

Hematocrit, Thrombocyte, Body Mass Index, and Their Associations with the Severity of Dengue Hemorrhagic Fever Among Adult Patients at Esnawan Antariksa Air Force Hospital, Jakarta

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ABSTRACT

Dengue hemorrhagic fever (DHF) disease is one of the problems in healthcare facility. According to WHO criteria, thrombocyte and hematocrit are used as an indicator for the diagnosis of DHF. Hematocrit and thrombocyte examination will help and simplify therapy and diagnosis. The previous studies also stated that body mass index (BMI) has proven to influence the severity of DHF. The aimed is to determine the association between hematocrit, thrombocyte, body mass index and the severity of DHF among adult patients at Esnawan Antariksa Air Force Hospital from January to December 2018. . Subjects and Method: A cross sectional study conducted at Esnawan Antariksa Air Force Hospital East Jakarta, with 68 samples of medical records which were selected for this study. The dependent variable was the severity of dengue hemorrhagic fever, while the independent variables were hematocrit, thrombocyte and body mass index. Result showed a significant level of hematocrit ($p=0.000$), thrombocyte ($p=0.000$) and BMI ($p=0.245$). Conclusion: There were associations between hematocrit, thrombocyte and the severity of DHF among adult patients but none between BMI and severity of DHF patients at Esnawan Antariksa Air Force Hospital. Majority of patients at Air Force Hospital had a normal BMI, which is with normal BMI people had a better immunity than those without.

Keywords: *DHF, hematocrit, thrombocyte, BMI*

1. INTRODUCTION

One of the diseases that often occurs in Indonesia is Dengue Hemorrhagic Fever. Dengue Haemorrhagic Fever (DHF) is one of the problems in the health sector which until now has not been able to be overcome either from the incidence of the disease or the spread of the epidemic [1]. DHF is an infectious disease caused by dengue virus with symptoms of fever, muscle or joint pain accompanied by leukopenia, rashes, lymphadenopathy, thrombocytopenia and hemorrhagic diathesis [2]

.Based on data in Indonesia as many as 68,407 DHF sufferers and 493 others died, while there were 204,171 DHF sufferers and 1598 patients who died in 2016 in Indonesia [1]. Despite the decline, dengue fever is still the most common cause of death in several regions in Indonesia. In the province of DKI Jakarta, the quality of the environment and climate supports the development of the *Aedes aegypti* mosquito [3]. From the records of the Jakarta City Health Office, the number of dengue fever

cases in Jakarta in 2015 was 4194 cases, while in 2016 there were 22,697 cases.

Dengue virus infection in DHF causes cross reactions between antibodies and antigens which will cause a decrease in platelets and an increase in hematocrit. Thrombocytes are the smallest elements of blood cells that play an important role in the formation of blood vessels in the event of endothelial damage to blood vessels [4], while hematocrit is an indicator that is used as a marker of a decrease in plasma volume. Plasma volume that is too low, accompanied by a decrease in platelets can cause shock. There are other risk factors that can support the severity of DHF besides hematocrit and thrombocyte including age, sex and body mass index. DHF patients with a high Body Mass Index have a risk of shock [5]. The occurrence of shock in DHF patients can worsen the condition of the individual.

The severity of DHF is divided into degrees 1 to 4, each of which has certain characteristics both from clinical

symptoms and from laboratory results [6]. Generally, dengue patients treated at the hospital are patients aged 18-40 years. The purpose of this study stated the description of hematocrit, thrombocyte, body mass index and grade of severity in adult DHF patients at Esnawan Antariksa AF Hospital. Research also determine the relationship between hematocrit, thrombocyte and Body Mass Index and the grade of severity of DHF in adult patients.

2. METHOD

The study design was observational analytic with a cross-sectional approach to determine the relationship between hematocrit, thrombocyte and body mass index to the grade of severity of adult DHF patients at Esnawan Antariksa AF Hospital in 2018-2019. The study population was the medical records of adult DHF patients who were hospitalized in the Esnawan Antariksa AF Hospital in the January-December 2018 period with inclusion criteria, namely patients diagnosed with DHF, ages 18-40 years and duration of fever 3-5 days. Exclusion criteria were DHF patients with a history of blood clotting disorders, history of blood disorders (Polycythemia vera, Aplastic Anemia, Autoimmune Disease), incomplete medical record data, patients with other infectious diseases (typhoid fever, pulmonary TB, pneumonia), patients who had taking drugs, patients with a history of DM, hypertension, patients with a diagnosis of atypical dengue. The total sam

3. RESULTS AND DISCUSSION

A total of 68 adult DHF patients most of the men (66.2%) or as many as 45 people, had the most age is 20-40 years, age can determine sensitivity to dengue virus infection and have a role important for the occurrence of plasma leakage. Age that often experience DHF is the age of children and young adults. The number of adult DHF patients in men is due to the fact that men tend to have high outdoor activities, in adulthood tend to be productive so they are more susceptible to the bite of the Aedes Aegypti mosquito, it is easier in women to form immunoglobulin and hormone-managed antibodies [11].

Table 1. Characteristic of Hematocrit in Dhf Patients in Esnawan Antariksa AF Hospital

Hematocrit	N	%
Low	5	7.4
Normal	39	57.4
High	24	35.3
Total	68	100

Secondary Data, 2018

Most adult DHF patients had normal hematocrit (57.4%). This is in accordance with what was noted by Hidayat et al.,

[12] that from 138 samples in RSUP Dr. M. Djamil, DHF patients, 75 people tended to have normal hematocrit levels. Hematocrit examination is one of the tests to help diagnose DHF, where the increase in hematocrit values is one indicator of laboratory examination of DHF patients. The possibility of a normal amount of hematocrit indicates that plasma penetration has not yet occurred in these patients (See Table 1).

Adult DHF patients at Esnawan Antariksa AF Hospital in 2018 mostly had thrombocytes>100,000 in the amount of 31 people (45.6%), between 50,000 to 100,000 by 30 people (44.1%). DHF patients in Al Islam Bandung Hospital had thrombocytes <100,000 there were 72 people (55.8%) [13]. Decreased thrombocytes in dengue cases can occur due to decreased thrombopoiesis, increased destruction of thrombocyte in the blood and the presence of impaired thrombocyte function due to dengue virus infection (see Table 2).

Table 2. Description of Thrombocyte of DHF Patients in Esnawan Antariksa AF Hospital

Trombocyte	N	%
< 50.000	7	10.3
50.000- 100.000	30	44.1
> 100.000	31	45.6
Total	68	100

The dependent variable was the Grades of Severity of adult DHF patients, there were four grades which grade I had 41 the most patients (60.3%) and grade II had 19 patients (27.9%). The rest of the samples were grade III and IV (6 and 2 patients respectively). On bivariate Analysis Results, Table 3 showed that with the Kolmogorov-Smirnov test by merging cells obtained a value of p = 0,000 (p value <0.05) indicating that there was a significant relationship between hematocrit and the severity of adult DHF patients at Esnawan Antariksa AF Hospital in 2018. In Table 4 it can be seen that the Kolmogorov-Smirnov test found that there was a relationship between Thrombocyte and the severity of adult DHF patients p = 0.000. Thrombocytes were the smallest elements in the form of fragments that function for blood clotting. Decreased Thrombocyte will result in no clotting process in the event of bleeding and will cause shock if not treated immediately.

Table 3. Relationship between Hematocrit and the Grades of DHF Patients Severity in Esnawan Antariksa AF Hospital

Grades of DHF Severity									
HEMATOCRIT	GRADE I		GRADE II		GRADE III, IV		TOTAL		P-value
	N	%	n	%	n	%	N	%	
Low	4	80	1	20	0	0	5	100	0.000
Normal	33	84,6	5	12,8	1	2,6	39	100	
High	4	14,5	13	54,2	7	2,8	24	100	
Total	41	60,3	19	27,9	8	11,8	68	100	

Secondary data, 2018

Table 4. Relationship between Thrombocyte and the Grades of DHF Patients Severity in Esnawan Antariksa AF Hospital

Grades of DHF Severity									
THROMBOCYTE	GRADE I		GRADE II		GRADE III, IV		TOTAL		P-value
	n	%	n	%	N	%	n	%	
< 50000	0	0	0	0	7	100	7	100	0.000
50.000-100.000	13	43,3	16	53,3	1	3,3	30	100	
> 100.000	28	90,3	3	9,7	0	0	31	100	
Total	41	60,3	19	27,9	8	11,8	68	100	

Secondary data, 2018

In DHF patients, Thrombocyte reduction can occur with a variety of mechanisms. A decrease in Thrombocyte can occur by decreasing Thrombocyte production due to suppression of the spinal cord, increased Thrombocyte destruction, and excessive Thrombocyte use [4]. Dengue virus infection will cause thrombocytopenia by suppressing the spinal cord so that production decreases. Usually this decrease in production occurs on days 3, 4, and 5 fever. Thrombocytopenia is caused by the discovery of immune complexes on the surface of Thrombocytes so that they can be destroyed by the RES system [8]. In addition, when dengue infection activates several inflammatory mediators such as TNF α , IL-6 and histamine which will cause changes in endothelial cells and plasma leakage so that Thrombocyte use increases. When the Thrombocyte count is reduced, Thrombocyte hemostasis function decreases so that the resistance of the blood vessels will be reduced and can cause bleeding manifestations that can cause shock [8]. There was no relationship between Thrombocyte and the severity of DHF [7]. The differences in this hypothesis can occur due to the influence of drugs, slow blood sampling, not immediately mixing anticoagulants or blood with inadequate anticoagulants, differences in Thrombocyte production in the spine, delayed examination of samples that are more than one hour and mixing blood with anticoagulants that is not appropriate so that it can affect the value of thrombocyte.

In the Kolmogorov-Smirnov test it was found that there was no relationship between BMI and the severity of adult DHF

patients with $p = 0.245$. Amount of 37 adult DHF patients or 54.4% had the normal body mass index while 6 (8.8%) had less than normal body mass index, which is people with normal BMI had a better immunity than those without. This is in accordance with conclusion from Xiaolin Lie et al [14] research that Higher baseline BMI could predict better immune reconstitution in HIV-infected patients after HAART initiating.

4. CONCLUSION

1. Most of the adult DHF patients suffered DHF of the first degree, had laboratory results with normal hematocrit, had thrombocyte examination results > 100,000 and had a normal Body Mass Index.
2. There were associations between hematocrit and thrombocyte with grades of severity in adult DHF Dr. Esnawan Antariksa patients Air Force Hospital.
3. There was no association between body mass Index with the grade of severity in adult DHF patients in Dr. Esnawan Antariksa AF Hospital.

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