


Relationship Between Hematocrit Values and The Degree of Dengue Fever in Dengue Fever Patients at Panembahan Senopati Hospital, Bantul

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Article Info	ABSTRACT
Keywords: Hematokrit, Dengue Hemorrhagic Fever (DHF), Dengue Hemoorrhagic Fever (DHF) Level	Dengue Hemorrhagic Fever (DHF) is one of the major public health problems in Indonesia. The incidence of DHF in Bantul Regency in 2019 increased compared to 2018. In 2019 there were 1,424 cases of DHF Incident Rate (IR 1.5%), while in 2018 there were 182 cases of Incident Rate (IR 0.18%). An increase in hematocrit will be found very often in cases of shock because there will be an increase (hemoconcentration) due to an increase in blood cell levels or a decrease in blood plasma levels, for example in cases of DHF. The purpose of this study was to determine the relationship between hematocrit values and the severity of DHF in DHF patients. Method: This study used a cross-sectional study design, using 127 inpatient data at Panembahan Senopati Bantul Regional Hospital with the criteria; having symptoms of Dengue Hemorrhagic Fever who were hospitalized by undergoing hematocrit examination using a hematology analyzer in 2022. The results of the analysis showed a relationship between hematocrit values and the severity of DHF with a value of $p = 0.14$ and $r = 0.13$. Conclusion: There is no relationship between hematocrit values and the severity of DHF in DHF patients.
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INTRODUCTION

Dengue Hemorrhagic Fever is an acute dengue virus infection disease starting with fever for 2-7 days and manifestations of bleeding, decreased platelets, hemoconcentration due to plasma leakage (increased hematocrit, ascites, pleural effusion, hypoalbuminemia) accompanied by non-specific symptoms such as headache, muscle pain, bone pain, skin rash or pain behind the eyeballs[1]. Dengue Hemorrhagic Fever (DHF) is one of the main public health problems in Indonesia. The course of DHF is very fast and fatal events are often found because many patients die due to late treatment.[2]. 40% of the world's population lives in areas at risk of dengue fever infection. The population experiencing dengue fever every year is estimated to reach 360 million people in the world[3]. The incidence of Dengue Hemorrhagic Fever (DHF) in Indonesia from 2014 to 2019 continues to increase. DHF cases in 2019 were 13,683 people with a Case Fatality Rate (CFR) of 0.92 while in 2014 it was 0.9[4]. According to data from WHO (2017)[5], DHF is one of the potential threats among 10

diseases for 2019 in several countries. Indonesia reported the highest Case Fatality Rate (CFR) (1.12%) in Southeast Asia[4].

The number of dengue fever cases in the Special Region of Yogyakarta was 649 cases with 2 deaths in 2018.[6]. DHF cases in 2019 were 3,399 sufferers, and in 2020 there were 3,599 sufferers. The highest incidence of DHF was in Bantul Regency, Special Region of Yogyakarta Province[6].

The number of DHF cases in Bantul Regency in 2019 increased compared to 2018. In 2019 there were 1,424 DHF cases with an Incident Rate (IR 1.5%), while in 2018 there were 182 cases with an Incident Rate (IR 0.18%). Banguntapan District, Bantul is an endemic area where there are DHF cases every year. In addition, population density and rapid migration in Banguntapan District have made this case continue to increase. DHF cases in Banguntapan in 2019 were in the range of 51 - 75 cases[7].

In endemic areas of Dengue Fever, children are at greater risk of contracting Dengue Fever compared to adults due to the influence of differences in immunity between children and adults, because the immunity of adults is stronger than that of children. This also affects the incidence of dengue shock in children.[8]. Dengue shock in children can be caused by the blood vessels in children still growing, so they are more permeable and leak easily.[9]. It is known that microvasculature is more permeable to water and plasma proteins compared to more mature blood vessels.[10].

The hematocrit value is concentration (expressed as a percentage) of red blood cells in 100 mL of blood. Increased hematocrit values will be found very often in cases of shock because there is an increase (hemoconcentration) in blood cell levels or a decrease in blood plasma levels, for example in cases of DHF[11]. On the other hand, the hematocrit value will decrease (hemodilution) due to a decrease in blood cells or an increase in blood plasma levels, for example in the case of anemia. So it is necessary to measure the hematocrit value in monitoring DHF cases.[12]. According to WHO (2017)[5], the symptoms of DHF are classified into 4 degrees, namely degrees I-IV[13]. Medical indications for grade 1 and 2 DHF patients have symptoms of fever that last for 2-7 days, body aches, muscle pain, and convulsions (in children).[14]. Grade III DHF patients experience circulatory failure such as rapid and slow pulses and hypotension and cyanosis around the mouth. Grade IV DHF patients experience severe shock and an unpalpable pulse and irregular blood pressure.[15]

Grade I is the mildest condition with the criteria of fever, positive tourniquet test, and minor bleeding.[16]. Grade II is the criteria Grade I plus spontaneous bleeding. Grade III is characterized by circulatory failure, hypotension, cyanosis around the mouth, and the patient appears restless.[2]. Grade IV is also called Dengue Shock Syndrome (DSS), the patient experiences shock with decreased consciousness to coma, pulse pressure cannot be measured[17].

HOSPITAL The Worship of the Senopati of Bantul is a hospital that provides complete individual health services with a specialty in health services in the field of Dengue Hemorrhagic Fever (DHF). Based on the results of a survey conducted by researchers on Dengue Hemorrhagic Fever patients who were hospitalized at Panembahan Senopati Bantul Hospital, there were 124 cases in January - September 2022. The purpose of this study was

to determine the relationship between Dengue Hemorrhagic Fever (DHF) hematocrit values and the Severity of DHF.

METHODS

This study used a cross-sectional study design, using 127 patient data who were hospitalized at Panembahan Senopati Bantul Regional Hospital with the criteria; Hospitalized patients who had symptoms of Dengue Hemorrhagic Fever, and underwent hematocrit examination using a hematology analyzer in 2022.

RESULTS AND DISCUSSION

Sample Characteristics

The sample in this study was all patients with a diagnosis of DHF who were hospitalized at Panembahan Senopati Bantul Regional Hospital, totaling 122 samples and meeting the sample criteria.

Table 1. Sample Characteristics

No	Characteristics	Degrees I Frequency (%)	Degrees II Frequency (%)	Degrees III Frequency (%)	Degrees IV Frequency (%)
1	Age				
	Toddlers (0-5 Years)	4 (3)	3 (2)	3 (2)	9 (7)
	Children (6-11 Years)	4 (3)	8 (6)	4 (3)	11 (8)
	Teenager (12-25 Years)	9 (8)	17 (13)	5 (6)	13 (10)
	Mature (26-45 Years)	6 (4)	8 (6)	3 (2)	1 (1)
	Elderly (>46 years)	5 (3)	7 (5)	1 (1)	1 (1)
	Total	28 (21)	43 (32)	16 (20)	35 (27)
2	Gender				
	Man	21 (16)	21 (16)	9 (7)	16 (12)
	Woman	11 (8)	21 (16)	10 (8)	18 (14)
	Total	32 (24)	42 (32)	19 (15)	34 (26)

Table 2. Relationship between Hematocrit and the Degree of Dengue Fever

No	Degree of Dengue Fever	Hematocrit			Kolmogorov Smirnov Test	Spearman Correlation Test
		Mean	SD	Median		
1	Degree I	38.39	4.50	38		
2	Grade II	38.41	4.47	38	0.01	p= 0.14
3	Grade III	38.52	4.51	38.3		r= 0.13
4	Grade IV	38.44	4.50	38		

Based on the research results obtained in Table 1. The number of respondents who suffered the most from Dengue Fever were children aged 6-11 years to teenagers aged 17-25 years. In Table 2. The average hematocrit value in Dengue Fever patients at Panembahan Senopati Bantul Hospital was higher at grade III (38.52%). The following research results also showed a decrease in the average hematocrit value at grade I (38.39%), but increased again at grade II (38.52%) and grade IV (38.44%).

The results of the correlation analysis showed that there was no relationship between the average hematocrit value and the clinical degree of Dengue Fever with a value of $p = 0.14$ (> 0.05) and $r = 0.13$, namely there was no statistical relationship between the hematocrit value and the clinical degree of Dengue Fever. These results are similar to research from Efiariza, et al (2024)(Noviyani, 2023) obtained results $p = 0.315$ and $r = 0.134$, this shows that there is no statistically significant correlation between hematocrit values and the degree of DHF. However, these results differ from the research conducted by Handayani, et. al (2022)(Made *et al.*, 2022) which states that there is a correlation between hematocrit values and the degree of DHF ($p = 0.023$ and $r = -0.248$). Increased hematocrit values in patients with Dengue Hemorrhagic Fever can describe hemoconcentration conditions. This condition is an indicator of plasma leakage, increased hematocrit levels $\geq 20\%$ indicate increased capillary permeability and plasma seepage (Triana, Kurniati and Wirastari, 2020)(Tuntun and Anisa, 2017). This plasma leakage causes the plasma volume to decrease and there are many red blood cells in the blood vessels, causing the hematocrit value to increase.(Putri, Shinta and Patricia, 2023). This can result in hypovolemic shock and circulatory failure, thus worsening the degree of Dengue Hemorrhagic Fever.(Tuntun and Anisa, 2017). Increased hematocrit concentration can be caused by severe diarrhea, erythrocytosis, dehydration, polycythemia vera, diabetic acidosis, cerebral ischemia, eclampsia, surgery and burns.(Nugraha, 2017). Hematocrit values will decrease when hemodilution occurs, due to a decrease in blood cellular levels or an increase in blood plasma levels, such as in anemia.(Hidayat, Yaswir and Murni, 2017). In DHF patients, there is an increase in hematocrit values which indicates hemoconcentration.(Vanitha, Sandhyarani Javalkar and Manjunath, 2017). Reference values for normal hematocrit are 40–54% for adult males and 37–54% for adult females.(Kolondam, Nelwan and Kandou, 2020).

CONCLUSION

Based on the results of research conducted at Panembahan Senopati Bantul Regional Hospital regarding the relationship between hematocrit values and the degree of DHF, it was found that there was no relationship between hematocrit values and the degree of DHF in patients with Dengue Hemorrhagic Fever at Panembahan Senopati Bantul Regional Hospital.

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