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The Relationship Between Platelet Distribution Width (PDW) and Mean Platelet Volume (MPV) Value to the Clinical Degree of Dengue Hemorrhaging Fever (DHF) in Haji Saiful Anwar General Hospital, Subang District, West Java, Indonesia

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Abstract: ***Background: Dengue Hemorrhagic Fever (DHF) remains a significant health concern in various tropical countries, including Indonesia. Caused by the dengue virus transmitted through Aedes aegypti mosquitoes, DF can progress to severe conditions, particularly in cases with complications like bleeding or shock. Addressing this burden necessitates research into identifying factors guiding diagnosis, severity assessment, and patient management. Hematological parameters, especially Platelet Distribution Width (PDW) and Mean Platelet Volume (MPV), have gained attention in this context.***
Methods: This analytical observational cross-sectional study was conducted at Haji Saiful Anwar General Hospital in West Java, Indonesia, from March to June 2023. The study enrolled 60 patients diagnosed with DHF based on WHO criteria. Clinical and demographic data were collected from medical records. Complete blood count tests were performed to obtain PDW and MPV values. Statistical analyses, including Pearson or Spearman correlation tests, were used to explore the relationship between PDW, MPV, and DF severity.
Results: The study revealed interesting variations in patient characteristics based on gender and age groups. Notably, 41.6% were male and 58.4% were female. Patients aged 6-14 years comprised the largest group (35%), followed by those aged 15-24 years (31.67%). DF severity distribution indicated that 76.67% had grade 1 DF, 18.33% had grade 2, and 5.00% had grade3.
Conclusion: The study provides insights into the potential of PDW and MPV as indicators for evaluating DF severity. While these findings hold clinical significance for DF management, further research is needed to validate these results in broader clinical settings and to understand their biological implications.
Keywords: Dengue Hemorrhagic Fever; Platelet Distribution Width (PDW); Mean Platelet Volume (MPV); severity assessment.

I. INTRODUCTION

Dengue Hemorrhagic Fever (DHF) remains a significant health problem in many tropical countries, including Indonesia. This disease is caused by the dengue virus which is transmitted by the Aedes aegypti mosquito. DHF can develop into serious and even life-threatening conditions, especially in cases with complications such as bleeding or shock[1].

In an effort to overcome this disease burden, medical research continues to focus on identifying factors that can provide guidance for the diagnosis, assessment of severity, and management of DHF patients. Recently, increasing attention has been paid to haematological parameters, especially those related to changes in platelet count and characteristics. These two parameters, namely Platelet Distribution Width (PDW) and Mean Platelet Volume (MPV), have been highlighted in related research.[2].

Platelet Distribution Width (PDW) is a measure of the variation in the size of platelets in the blood, while Mean Platelet Volume (MPV) measures the average size of platelets[3]. Changes in PDW and MPV values have been associated with the response of platelets to inflammation, coagulation, and various other pathological conditions. Therefore, the potential of these two parameters as diagnostic and prognostic indicators in DHF has attracted the interest of researchers[4].

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Haji Saiful Anwar General Hospital, Subang Regency, West Java, Indonesia, as one of the health facilities in the region, has an important role in handling DHF patients. Against this background, this study aims to explore the relationship between PDW and MPV values with clinical degrees of Dengue Hemorrhagic Fever (DHF) in patients treated at the hospital.

This study is expected to provide further understanding of the role of hematological parameters, especially PDW and MPV, in evaluating the severity of DHF. The results of this study can make an important contribution in developing diagnostic tools and making better clinical decisions in the management of DHF patients.

II. METHOD

This study used an analytic observational study design with a cross-sectional approach. The study was conducted at Haji Saiful Anwar General Hospital, West Java, Indonesia during March 2023-June 2023. This location was chosen because it is a medical facility that serves patients with dengue hemorrhagic fever (DHF) and has facilities for measuring hematological parameters. The research sample consisted of 60 patients diagnosed with DHF based on WHO criteria. Participants were randomly selected based on data availability during the study period.

Patient demographic and clinical data, including age, sex, medical history, symptoms, and clinical signs, were retrieved from medical records. A complete blood count was performed for each patient to obtain PDW and MPV values. The data obtained will be analyzed using statistical methods, including the Pearson or Spearman correlation test to evaluate the relationship between PDW and MPV with clinical degrees of DHF. The specified level of significance was $p < 0.05$.

III. RESULTS

Table 1 describes the characteristics of Dengue Hemorrhagic Fever (DHF) patients based on age and sex. Of the total 60 patients who were included in the study, there were interesting variations in the distribution of sex and age groups.

In terms of gender, of the total sample, 25 patients (41.6%) were male, while 35 patients (58.4%) were female. This indicates that women have a slightly higher proportion in the studied population of DHF patients.

Meanwhile, the distribution of patients by age group also provides useful insights. The age group 6-14 years had the highest number of patients, namely 21 patients (35%), followed by the age group 15-24 years with 19 patients (31.67%). The 0-5 years age group had 7 patients (11.67%), while the 25-44 years age group had 10 patients (16.67%), and the age group over 45 years had the least number of patients, namely 3 (5%) .

By analyzing patient characteristics by sex and age group, this study provides an initial understanding of how DHF may affect different population groups, as well as illustrating potential differences in severity in each age group.

Table 1. Characteristics of DHF Patients Based on Age and Gender

variable		Frequency (n=60)	Percentage (%)
Gender			
	Man	25	41,6
	Woman	35	58,4
age group			
	0-5 years	7	11,67
	6-14 years	21	35
	15-24 years	19	31,67
	25-44 years	10	16,67
	>45	3	5

Table 2 shows the patient characteristics based on several variables related to blood parameters. In terms of hematocrit, it can be seen that 26.67% of the total sample (n=60) had a hematocrit of less than 30%. The majority of patients (50.00%) had a hematocrit in the range of 30-40%, while 23.33% had a hematocrit above 40%.

In the hemoglobin variable, 18.33% of patients had a hemoglobin level of less than 10 gr/dL. Most of the patients (78.33%) had hemoglobin levels in the range of 10-18 gr/dL.

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In terms of Platelet Distribution Width (PDW) values, a small proportion of patients (3.33%) had PDW values of less than 10. The majority of patients (83.33%) had PDW values in the range of 10-18, while 13.33% had PDW over 18.

When looking at the Mean Platelet Volume (MPV) value, 56.67% of patients had an MPV value between 6.5 and 11. Meanwhile, 43.33% of patients had an MPV value above 11. The results from this table illustrate the variation in patient blood parameters researched. This information can provide an initial understanding of a patient's blood profile in the context of the observed haematological parameters, which can contribute to further evaluation and understanding of associated health conditions.

Table 2. Laboratory Characteristics of DHF Patients

Variable	Frequency (n=60)	Percentage (%)
hematocrit (%)		
<30	16	26,67
30-40	30	50,00
>40	14	23,33
hemoglobin (gr/dL)		
<10	11	18,33
10-18	47	78,33
PDW value		
<10	2	3,33
10-18	50	83,33
>18	8	13,33
MPV value (%)		
6,5-11	34	56,67
>11	26	43,33

Table 3 shows the distribution of patients based on the clinical degree of Dengue Hemorrhagic Fever (DHF). The results of the study illustrated that the majority of patients, approximately 76.67% of the total sample (n=60), experienced a clinical degree of DHF which was classified as degree 1. This degree 1 may include mild symptoms associated with DHF.

Meanwhile, around 18.33% of patients had grade 2 DHF, which indicated a higher level of severity compared to grade 1. Grade 2 could involve more serious symptoms and require more intensive medical attention.

The most severe clinical degree of DHF was grade 3, which was seen in 5.00% of the patients in the sample. Grade 3 indicates a higher level of severity, with symptoms and signs that are serious and can be life-threatening.

Thus, this table provides an overview of the distribution of clinical degrees of DHF in the patient population studied. This information is important for further evaluation and understanding of the severity of DHF and its potential implications for patient care and treatment.

Table 3. Characteristics of the Clinical Degree of DHF Patients

Variable	Frequency (n=60)	Percentage (%)
clinical degree of DHF		
Grade 1	46	76,67
Grade 2	11	18,33
Grade 3	3	5,00

Table 4 presents the p value and the correlation (r) between the Platelet Distribution Width (PDW) value variables in percentage and the clinical degree of Dengue Hemorrhagic Fever (DHF). The results of the statistical analysis showed that the recorded p value was 0.03, indicating that there was a significant relationship between the PDW value and the clinical degree of DHF.

With a significant p-value, this indicates that the possible relationship between PDW values and clinical grades of DHF did not arise by chance alone. The correlation value (r) is not listed in the table, but because there is a low p-value, it can be assumed that the correlation value (r) is significant enough to show the relationship that exists between the two variables.
These results indicate that there is an indication that the PDW value can have a role in describing or related to the degree of severity of Dengue Hemorrhagic Fever. However, for a deeper understanding of these correlations, more specific correlation values and more detailed interpretations are required.

Table 4. Correlation of PDW values with clinical degrees of DHF patients

variable	p	r
PDW value (%) clinical degree of DHF	0,03	0,41

Table 5 displays the p value and correlation (r) between the Mean Platelet Volume (MPV) variable and the clinical degree of Dengue Hemorrhagic Fever (DHF). The results of the statistical analysis showed that the recorded p value was 0.01, indicating a significant relationship between the MPV value and the clinical degree of DHF.
With a significant p value, this illustrates that the relationship between the MPV value and the clinical degree of DHF does not occur by chance alone. The correlation value (r) listed is 0.52, which indicates a fairly strong correlation between the two variables.
These results imply that the MPV value has the potential to provide information about the degree of severity of Dengue Hemorrhagic Fever. Significant correlation values indicate that there is a positive or negative relationship (depending on the sign of the correlation) which can help in further understanding how MPV values can influence or be reflected in the clinical degree of DHF.

Table 5. Correlation of MPV values with clinical degrees of DHF patients

variable	p	r
MPV value clinical degree of DHF	0,01	0,52

IV. DISCUSSION

The results of this study indicate that in the studied population of DHF patients, the proportion of females (58.4%) was slightly higher than the proportion of males (41.6%). Although the difference is not striking, it may provide an indication that certain biological or social factors may contribute to the higher sex range in the disease.[5].
In this study, the distribution of dengue hemorrhagic fever (DHF) patients by age group is an important aspect to consider. This distribution provides useful insight into how the prevalence and impact of DHF varies across age groups. In this study, the distribution of dengue hemorrhagic fever (DHF) patients by age group is an important aspect to consider. This distribution provides useful insight into how the prevalence and impact of DHF varies across age groups[6].
The results show variations in the hematocrit of DHF patients. A total of 26.67% of the total sample had a hematocrit of less than 30%, which may indicate an increase in circulating fluid or significant blood loss. The majority of patients (50.00%) have a hematocrit within the 30-40% range, which can be considered the normal range. Meanwhile, 23.33% had a hematocrit above 40%, which may reflect a higher concentration of red blood cell components.
Hemoglobin levels in DHF patients also showed significant variations. As many as 18.33% of patients had a hemoglobin level of less than 10 gr/dL, indicating anemia. Most of the patients (78.33%) had hemoglobin levels in the range of 10-18 gr/dL, which can be interpreted as a normal range depending on other factors such as age and gender.[7].
Distribution of PDW values shows variations in platelet size in DHF patients. Although a small proportion (3.33%) had a PDW value of less than 10, the majority (83.33%) had values in the 10-18 range. A higher PDW value may indicate a greater variation in platelet size, which may occur in response to inflammation or blood clotting disorders[8].
Analysis of the MPV value shows variations in the average size of platelets in the blood of DHF patients. More than half (56.67%) of patients had an MPV value between 6.5 and 11, while 43.33% had a value above 11[9].

From the results of this study, it appears that most of the DHF patients in the sample (approximately 76.67%) experienced clinical degrees of DHF which were classified as grade 1. This degree included patients who experienced mild symptoms such as fever, muscle aches, and possibly skin rashes. . These results are consistent with the general characteristics of DHF which often starts with mild symptoms before progressing further. Although grade 1 is classified as a lower level of severity, it still requires medical monitoring and treatment[10].

There is a significant relationship between the PDW value and the clinical degree of DHF. These findings have important implications for understanding DHF disease and the potential of PDW as a diagnostic and prognostic indicator. Platelet Distribution Width (PDW) is a measure of the variation in the size of platelets in the blood. Platelets play a role in blood clotting and response to vascular damage. Higher PDW values may indicate greater variation in platelet size, which may reflect platelet activation in inflammatory or coagulation situations.[11]. In the context of DHF, the increased PDW values may reflect the platelet response to inflammation that occurs during infection[12].

There is a significant relationship between MPV value and clinical degree of DHF. These results have relevant implications for understanding DHF disease and its potential to assist patient assessment and management. Mean Platelet Volume (MPV) measures the average size of platelets in the blood. Platelets are blood cells that play an important role in blood clotting. A higher MPV value may indicate platelet activation[13]. In the context of infectious diseases such as DHF, changes in MPV values may reflect the response of platelets to inflammatory and inflammatory processes occurring in the body[14].

The results of the statistical analysis showed that there was a significant relationship between the two hematological parameters, PDW and MPV, with the clinical degree of DHF. These findings strengthen the hypothesis that changes in platelet characteristics reflected in PDW and MPV values can be important indicators in assessing disease severity. These results are in line with previous studies which have linked these values to inflammatory conditions and inflammation in various diseases[15,16].

V. CONCLUSION

PDW and MPV values can have potential as measurement indicators in evaluating the severity of DHF in patients. These findings have important clinical implications in the management of DHF patients. However, further research is needed to understand the deeper clinical and biologic implications as well as validate these findings in a wider clinical setting.

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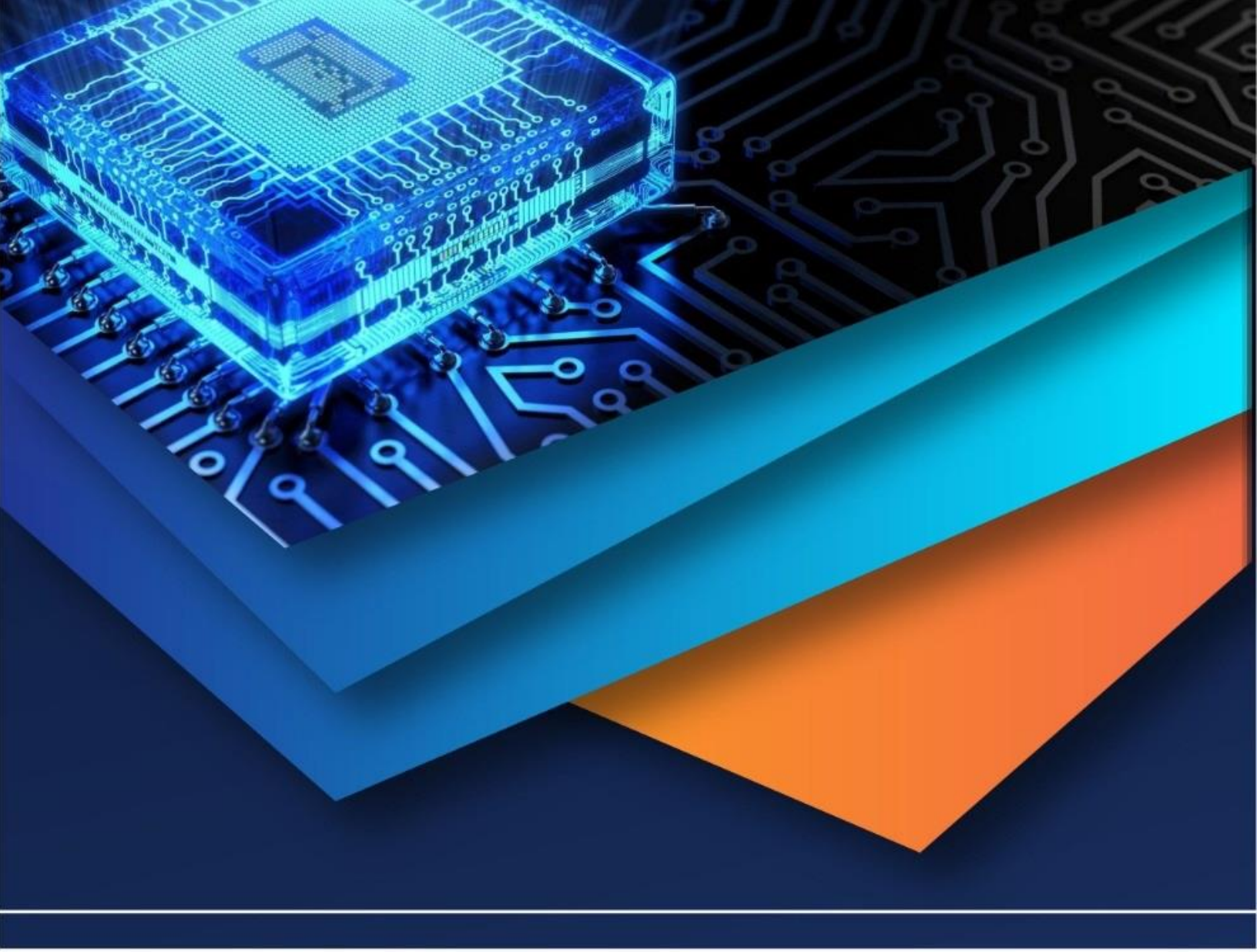

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