



CORRELATION BETWEEN DENGUE ANTIBODIES IGM AND IGG WITH LYMPHOCYTE COUNT IN PATIENTS WITH SUSPECTED DENGUE FEVER

HUBUNGAN ANTARA ANTIBODI DENGUE IGM DAN IGG DENGAN JUMLAH LIMFOSIT PADA PASIEN SUSPEK DEMAM DENGUE

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Abstract

Dengue Hemorrhagic Fever (DHF) is a disease caused by the Dengue virus transmitted to humans through the bite of the *Aedes aegypti* and *Aedes albopictus* mosquitoes. One of the laboratory tests that can help diagnose Dengue fever includes Dengue IgM and IgG Antigens and hematology tests. The number of lymphocytes plays a role in the body's immune system and is one of the parameters found in hematology tests. This study aims to determine the relationship between Dengue IgM and IgG antibodies and the number of lymphocytes in patients suspected of having Dengue fever at the Prodia Sunter Clinical Laboratory for the period 2021-2024. The research method is observational with cross-sectional using secondary data of 104 samples. Data analysis uses Spearman rank. The results of the study showed that most of the suspected Dengue fever patients were male, 56 patients (53.8%) with the highest age at 19-59 years as many as 53 patients (51.0%) and the duration of fever was mostly experienced on the 3rd day of fever 29 patients (27.9%). The results of the Dengue antigen IgM examination in suspected Dengue fever patients were negative for 89 patients (85.6%) and the Dengue antigen IgG was negative for 64 patients (61.5%). The number of lymphocytes was within normal limits for 44 patients (42.3%). The results of the IgM correlation test obtained $p = 0.005$ with $r = 0.271$, so the hypothesis was accepted, it can be concluded that there is a weak correlation between Dengue IgM antibodies and the number of lymphocytes and the results of the IgG correlation test obtained $p = 0.043$ with $r = 0.198$, so the hypothesis was accepted, it can be concluded that there is a weak correlation between Dengue IgG antibodies and the number of lymphocytes in suspected Dengue fever patients.

Keywords : Lymphocytes, Dengue IgG and IgM, Dengue Fever



Abstrak

Demam Berdarah Dengue (DBD) adalah penyakit yang disebabkan oleh virus Dengue ditularkan kepada manusia melalui gigitan nyamuk *Aedes aegypti* dan *Aedes albopictus*. Salah satu pemeriksaan laboratorium yang dapat membantu diagnose demam Dengue antara lain Antigen Dengue IgM dan IgG dan pemeriksaan hematologi. Jumlah limfosit berperan dalam sistem imunitas tubuh dan merupakan salah satu parameter yang terdapat di pemeriksaan hematologi. Penelitian ini bertujuan untuk mengetahui hubungan antara antibodi Dengue IgM dan IgG dengan jumlah limfosit pada pasien suspek demam Dengue di Laboratorium Klinik Prodia Sunter periode tahun 2021-2024. Metode penelitian bersifat observasional dengan cross sectional yang menggunakan data sekunder sebanyak 104 sampel. Analisa data menggunakan rank spearman. Hasil penelitian didapatkan sebagian besar jumlah pasien suspek demam Dengue berjenis kelamin laki-laki 56 pasien (53,8%) dengan umur terbanyak pada 19-59 tahun sebanyak 53 pasien (51,0%) dan lama demam banyak dialami pada demam hari ke-3 29 pasien (27,9%). Hasil pemeriksaan Dengue antigen IgM pada pasien suspek demam Dengue hasil negatif sebanyak 89 pasien (85,6%) dan Dengue antigen IgG negatif sebanyak 64 pasien (61,5%). Jumlah limfosit dalam batas normal sebesar 44 pasien (42,3%). Hasil uji korelasi IgM didapatkan hasil $p = 0,005$ dengan $r = 0,271$ maka hipotesis diterima, dapat disimpulkan terdapat hubungan yang lemah antara antibodi Dengue IgM dengan jumlah limfosit dan hasil uji korelasi IgG didapatkan hasil $p = 0,043$ dengan $r = 0,198$ maka hipotesis diterima, dapat disimpulkan terdapat hubungan yang lemah antara antibodi Dengue IgG dengan jumlah limfosit pada pasien suspek demam Dengue.

Kata Kunci : Limfosit, Dengue IgG dan IgM, Demam Dengue

1. INTRODUCTION

Dengue Hemorrhagic Fever (DHF), caused by the Dengue virus, is transmitted primarily through the bites of *Aedes aegypti* and *Aedes albopictus* mosquitoes (Husin et al., 2024). Indonesia remains an endemic region, with rising cases of DHF. In 2022, the Ministry of Health reported over 116,000 DHF cases, with significant morbidity and mortality, particularly among children and young adults (Kemenkes RI, 2021). The increase in DHF cases is attributed to various factors, including urbanization, climate change, and human behaviors, such as water storage in containers, which provide breeding grounds for mosquitoes (Husin et al., 2024).

DHF diagnosis relies on clinical signs and laboratory tests, including platelet counts and hematocrit values. Leukopenia, often overlooked in DHF, is a critical factor in predicting severe forms like Dengue Shock Syndrome (DSS) (Risniati et al., 2012). Lymphocytes, a type of white blood cell, play a vital role in immune defense, and their count can fluctuate during Dengue infection. While lymphocytes are crucial for immune responses, the relationship between lymphocyte counts and Dengue antibodies (IgM and IgG) has not been fully explored.

IgM and IgG antibodies are essential for diagnosing Dengue and distinguishing between primary and secondary infections. IgM appears early in primary infections and persists for several weeks, while IgG is detected later, especially in secondary infections, and remains for life (Pakan, 2011; Mahasurya et al., 2017). However, the correlation between IgM, IgG, and lymphocyte counts remains unclear. Kurniawati (2022) found a weak, non-significant



correlation between absolute lymphocyte counts and IgM/IgG levels, suggesting that further research is needed to understand this relationship in DHF patients.

This study aims to explore the relationship between Dengue IgM and IgG antibodies and lymphocyte counts in suspected DHF patients, addressing the gap in understanding how immune markers and lymphocyte dynamics contribute to disease progression and severity.

2. RESEARCH METHOD

The research used is an analytical observational method with a cross-sectional approach. Analytical observational research examines the relationship between two or more variables, and the researcher only observes without intervening with the research subjects. Cross-sectional research is a study to examine the dynamics of the correlation between risk factors and the causes of diseases that occur in the subjects, with the data being collected simultaneously at the same time (Notoatmodjo, 2012). The type of data used in this study is secondary data, specifically data from suspected Dengue fever patients who underwent tests at the Prodia Sunter Clinical Laboratory. The data were taken from medical records from January 2021 to April 2024. The total population for this study was 140 patient data. The sample size for this study was determined using the Slovin formula. Based on the sample size calculation with a precision limit of 5%, a sample of 104 patient data was obtained. Sampling in this study used purposive sampling technique. In this study, the samples selected by the researcher met the inclusion and exclusion criteria. The inclusion criteria for this study were patients with suspected Dengue fever who had undergone Dengue IgM and IgG antibody tests, along with a lymphocyte count. The exclusion criteria for this study were patients without complete medical records and patients with other coincident diseases, such as typhoid fever. The data obtained in this study is in ordinal scale, and to determine the relationship between the two variables, the data were tested using the Spearman Rank statistical test.

3. RESULTS AND DISCUSSION

Research Results

Respondent Characteristics in Suspected Dengue Fever Patients

The respondent characteristics of suspected Dengue fever patients who underwent IgM antigen, IgG antigen, and lymphocyte count tests were obtained from medical records and grouped based on age, duration of fever, and gender.

Table 1. Characteristics Frequency Distribution Based on Gender, Age, and Duration of Fever

Characteristic		Frequency (n)	Percentage (%)
Gender	Male	56	53,8
	Female	48	46,2
	Total	104	100
Age (Years)	0-4 Years	2	1,9
	5-9 Years	18	17,3
	10-18 Years	16	15,4
	19-59 Years	53	51,0
	>60 Years	15	14,4
	Total	104	100
* Duration of Fever (Days)	1	1	1,0
	2	4	3,8



Characteristic	Frequency (n)	Percentage (%)
3	29	27,9
4	27	26,0
5	25	24,0
6	9	8,7
7	9	8,7
Total	104	100

Based on the data from Table 1, it can be seen that for the gender characteristic of suspected Dengue fever patients, the majority are male, with 56 patients (53.8%). The highest number of Dengue fever patients are in the age group of 19-59 years, totaling 53 patients (51.0%). Based on the duration of fever, the highest number of suspected Dengue fever patients who underwent the Dengue IgM and IgG antigen tests, along with lymphocyte count, occurred on the 3rd day of fever, with 29 patients (27.9%).

Dengue IgM and IgG Antigen Status in Suspected Dengue Fever Patients

The data on the status of respondents who underwent Dengue IgM and IgG antigen tests, along with lymphocyte count, were obtained from medical records at the Prodia Sunter Clinical Laboratory and can be seen in Table 2.

Table 2. Dengue IgM and IgG Antigen Status

No	Dengue IgM Antigen	Frequency (n)	Percentage (%)
1	Negative	89	85,6
2	Positive	15	14,4
	Total	104	100

No	Dengue IgG Antigen	Frequency (n)	Percentage (%)
1	Negative	64	61,5
2	Positive	40	38,5
	Total	104	100

Based on the data from Table 2, it can be seen that for suspected Dengue fever patients who underwent Dengue IgM and IgG antigen tests, the majority of Dengue IgM results were negative, with 89 patients (85.6%) and the majority of Dengue IgG antigen results were negative, with 64 patients (61.5%).

Lymphocyte Count Status in Dengue Fever Patients

The data on the status of respondents who underwent lymphocyte count tests in suspected Dengue fever patients were obtained from medical records at the Prodia Sunter Clinical Laboratory and can be seen in Table 3.

Table 3. Lymphocyte Count Status

No	Lymphocyte Count	Frequency (n)	Percentage (%)
1	Below normal	28	26,9



2	Normal	44	42,3
3	Above normal	32	30,8
Total		104	100

From Table 3, it can be seen that the normal lymphocyte count was found in 44 patients (42.3%), below normal in 28 patients (26.9%), and above normal in 32 patients (30.8%) in suspected Dengue fever patients who underwent Dengue IgM and IgG antigen tests, along with lymphocyte count.

Analysis of the Relationship Between Dengue IgM Antibody and Lymphocyte Count

The data on the relationship between Dengue IgM and lymphocyte count in suspected Dengue fever patients, obtained from medical records at the Prodia Sunter Clinical Laboratory, can be seen in the table below.

Table 4. Spearman Rank Test of the Relationship Between Dengue IgM Antibody and Lymphocyte Count

Research Variable	Limfosit						Total	P value	r	
	Below normal		Normal		Above normal					
IgM	F	%	F	%	F	%	F	%		
Negative	26	25%	41	39,4%	22	21,2%	89	85,6%	0,005	0,271
Positive	2	1.9%	3	2.9%	10	9.6%	15	14.4%		

From Table 4, it can be seen that after conducting the Spearman rank test on Lymphocyte Count and Dengue IgM Antigen, the obtained Sig. (2-tailed) value was 0.005. Since the Sig. value (2-tailed) < 0.05, there is a significant relationship between the Dengue IgM antibody variable and Lymphocyte Count. The correlation coefficient obtained is 0.271, indicating a weak positive relationship, meaning that the two variables tend to move in the same direction, either both increase or both decrease, but the relationship is not very strong or significant, meaning that a change in one variable does not always correspond to a proportional change in the other variable.

Analysis of the Relationship Between Dengue IgG Antibody and Lymphocyte Count

The data on the relationship between Dengue IgG and lymphocyte count in suspected Dengue fever patients, obtained from medical records at the Prodia Sunter Clinical Laboratory, can be seen in the table below.

Table 5. Spearman Rank Test of the Relationship Between Dengue IgG Antibody and Lymphocyte Count

Research Variable	Limfosit						Total		P value	r
	Below normal		Normal		Above normal					
IgM	F	%	F	%	F	%	F	%		
Negative	18	17,3%	33	31,7%	13	12,5%	64	61,5%	0,043	0,198
Positive	10	9,6%	11	10,6%	19	18,3%	40	38,5%		



The Spearman rank test for Lymphocyte Count and Dengue IgG Antigen shows that the Sig. (2-tailed) value is 0.043. Since the Sig. value (2-tailed) < 0.05 , there is a significant relationship between the Dengue IgG antibody variable and Lymphocyte Count. The correlation coefficient is 0.198, indicating a weak relationship.

Discussion of Results

Characteristics of Age, Gender, and Duration of Fever

The results of this study show that patients with Dengue Hemorrhagic Fever (DHF) were predominantly male (53.8%), with no significant difference observed between genders. This finding is consistent with previous studies, including those by Sari and Yasa (2020), which noted a high incidence of DHF among adults aged 15-64 years. The increased incidence in adults may be due to higher exposure to mosquito vectors, especially in areas with high human mobility, which increases the risk of infection (Husin et al., 2024). The duration of fever is also a key factor in DHF diagnosis. In this study, most patients experienced fever for 3-5 days, with laboratory tests conducted around the third day, aligning with the WHO recommendation that this period is critical for DHF diagnosis (WHO, 2022).

Dengue IgM and IgG Antibody Testing

The findings on Dengue IgM and IgG testing indicate a predominance of negative results, with 85.6% of patients testing negative for IgM and 61.5% for IgG. This suggests that a significant portion of the patients in this study may not have been infected with the Dengue virus at the time of testing, and their fever could be attributed to other causes. This is supported by Mahasurya et al. (2017), who noted that negative antibody tests may indicate that the fever was not due to Dengue, but possibly another viral or bacterial infection.

The weak positive results for IgM and IgG found in some patients suggest that early-phase testing might fail to capture the full range of Dengue infections, particularly in secondary cases where IgG antibodies appear earlier (Susanti, 2022). IgM antibodies typically appear within 3-5 days of infection in primary infections and can persist for up to 60 days, whereas IgG antibodies emerge later, typically after day 14, and persist for life (Pakan, 2011). This timing discrepancy underscores the importance of considering the stage of infection when interpreting antibody results.

The negative results in this study could indicate that patients were either in the early stages of infection, outside the detectable window for IgM, or had been exposed to other pathogens. This highlights the complexity of diagnosing Dengue, as non-specific symptoms and overlapping clinical features with other diseases like typhoid fever may lead to false-negative results.

Lymphocyte Testing

Lymphocyte counts in the study showed that the majority of patients had normal lymphocyte levels (42.3%), with the remaining patients showing either lymphocytosis or



lymphopenia. Lymphocyte count is a crucial parameter in understanding the immune response during Dengue infection. As observed in studies by Nainggolan et al. (2021), lymphocytosis typically occurs during the convalescent phase, while lymphopenia is more commonly observed during the critical phase of infection. Lymphopenia is associated with the destruction of lymphocytes and their migration to infected tissues, which is indicative of a systemic immune response to the viral infection (Nainggolan et al., 2021).

The weak correlation between lymphocyte counts and both IgM and IgG antibodies suggests that lymphocyte levels may not directly correlate with antibody production in DHF patients. This discrepancy could be due to the complex immune mechanisms involved in Dengue infection, where lymphocyte count is influenced by various factors such as the phase of infection and the individual's immune response. Although lymphocyte count is typically higher in the recovery phase, it does not always correlate with IgM or IgG levels, which may still be elevated due to ongoing immune activation (Hidayat et al., 2021). This lack of strong correlation suggests that while lymphocyte counts are informative, they should be interpreted in conjunction with other clinical and laboratory parameters.

The Correlation Between Dengue IgM Antibodies and Lymphocyte Count

The weak correlation observed between Dengue IgM antibodies and lymphocyte count ($r = 0.082$, $p = 0.667$) supports findings by Kurniawati (2022), where a similar weak correlation was found. This weak relationship may be due to the fact that IgM levels are often highest in the acute phase of primary infection and decrease over time, whereas lymphocyte counts are subject to more complex dynamics, including migration to tissues and destruction during the critical phase. As such, a low correlation may reflect the biological processes at play, where lymphocyte dynamics do not always coincide with antibody responses. The role of lymphocytes in the immune response to Dengue is critical, but their count alone may not provide a direct indicator of antibody production or disease progression.

The Correlation Between Dengue IgG Antibodies and Lymphocyte Count

Similarly, the weak correlation between Dengue IgG antibodies and lymphocyte count ($r = 0.006$, $p = 0.978$) further underscores the complexity of immune responses in Dengue infection. As IgG antibodies generally rise during secondary infections, the lack of a strong correlation with lymphocyte count suggests that the immune mechanisms involved in Dengue are not solely reflected by the lymphocyte count. In secondary infections, IgG antibodies appear early, but lymphocyte responses may not always mirror these changes, highlighting the need for a more nuanced approach to understanding the immune response in DHF (Wibowo, 2020).

4. CONCLUSION

Based on the data analysis regarding the correlation between Dengue IgM and IgG antibodies and lymphocyte count in suspected Dengue fever patients at the Prodia Sunter



Clinical Laboratory, several conclusions can be drawn. The majority of suspected Dengue fever patients were male (53.8%), with the highest age group being 19-59 years (51.0%), and the most common duration of fever was 3 days (27.9%). The results of the Dengue IgM antigen test were predominantly negative (85.6%), as were the Dengue IgG antigen tests (61.5%). Lymphocyte counts in these patients were mostly within normal limits (42.3%). A weak correlation was found between Dengue IgM antibodies and lymphocyte count, with a p-value of 0.005 and an r-value of 0.271, and similarly, a weak correlation was found between Dengue IgG antibodies and lymphocyte count, with a p-value of 0.043 and an r-value of 0.198 during the 2021-2024 period.

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