albopictus* and *Aedes aegypti*. Factors that cause the spread of dengue fever include climate factors, environmental conditions, population density, community behavior, and others (Kemenkes RI, 2020).

According to Kemenkes RI (2022), Over the past four years, there has been a drastic increase of more than eight times in reported cases of DHF in Indonesia. The number of DHF cases increased from 505,000 cases to 4.2 million cases in 2019. However, in 2021, 73,518 cases of DHF were recorded, with 705 deaths. There has been a decrease in cases and deaths from DHF compared to 2020 when there were 108,303 cases and 747 deaths.

The number of cases of morbidity and mortality can be described by indicators of Incident Rate (IR) per 100,000 population. The impact of dengue fever in 2019 was 51.53 thousand per 100 thousand population. In West Java Province, the IR is 47.62 thousand per 100 thousand population (Kemenkes RI, 2020). According to Dinas Kesehatan Kota Bekasi (2019), the spread of DHF cases in 2019 had increased (2,484 cases). The highest increase in the incidence was in the Jatiasih area, with 408 cases.

Dengue infection can cause plasma leakage, which occurs due to the activation of capillary endothelial cells. Plasma leaks that occur can result in loss of intravascular fluid, even shock, until death. Therefore, it is necessary to support laboratory blood test results such as platelet values (Kemenkes RI, 2020). However, in estimating the course of dengue fever, laboratory blood test results such as the neutrophil and lymphocyte ratio (NLR) value need to be supported. According to Java *et al.* (2018), in viral infections, leukopenia generally occurs, namely a decrease in the number of white blood cells. In addition, changes in the NLR value (neutrophils < lymphocytes) also play a role in determining the critical period for plasma permeation.

Several previous studies, namely research on the relationship between platelet, hematocrit, and hemoglobin levels with the degree of dengue hemorrhagic fever in hospitalized pediatric patients at BRSU Tabanan (Made *et al.*, 2022). Subsequent research by Java *et al.* (2018) compared NLR values in children with dengue fever and DHF. Based on previous research, there has never been any data regarding the relationship between NLR levels and platelet values in dengue fever patients at one of the Jatiasih Bekasi Private Hospitals for the 2019-2021 period, which were discussed simultaneously and tested for correlation. Therefore, researchers are interested in conducting research on the

relationship between NLR levels and platelet values in dengue fever patients at one of the Jatiasih Bekasi Private Hospitals for the 2019-2021 period. The hope is that the results of this research can be a source of helpful information for the community regarding the health and prevention of dengue infection in the area.

Methods

This type of research is quantitative descriptive. The research design used is *cross-sectional*. The method of data collection is done by *purposive sampling*. The research was carried out from February - March 2023. This study used data from medical records at one of the Jatiasih private hospitals, namely patients with dengue virus infection who were taken from June 2019 - December 2021 (for two years). This research was conducted at one of the Jatiasih private hospitals.

The population in this study were patients suffering from dengue fever who had checked platelet counts and leukocyte counts at one of the Jatiasih private hospitals in the period June 2019 – December 2021, namely 74 people out of 233 people. The samples used in this study had to meet the inclusion criteria, namely patients who had confirmed dengue fever by a doctor and underwent a hematological examination and leukocyte count. The exclusion criteria are patients confirmed by a doctor for dengue fever and undergo a hematological examination but suffer from bacterial infections such as urinary tract infections, pneumonia, and so on. Two variables are used in this study, namely the independent and dependent variables. The independent variable in this study was patients with dengue virus infection. Meanwhile, the dependent variables in this study were NLR values and platelet counts.

Results and Discussions

Data on patients with DHF at one of the Jatiasih private hospitals collected from June 2019 - December 2021 obtained 74 patients. Data from 74 research subjects who completed the predetermined exclusion and inclusion criteria. Patient data collected by gender and age obtained from the medical records of one of the Jatiasih private hospitals was obtained as follows:

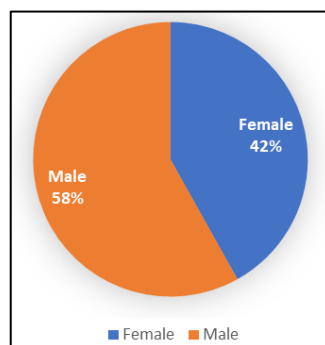


Figure 1. Characteristics of DHF Sufferers Based on Gender

Based on **figure 1** shows that the data on patients with confirmed dengue fever mainly were men, 43 people (42%) out of 74 samples, and 31 women (58%).

Table 1. Data on Patients Infected with Dengue Based on Age

Age	Amount	Percentage (%)
Toddler		
1 – 5 years	9	12
Children		
6- 10 years	10	14
teenager		
11 – 19 years	13	18

Mature		
20 – 44 years	35	47
Elderly		
45 – 60 years	7	9
Total	74	100

Based on **Table 1**, the results show the distribution of patients with confirmed dengue fever, totaling 74 patients, with nine people in the toddler age group (1-5 years), ten children (6-10 years), 13 teenagers (11-19 years) people, adults (20-44 years) numbering 35 people, elderly (45-60 years) numbering seven people in patients suffering from dengue fever infection starting from the age of 1 year to the age of 59 years.

Table 2 NLR Value in Patients Suffering from DHF

NLR value	Amount	Percentage (%)
<3,13	45	61
>3,13	29	39
Total	74	100

Based on **Table 2**, it can be seen that the patients with DHF had normal NLR values in 45 people (61%), while there were 29 people with abnormal NLR values (39%).

Table 3 Platelet Count in Patients Suffering from DHF

Platelet value	Amount	Percentage (%)
<150.000	59	80
150.000-450.000	15	20
>450.000	0	0
Total	74	100

Based on **Table 3**, it is illustrated that the majority of patients with DHF had a below-normal platelet count in 59 people (80%), while 15 people (20%) had normal platelet results. Analysis of the relationship between NLR values and platelets was carried out using multiple linear regression tests. This analysis can be seen based on **Table 4**:

Table 4 Value of the level of relationship between variables (r), sig value = 0.026

Inspection	R Value	Interpretation
Platelets and NLR	0,259	Weak Relationship

Based on **Table 4**, a significant value was obtained of 0.026 <0.05 (5%), so it can be concluded that H0 was rejected, which shows a relationship between the number of platelets and the NLR value in patients suffering from dengue fever. The relationship between platelet count and NLR value shows a value of 0.259, which means the relationship is weak.

Based on the study's results, data were obtained from 74 patients with confirmed DHF at a private hospital in Jatiasih with a minimum age of 1 year and a maximum of 59 years with an average age of 24. The age of DHF sufferers is adults aged 20-44 years, as many as 35 people (47%). The age range of 20-44 years is the productive age category. This is similar to research conducted by *Kafrawi et al. (2019)*, who said that the most DHF sufferers were adults aged 18-40 years, as many as 43 people (69.4%), and research by *Hidayat et al. (2017)* obtained the most results at the age of 20-40 years, namely 69 people (50%). Age is one of the factors that affect susceptibility to dengue virus infection. One reason is because of the activities they do outside the home. Adults tend to be more active outside the home, including in work, travel, or social activities. This increases their chances of being bitten by *Aedes* mosquitoes, which carry the dengue virus. In addition, awareness and self-protection factors can also affect the infection rate. Some adults may be less aware of the threat of *Aedes* sp. Mosquitoes. and paying little attention to preventive measures such as using mosquito nets, wearing protective clothing, or using insecticides. This can increase their risk of getting bitten by

mosquitoes and possibly being infected with the dengue virus (Hidayat *et al.*, 2017). Awareness and self-protection factors can also influence infection rates. Some adults may be less aware of the threat of *Aedes Sp.* Mosquitoes, and less attention to preventive measures such as using mosquito nets, clothing that protects the body, or using insecticides. This can increase their risk of getting bitten by mosquitoes and possibly being infected with the dengue virus (Hidayat *et al.*, 2017). Awareness and self-protection factors can also influence infection rates. Some adults may not be aware of the threat of the *Aedes Sp.* mosquito. Furthermore, less attention to preventive measures such as using mosquito nets, clothing that protects the body, or using insecticides. This can increase their risk of being bitten by mosquitoes and possibly infected with the dengue virus (Hidayat *et al.*, 2017).

Gender characteristics in the data obtained show that there are more men than women, where there are 43 men (58%) while there are 31 women (42%). This is similar to research by Hidayat *et al.* (2017) that the male sex was more numerous, namely 81 people (58.7%), while 57 women (41.3%). In general, men have a higher risk of infection than women because the production of immunoglobulins or antibodies in women is genetically and hormonally more efficient than in men (Hernawan and Afrizal, 2020)

Based on **Table 2**, the results of the NLR values are dominated by the interpretation of normal results. This is presumably because the respondent has received medical action, so that the condition of the respondent is good. However, it is different from the results of the platelet values contained in Table 4, which are dominated by decreased interpretation results. It is suspected that the patient is experiencing a critical or acute phase of DHF. In the critical phase of DHF, there is a horse's saddle curve, characterized by a decrease in platelet values. Based on research by Ishaque *et al.* (2022) and Cahyani *et al.* (2020), an increase in NLR values occurs in the early phase of fever, which is characterized by a decrease in the number of neutrophils (neutropenia) and an increase in lymphocytes (lymphocytosis). Neutropenia occurs due to neutrophil apoptosis triggered by dengue infection and bone marrow depression caused by viruses directly or through proinflammatory cytokines. In dengue infection, there is an increase in the relative number of lymphocytes, which indicates the important role of lymphocytes in the body's defense mechanism against the dengue virus. The mean time to decrease in NLR values is usually seen more frequently between the 3rd and fifth day after the onset of infection. A decrease in NLR values indicates the late febrile phase of dengue infection.

The decreased platelet count can be caused by increased platelet activation due to the large number of blood vessels being damaged due to activation of the body's immune response to eliminate the dengue virus by forming antigen-antibody bonds. The antigen-antibody bond can trigger activation of the complement system, thereby causing an inflammatory reaction in the blood vessels. As a result, blood vessels lyse and cause increased use of platelets to close wounds. Therefore, thrombocytopenia occurs. Thrombocytopenia in dengue infection can also occur due to bone marrow suppression (Hidayat *et al.*, 2017). Therefore, from the research results, there is a weak relationship between the number of platelets and the NLR value on the incidence of dengue fever.

Conclusions

The results of this study indicate that there is a weak relationship between the value of the Neutrophil Lymphocyte Ratio and the value of platelets in DHF patients at one of the Jatiasih Bekasi Private Hospitals for the 2019-2021 period.

References

- Cahyani, S, T Rizkianti, and T Susantiningsih. 2020. "Hubungan Jumlah Trombosit , Nilai Hematokrit Dan Rasio Neutrofil-Limfosit Terhadap Lama Rawat Inap Pasien DBD Anak Di RSUD Budhi Asih Bulan Januari – September Tahun 2019." *Seminar Nasional Riset Kedokteran (SENSORIK) 2020* 1(1): 49–59.
- Dinas Kesehatan Kota Bekasi. 2019. "Profil Kesehatan Kota Bekasi." *DinKes Kota Bekasi* 93–94.
- Hernawan, Budi, and Adheelah Rachmah Afrizal. 2020. "Hubungan Antara Jenis Kelamin Dan Usia Dengan Kejadian Dengue Syok Sindrom Pada Anak Di Ponorogo." *Publikasi Ilmiah*: 80–88.
- Hidayat, Wardhy Arief, Rismawati Yaswir, and Arina Widya Murni. 2017. "Hubungan Jumlah Trombosit Dengan Nilai Hematokrit Pada Penderita Demam Berdarah Dengue Dengan Manifestasi Perdarahan Spontan Di RSUP Dr. M. Djamil Padang." *Jurnal Kesehatan Andalas* 6(2): 446.
- Ishaque, N, MU Siddique, A Imran, and NA Malik. 2022. "Utilization of Neutrophil to Lymphocyte Ratio to Assess Recovery in Patients with Dengue." *Journal of Haematology and Stem Cell Research* 2(2): 77–80.

- Java, Putri, Islami Yuntoharjo, and Nahwa Arkhaesi. 2018. "Perbandingan Antara Nilai Rasio Neutrofil Limfosit (NLCR) Pada Anak Dengan Demam Dengue Dan Demam Berdarah Dengue." *Diponegoro Medical Journal (Jurnal Kedokteran Diponegoro)* 7(2): 801–12. http://www.scopus.com/inward/record.url?eid=2-s2.0-84865607390&partnerID=tZOtx3y1%0Ahttp://books.google.com/books?hl=en&lr=&id=2LIMMD9FVXkC&oi=fnd&pg=PR5&dq=Principles+of+Digital+Image+Processing+fundamental+techniques&ots=HjrHeuS_.
- Kafrawi, Vudhya Ulhaq, Nadia Purnama Dewi, and Prima Adelin. 2019. "Gambaran Jumlah Trombosit Dan Kadar Hematokrit Pasien Demam Berdarah Dengue Di Rumah Sakit Islam Siti Rahmah Padang." *Health & Medical Journal* 1(1): 38–44.
- Kemkes RI. 2020. Kementerian Kesehatan Republik Indonesia *Profil Kesehatan Indonesia Tahun 2019*. <https://pusdatin.kemkes.go.id/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-indonesia-2019.pdf>.
- . 2022. Pusdatin.Kemkes.Go.Id *Profil Kesehatan Indonesia 2021*.
- Made, Ni et al. 2022. "Hubungan Kadar Trombosit , Hematokrit , Dan Hemoglobin Dengan Derajat Demam Berdarah Dengue Pada Pasien Anak Rawat Inap Di BRSU Tabanan Berdasarkan Data Kementerian Kesehatan Demam Berdarah Dengue Dapat." *Aesculapius Medical Journal* 2(2): 130–36.